

SCHOOL LAUNCH • LIFE SCIENCE K-8

# KINDERGARTEN LIFE SCIENCE: GOD MADE THE ANIMALS

*A year of looking closely at the living things God made, from the cow in the barn and the dog by the back door to the goldfinch, the ant, the bean seed, the child's own hands and the dinosaur bones in the museum, each one seen, touched, counted and drawn at the kitchen table, and ending at the door of Noah's ark with the animals going in two by two.*

First edition

*"And God made the beast of the earth after his kind, and cattle after their kind, and every thing that creepeth upon the earth after his kind: and God saw that it was good." (Genesis 1:25, KJV)*

## COURSE GUIDE

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This course takes a kindergartner through one year of living things: the farm animals, the pets, the birds, the bugs, the seeds and plants, the child's own body, the dinosaurs, and at the end the animals of Noah's ark. Every lesson begins with **a story**, read aloud by a parent: a real cow in a real barn, a hen sitting on her eggs, a shepherd and his sheep, a goldfinch on a chain in a Dutch painter's studio, a woman who sailed across the ocean to draw butterflies, a man who dug dinosaur bones out of a hillside. Then the child **looks and measures**: counts the legs on an ant, compares a big seed and a small seed, feels raw wool, shakes cream into butter, holds an egg up to a lamp, measures a dinosaur footprint with her own two hands.

The thread of the year is simple enough for a five-year-old to say back: **every living thing was made, and every living thing has what it needs**. The cow has four stomachs for grass. The bird has hollow bones for flying. The seed has its own packed lunch inside. The child has two eyes, two ears, ten fingers and a skeleton that holds him up. Unit by unit the course asks the same three questions: What is it? What does it have? What does it do with what it has? By spring the child is asking those questions on his own at the zoo, in the garden and in the backyard.

The faith thread runs through the whole year without being forced. The course is written from a Christian view of creation and takes the words of Genesis at face value: "And God made the beast of the earth after his kind, and cattle after their kind, and every thing that creepeth upon the earth after his kind: and God saw that it was good." (Genesis 1:25). Each unit carries one short verse the child can learn by heart, such as "The LORD is my shepherd" beside the sheep, "Go to the ant" beside the ants, "Behold the fowls of the air" beside the birds and "I am fearfully and wonderfully made" beside the child's own body. The year ends with Noah's ark and the rainbow promise, and the child names the animals as Adam did.

Nothing is read by the child. Everything is said, pointed to, built, sorted or drawn. The child keeps a **nature notebook** of crayon drawings and the parent writes one sentence under each one in the child's own words. An optional **Nature Lab** of four outings (a nature walk, a backyard survey, a visit to a zoo, farm or museum, and a small collection of leaves, feathers and shells) can be used any time in the year or over the summer.

### WHO IT IS FOR

Written for children in kindergarten (about ages 5-6) and usable with ages 5-8. A parent or teacher reads every word aloud, handles the eggs, the stove and the scissors, and writes the child's sentences in the nature notebook. The child does not need to read or write. Counting to 10 or 20, telling bigger from smaller, and holding a crayon are all that is needed. Nothing needs to be bought beyond ordinary household things: a notebook, crayons, a jar, some cream, an egg, a few dried beans, a pinecone and a magnifying glass if you have one.

## HOW TO USE THIS COURSE

**The weekly rhythm.** The year has 32 lessons, one a week, in eight units of four. Each lesson takes two sessions of 30–40 minutes. Session 1 is the warm-up, the story, the key words and the picture study. Session 2 is the make-and-do activity, the practice and the nature notebook. In the last week of each unit, add a short third sitting for the unit review and the unit project. The optional Nature Lab (four outings) can be dropped in wherever the weather and the calendar allow.

**The ★ quarter path.** Ten lessons are marked with a star: one or two from each unit. A family that wants a one-quarter version, or a younger child who is just getting started, can do only the starred lessons and still touch every unit, learn every verse, and finish the year at Noah’s ark. Children who love a unit can always go back and do the lessons they skipped.

**The nature notebook.** Use one blank or sketch notebook for the whole year. Every lesson ends with the child drawing what she saw, made or counted: a cow with its four legs, the inside of an egg, a feather, an ant with six legs, a seed cut in half, a hand traced on the page. The parent dates the page and writes one sentence under the drawing in the child’s own words. The notebook is the child’s record of the year and the main thing the parent looks at to see what the child has learned.

**Make and do, and safety.** Every lesson has one simple activity with household things: making butter in a jar, looking inside an egg, feeling wool, building a nest from grass and mud, growing a bean in a wet paper towel, making a pinecone bird feeder, measuring a dinosaur footprint with hands and feet. A parent handles anything hot, sharp or breakable, cracks the eggs, and supervises every outing and every live animal. Wash hands after touching animals, eggs, soil or raw wool. Never touch a wild animal, a bee or a bird’s nest with eggs in it; look from a step away.

**Worked examples and practice.** Each lesson shows one very simple example, worked out loud, such as counting the legs on a bug, telling which of two animals is bigger, reading a picture chart or measuring with hands or a ruler. Then come five short practice items, nearly all of them oral: point to, sort, match, count, draw or tell back. The answers are printed for the parent. Numbers stay under 20. There is no written work for the child.

**Unit reviews and unit projects.** Each unit ends with a short review of 20 points: six to eight questions a parent asks aloud and the child answers by telling, pointing or drawing. Then comes a unit project that pulls the unit together, such as a farm animal picture chart, a pet-care checklist, a bird feeder, a bug book, a bean in a cup with its growth marked by a ruler, a traced-body poster, a dinosaur size line on the floor and a shoebox ark with paper animals two by two. Keep the projects, or a photo of each, with the nature notebook.

**A word about time.** The course is written from a Christian view of creation (Genesis 1:1) and the Flood (Genesis 6–9). Deep-time names such as “Jurassic” or “Ice Age” are taught as museum words so that the child can hear any museum sign, library book or textbook read aloud and know what the words mean. Wherever such a word comes up, a ⌚ Thinking About Time box sets out in a few plain sentences what the sign says, what we can actually observe,

and how Christians read it. The course gives no numbers for the age of anything. A parent can read the box aloud, shorten it, or skip it, as fits the family.

## **SCOPE AND SEQUENCE**

### **Unit 1: Farm Animals** (1-4)

The cow and her milk, the hen and her eggs, the sheep and her wool, and the horse that pulled the plow; what each animal gives and how a farmer cares for it.

### **Unit 2: Pets** (5-8)

Dogs, cats and fish in a bowl; what each one needs to eat, drink and rest, and how a kind child cares for the animals in his keeping.

### **Unit 3: Birds** (9-12)

Feathers, nests and songs; how a bird is built for flying, how it builds a home, and how God feeds the fowls of the air.

### **Unit 4: Bugs** (13-16)

Ants, butterflies, ladybugs and bees; six legs, three body parts, a caterpillar that turns into a butterfly, and a hive full of honey.

### **Unit 5: Seeds and Plants** (17-20)

What is inside a seed, how roots go down and shoots go up, why leaves turn toward the light, and the tiny mustard seed that grows into a tree.

### **Unit 6: My Body** (21-24)

The child's own body, fearfully and wonderfully made: the bones that hold him up, the five senses that take in the world, and the hands he keeps clean.

### **Unit 7: Dinosaurs** (25-28)

Dinosaur names and what they mean, the big plant-eaters and the fierce meat-eaters, and the eggs and babies found in the rocks; museum words explained in a 🕒 Thinking About Time box.

### **Unit 8: Noah's Ark** (29-32)

The animals going in two by two, big and small, the rainbow promise, and naming the animals as Adam did; the whole year gathered into one ark.

### **Unit 9: Nature Lab (optional)** (Any time)

Four outings to use whenever the weather allows: a nature journal walk, a backyard survey, a visit to a zoo, farm or museum, and a small collection of leaves, feathers and shells.

## MATERIALS

- **Nature notebook (a blank or sketch notebook):** One for the whole year. The child draws; the parent dates the page and writes one sentence in the child's words.
- **Crayons, colored pencils, a glue stick and child-safe scissors:** Used in nearly every lesson for drawing, sorting cards and the unit projects.
- **A magnifying glass:** For looking at feathers, seeds, ants, leaves and the child's own fingerprints. A cheap plastic one is fine.
- **A ruler and a tape measure:** For measuring seeds, feathers, a hand, a foot and a dinosaur footprint on the floor. Hands and feet work when there is no ruler.
- **Kitchen things: a jar with a tight lid, heavy cream, a few eggs, honey, a lemon and clear cups:** For making butter, looking inside an egg, tasting honey and growing seeds. A parent handles the eggs and the stove.
- **Dried beans, a packet of seeds, paper towels, potting soil and a sunny windowsill:** For Unit 5 and the bean-in-a-cup unit project.
- **A pinecone, peanut butter or shortening, and birdseed:** For the Unit 3 bird feeder. Use shortening if anyone in the house has a nut allergy.
- **A handful of raw wool or thick yarn, and a few feathers, shells and leaves:** For touching, sorting and the Nature Lab collection. Wash hands after handling raw wool.
- **Household odds and ends: a shoebox, cardboard, string, tape, cotton balls, grass and mud:** For nests, the traced-body poster, the dinosaur size line and the shoebox ark.
- **Optional: one of the picture books or resources listed in a unit:** Never required. See the list in each unit.

## GRADING

There are no letter grades in kindergarten. The parent listens to the child tell back the story, watches the child make and do, looks at the nature notebook, and asks the unit review questions aloud. A simple checklist is kept for each unit, and a child who can tell it back, point to it, and draw it has learned it. The parts below show where to put your attention, not how to compute a number.

- Oral narration (telling the story back in the child's own words): 40%
- Make and do activities (looking, counting, measuring and trying): 25%
- Nature notebook (a drawing for each lesson with a dated sentence): 20%
- Unit reviews and unit projects (asked aloud; 20 points each): 15%

No letter grades. Mark each checklist item Done, Done with help, or Try again next week. A unit is complete when every lesson has a notebook page and the child can answer most of the review questions aloud.

- Narration is the heart of it. After each story, ask "Tell me about the cow" or "What did the ant do?" and let the child talk. Short answers are fine; pointing and acting it out count too.

- Each unit review has 20 points over six to eight questions. Ask them aloud and let the child answer by telling, pointing or drawing. Write the answers down yourself if you want a record.
- A notebook page is complete when it has a drawing, a date and one sentence the child said. Neatness does not count; looking closely does.
- A child who is not ready for a lesson can do the ★ starred lessons only and come back to the rest later in the year or next year.
- Keep the unit projects, or a photo of each, in one folder with the nature notebook. Together they are the child's record of the year.

## **A NOTE TO PARENTS**

You do not need to know any science to teach this course. Read the story aloud, hand your child the egg, the feather or the bean, and ask three questions: "What do you see?", "How many?" and "What is it for?" Then let your child tell you. Most of what a good kindergarten science teacher does is slow down and look closely, and a parent at a kitchen table can do that better than anyone.

The course is written from a Christian view of creation. God made the cow, the goldfinch, the ant, the seed, the dinosaur and the child, and He saw that it was good. When museum words such as "Jurassic" or "Ice Age" come up, the ⌚ Thinking About Time box tells you plainly what the sign says, what anyone can observe, and how Christians read it, so that your child can walk through any museum with you and not be confused. No ages are given for anything, and nothing in the course asks you or your child to take sides in present-day public debates.

Keep it short and keep it happy. Thirty minutes of looking, counting and drawing is plenty for a five-year-old, and a lesson that ends with the child wanting more is a lesson that worked. If the butter does not come, the bean does not sprout or the bird does not visit the feeder, draw what happened and try again next week. Above all, the course hopes to raise a child who looks at a sparrow and sees the care of the One who made it.

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★ quarter path ·  Thinking About Time box

## FARM ANIMALS

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God made the animals, and on the very first pages of the Bible He gave them to people to care for. In this unit you will meet four animals that have lived and worked beside farm families for as long as anyone can remember: the cow, the chicken, the sheep and the horse. Each one gives us something good. The cow gives milk. The hen gives eggs. The sheep gives wool. The horse gives its strength.

You will not just hear about these animals. You will shake cream into butter, look inside an egg, feel wool straight off a sheep, and pull a load like a plow horse. You will look closely at four famous paintings of farm animals and count, point and tell what you see. And you will learn a song by David, who was a shepherd boy before he became king: “The LORD is my shepherd; I shall not want.”

### BEFORE YOU BEGIN

- Can count aloud to 12 and show numbers on fingers
- Can listen to a short story read aloud and answer a simple question about it
- Can hold a crayon and draw a simple animal
- Can sort a few objects by color or by size

### MASTERY CHECKLIST

- I can tell that milk comes from a mother cow and that cream shaken hard turns into butter.
- I can point to the shell, the white and the yolk of an egg and tell that a hen keeps her eggs warm to hatch chicks.
- I can tell that wool is the sheep’s coat, that shearing does not hurt, and that wool is twisted into yarn.
- I can tell two jobs horses did for farmers and measure something in hands.
- I can name the mother, father and baby of the cow, chicken, sheep and horse.
- I can say “The LORD is my shepherd; I shall not want” and tell what a shepherd does.

### OPTIONAL BOOKS AND RESOURCES

- **Beatrix Potter’s farm tales at Project Gutenberg (free)**  
(<https://www.gutenberg.org/>): Free. Search for Beatrix Potter and read aloud *The Tale of Jemima Puddle-Duck* (a farmyard and its eggs), *The Tale of Tom Kitten* and *The Tale of Little Pig Robinson*. Short, with pictures, and set on a real English farm.

## 1.1 COWS GIVE MILK ★

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### OBJECTIVES

- Tell that milk comes from a mother cow, and that cows eat grass and hay.
- Point to the cow, the bull and the calf in a picture and say which one gives milk.
- Shake cream in a jar until it turns into butter, and tell what happened.

**Warm-up.** Pour a little milk into a cup. Look at it. Smell it. Taste it. Ask: Where did this milk come from? The store? And before the store? Now hold up a stick of butter and a slice of cheese. All three came from the same animal. Can you guess which one? Say the sound that animal makes.

**Video.** Coming soon. Dairy cows being milked and how milk gets from the farm to the table, for young children; search farm tour footage, SciShow Kids, Homeschool Pop (Alternate), state dairy council channels and Moody Science classics on animals.

### KEY TERMS

#### cow

A grown-up mother of the cattle family. A cow makes milk for her baby. The father is called a bull.

#### calf

A baby of the cattle family. A calf drinks its mother's milk and grows up to be a cow or a bull.

#### cud

Grass that a cow swallows, brings back up and chews again. A cow chews her cud for hours every day.

#### cream

The rich, fatty part of milk. Shake cream hard for a long time and it turns into butter.

### CORE IDEAS

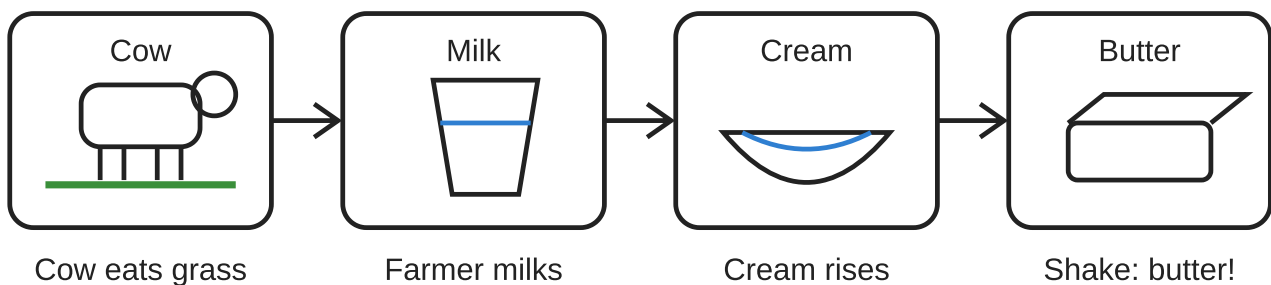
**The story.** Every morning, before the sun is up, a dairy farmer walks out to the barn. The cows are waiting. They are big and warm, and they smell like hay. The farmer washes each cow's **udder**. The udder is the soft bag under the cow where the milk is kept. Then a milking machine, or the farmer's own two hands, gently squeezes the milk out. The milk is warm and white and it foams in the bucket. The farmer milks the cows again at night. Cows are milked every single day, even on Sunday, even on Christmas.

**How they figured it out.** Why does a cow make milk at all? Because a cow is a mother. A mother cow makes milk for her **calf**, the way a mother cat makes milk for her kittens. Long ago people saw that a cow makes more milk than one calf needs, so there is plenty to share. And where does the milk come from? From grass! A cow eats grass and hay all day. She

swallows it, brings it back up, and chews it again. That is her **cud**. Watch a cow lying in a field. Her jaw goes round and round. Inside her, her stomach has four parts that turn grass into milk. Black-and-white cows are called Holsteins. Little brown cows are called Jerseys, and their milk is extra creamy.

**The big idea.** Milk is not just for drinking. If milk from the cow sits still, the **cream** floats to the top. Shake that cream, and tiny drops of fat bump into each other and stick together. Keep shaking and, all at once, you have a lump of butter and a thin, sour drink called buttermilk. The Bible knew this: “Surely the churning of milk bringeth forth butter” (Proverbs 30:33). Churning means shaking or stirring hard. From milk we also get cheese, yogurt and ice cream. Milk from the store has been warmed just enough to kill germs, so it stays fresh and safe. Then it is cooled and put in cartons.

**God’s handiwork.** On the sixth day God made “cattle after their kind.” Think about it: a cow eats grass we cannot eat, and gives milk we can drink. God made her that way. Next time you pour milk on your cereal, say a quiet thank-you to God, and maybe a thank-you to the cow.



*From grass to butter. Point to each step and say it aloud.*

## PICTURE STUDY



*The Bull*, Paulus Potter, 1647 · Oil on canvas · Mauritshuis, The Hague

Paulus Potter was a Dutch painter who loved farm animals. He painted this bull almost as big as a real one, so people standing in front of it feel as if they are in the meadow. Look closely and you will find a cow, sheep, a lamb, a herdsman, birds and even a frog in the grass.

Potter painted every hair and every fly. Dutch farmers were proud of their fat cattle, and this painting is like a thank-you for them.

### Look closely

- Find the bull. He is the father. Find the cow lying down. She is the mother. Which one gives milk?
- Count the sheep. Find the little lamb.
- Find the man leaning on the tree. What do you think his job is?
- Look at the sky. Is it morning or evening? Sunny or cloudy?

### Talk about it

1. The bull is very big. Why would a farmer want a strong, healthy bull on the farm?
2. What is the cow doing with her mouth as she lies in the grass?
3. If you could step into this meadow, what would you hear and smell?

## MAKE AND DO: BUTTER IN A JAR

Farm families used to make butter by hand. Today you will do it too, with nothing but a jar and your own two arms. By the end you will have real butter to spread on bread.

### You will need

- A small glass jar with a tight lid (a clean jam jar is perfect)
- Heavy whipping cream, left out of the refrigerator for about 20 minutes
- A pinch of salt
- A cup of cold water
- A spoon, a small bowl, and bread or crackers

### Steps

1. Fill the jar about halfway with cream. Screw the lid on tight. Parent checks the lid.
2. Shake, shake, shake! Hold the jar with both hands and shake it up and down. Sing a song while you shake. Take turns with your parent when your arms get tired.
3. After a few minutes, stop and look. The cream is thick and fluffy. That is whipped cream. Do not stop. Keep shaking.
4. Soon you will feel a lump bang inside the jar. Open the lid and look. A yellow lump of butter sits in thin white liquid. The liquid is buttermilk. Taste a sip.
5. Pour the buttermilk into the bowl. Put the butter in the cold water and press it with the spoon. The water washes out the last buttermilk. Pour the water off.
6. Sprinkle a pinch of salt on the butter and mix it in with the spoon.
7. Spread your butter on bread. Thank God for the cow. Eat!

### Tips

- Cream that is a little warm turns to butter faster than cold cream.
- It usually takes five to ten minutes of hard shaking. Just when you think it will never happen, it happens.
- Keep leftover butter in the refrigerator and use it within a few days.

### Check your work

- I can tell what cream turns into when it is shaken for a long time.
- I can name the thin liquid left behind.
- I can tell someone which animal our butter came from.

## NATURE NOTEBOOK

1. Draw a cow eating grass. Draw her udder underneath. Your parent writes the word *cow* under your drawing.
2. Draw the jar before shaking and the jar after shaking. Point to the butter.
3. Draw four foods that come from milk. Your parent writes their names.

**From history.** Before refrigerators, farm families made butter in a tall wooden churn. A child would push a long stick called a dasher up and down for a long time, just as you shook the jar. In the 1860s a French scientist named Louis Pasteur showed that gently heating wine kills the tiny germs that spoil it. Later people used his idea to keep milk

fresh and safe. Today almost all store milk is heated this way, and the process is named after him: pasteurized.

## WORKED EXAMPLES

**Example 1.** The farmer milks 4 cows in the morning and the same 4 cows again at night. How many times did the farmer milk a cow today?

1. Hold up 4 fingers for the morning milking.
2. Hold up 4 more fingers for the night milking.
3. Count all the fingers that are up: 1, 2, 3, 4, 5, 6, 7, 8.

**Answer:** 8 times. Each cow was milked twice, and 4 cows twice makes 8 milkings.

## PRACTICE

1. **EASY** Look at the painting of the bull. Point to the mother. Point to the father. Which one gives milk?
2. **EASY** What does a cow eat? Name two things.
3. **MEDIUM** Parent names these foods one at a time: milk, apple, cheese, bread, yogurt, egg, butter, ice cream. Child says “Moo!” for every food that comes from a cow.
4. **MEDIUM** A cow has 4 legs. Two cows stand in the field. Count all their legs on your fingers.
5. **HARD** Tell what happened inside the jar. Why did the cream turn into butter?

## COMMON MISTAKES

- Thinking milk is made at the store. The store only sells it. A cow made it, on a farm, out of grass.
- Thinking every cow gives milk all the time. Only a mother cow who has had a calf makes milk. A bull never does.
- Thinking a cow lying in the grass is doing nothing. She is chewing her cud, and her four-part stomach is hard at work turning grass into milk.

**Make it a game · Moo or No Moo.** Parent names a food or a thing: milk, a shoe, cheese, a rock, butter, a banana, yogurt. If it comes from a cow, the child shouts “Moo!” and pretends to shake a butter jar. If it does not, the child folds arms and says “No moo.” Then switch, and the child tries to trick the parent. First to ten right answers wins.

**Scripture.** “And God said, Let the earth bring forth the living creature after his kind, cattle, and creeping thing, and beast of the earth after his kind: and it was so.” (Genesis 1:24, KJV)

God made cattle on the sixth day, and He made them after their kind. Cows have calves, and calves grow into cows. God made the cow to turn grass into milk, and He gave her to us to care for and to thank Him for.

#### **Practice answers**

1. The cow lying down is the mother, and she gives milk. The big bull is the father, and he never gives milk.
2. Grass and hay (also grain). She chews her cud.
3. Moo for milk, cheese, yogurt, butter and ice cream. No moo for apple, bread and egg.
4. 8 legs.
5. Shaking made the tiny drops of fat in the cream bump together and stick. They joined into one lump of butter and left the watery buttermilk behind.

## 1.2 CHICKENS AND EGGS

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### OBJECTIVES

- Name the hen, the rooster and the chick, and tell which one lays eggs.
- Point to the shell, the white and the yolk of a cracked egg.
- Tell that a chick grows inside a warm egg and pecks its own way out.

**Warm-up.** Take an egg out of the refrigerator and hold it gently in your palm. Is it cold? Is it heavy or light? Tap it softly on the table. Is it hard or soft? Roll it. Does it roll straight, or in a circle? Now guess: what is inside? Today we will find out.

**Video.** Coming soon. Hens laying eggs, what is inside an egg, and a chick hatching from its shell, for young children; search SciShow Kids, Homeschool Pop (Alternate), farm and hatchery footage, Smithsonian and Moody Science classics.

### KEY TERMS

#### hen

A mother chicken. The hen lays the eggs. The father chicken is called a rooster.

#### chick

A baby chicken. It hatches out of an egg covered in soft, fuzzy down.

#### yolk

The round yellow part inside an egg. It is food for a growing chick.

#### hatch

To break out of the egg. A chick pecks a hole in the shell and pushes its way out.

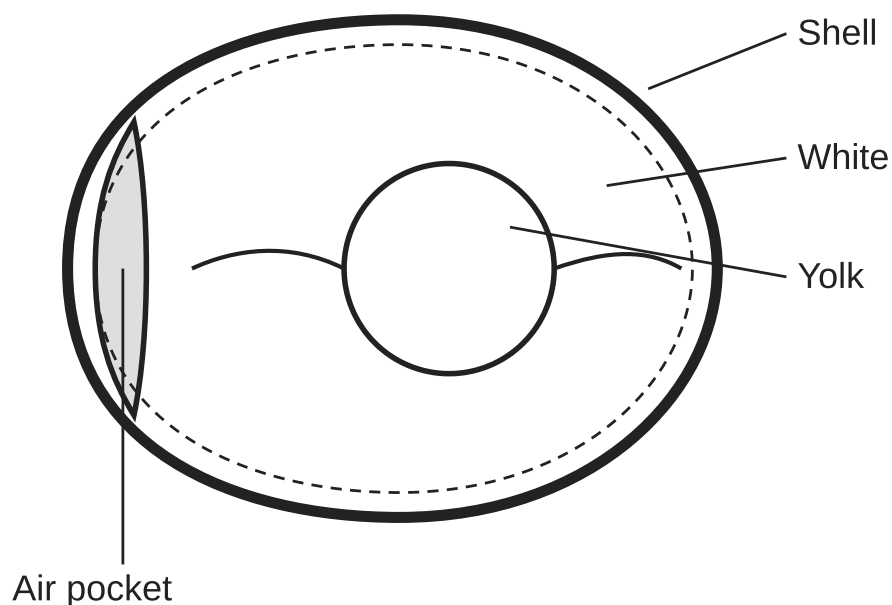
### CORE IDEAS

**The story.** At sunrise in a farmyard, the rooster stretches his neck and crows: cock-a-doodle-doo! The hens hop down from their roost. All day long they scratch in the dirt with their feet and peck at seeds, bugs and grain. In the afternoon a hen walks into her nest box, settles down, and lays an egg. It comes out warm. A good hen lays an egg almost every day. Before supper the farmer's children go out with a basket and gather the eggs.

**How they figured it out.** What is inside an egg? Crack one and look. First is the hard **shell**. It keeps dirt and germs out. Under the shell is a thin skin. Then comes the clear, slippery **white**. In the middle floats the round yellow **yolk**. Look closely and you will see two twisty white cords. They hold the yolk in the middle like little ropes. At the fat end of the egg there is a small pocket of air. A chick grows only if the egg was laid by a hen who lives with a rooster, and only if the egg is kept warm. The hen sits on her eggs for three weeks and turns them with her beak. Then the chick taps the shell with a tiny bump on its beak, called an egg tooth, and climbs out wet and tired. In a few hours it is dry and fluffy.

**The big idea.** A chicken is a bird. It has feathers, a beak, two legs and two wings, and it lays eggs. Chickens have no teeth. They swallow tiny stones, and the stones grind up their food inside them. The yolk is not the chick. The yolk is the chick's lunch while it grows. The eggs you buy at the store have no chick inside. They were never kept warm, and most were laid by hens with no rooster around, so they are just good food.

**God's handiwork.** A mother hen does not know how to read a book about eggs. She just knows to sit, to keep them warm, and to turn them. When her chicks hatch, she spreads her wings and they run underneath to hide and stay warm. Jesus talked about that picture (Matthew 23:37). God made the hen to care for her chicks, and He cares for us even more.



*Inside an egg. Point to the shell, the white, the yolk and the air pocket.*

## PICTURE STUDY



*A Cock, Hens and Chicks*, Melchior d'Hondecoeter, about 1668–1670 · Oil on canvas · The National Gallery, London

Melchior d'Hondecoeter was a Dutch painter who painted birds better than almost anyone. He watched living birds closely to see how they stood, pecked and ruffled their feathers. Here he painted a farmyard family: a rooster, hens and their chicks.

Look at how carefully he painted every feather. People in Holland hung pictures like this in their homes because they loved their farms and their animals.

### Look closely

- Find the rooster. He is the father. Look for his red comb on top of his head and his long, curved tail feathers.
- Find a hen. How is she different from the rooster?
- Count the chicks. Are they fluffy like cotton or smooth like the hen?
- What are the chickens standing on? What do you think they are looking for?

### Talk about it

1. Which bird in the picture lays the eggs?
2. Why do you think the chicks stay close to the hen?
3. If you were in the farmyard, what sounds would you hear?

**Safety first.** Raw eggs can carry germs. Keep the raw egg and shell away from mouths, and wash hands with soap after touching them. A parent cracks the egg and cooks or throws away what is left.

## MAKE AND DO: LOOK INSIDE AN EGG

Scientists look closely and name what they see. Today you will be an egg scientist. You will shine a light through an egg, float it, and then open it up and find every part.

### You will need

- Two raw eggs
- A flashlight and a dark room
- A tall glass of water
- A bowl and a plate
- A magnifying glass, if you have one

### Steps

1. Go into a dark room. Hold the flashlight against the fat end of the egg. Look at the glow. Can you see a darker shadow inside? Can you see the little air pocket at the fat end? Farmers call this candling, because long ago they used a candle.
2. Gently lower an egg into the glass of water. A very fresh egg sinks and lies flat on its side. An older egg stands up on its end, because its air pocket has grown bigger. What does yours do?
3. Parent cracks one egg into the bowl. Look. Point to the clear white. Point to the yellow yolk. Find the twisty white cords that held the yolk in the middle.
4. Look at the inside of the broken shell. Peel off the thin skin. That skin is under every shell.
5. Look at the shell with the magnifying glass. The shell has tiny holes so the chick inside can breathe.
6. Parent cooks the egg for a snack. Wash your hands with soap while it cooks.

### Tips

- Brown eggs and white eggs are the same inside. The shell color comes from the kind of hen that laid it.
- If a hen's egg from a farm is available, compare it with a store egg. Is the yolk a deeper yellow?

### Check your work

- I can point to the shell, the white and the yolk.
- I can tell what the air pocket is for and where it is.
- I can tell what a hen does to make her eggs hatch.

## NATURE NOTEBOOK

1. Draw an egg cut open. Draw the yolk in the middle and the white around it. Your parent writes *shell*, *white* and *yolk*.
2. Draw a hen sitting on her nest. Draw three eggs peeking out from under her.

3. Draw the rooster from the painting. Give him a big red comb and long tail feathers.

**From history.** Long ago in Greece, the teacher Aristotle wanted to know how a chick grows. He opened hens' eggs on different days as they were kept warm and wrote down what he saw, from a tiny red spot to a finished chick. People in ancient Egypt hatched thousands of eggs at once in warm mud-brick ovens, keeping the fires low and steady for three weeks, long before anyone had a thermometer.

## WORKED EXAMPLES

**Example 1.** Eggs come in a box of twelve. Twelve is called a dozen. Use dry beans for eggs. Count a dozen beans into a cup. If a hen lays one egg every day, how many days will it take her to lay a dozen?

1. Count beans into the cup one at a time: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12. Stop at twelve.
2. One egg each day means one bean each day.
3. Twelve beans means twelve days.

**Answer:** 12 days. A dozen is 12, and one egg a day makes 12 eggs in 12 days.

## PRACTICE

1. **EASY** In the painting, point to the rooster. Point to a hen. Point to a chick. Which one lays eggs?
2. **EASY** Name the three main parts of an egg.
3. **MEDIUM** Parent names these animals: chicken, cow, duck, sheep, horse, goose. Child flaps arms for every animal with feathers and says "Moo" or "Baa" or "Neigh" for the ones with fur or hair.
4. **MEDIUM** You gather 5 eggs from one nest box and 3 eggs from another. Count on your fingers. How many eggs are in your basket?
5. **HARD** Why does a mother hen sit on her eggs for so long? Tell two things she does.

## COMMON MISTAKES

- Thinking every egg has a chick inside. Store eggs have no chick. A chick grows only in a warm egg laid by a hen who lives with a rooster.
- Thinking the yolk is the baby chick. The yolk is the chick's food. The chick starts as a tiny spot on the yolk and grows from there.
- Thinking brown eggs are better than white eggs. Inside they are the same. The color comes from the kind of hen.

**Make it a game • Hen and Chicks.** Parent is the hen; child is the chick. The chick scratches and pecks around the room. When the hen clucks three times, the chick must

run and hide under the hen's arms before the hen counts to five. Then switch, and add more chicks if brothers and sisters want to play. Finish by crowing like the rooster to end the game.

**Scripture.** "He shall cover thee with his feathers, and under his wings shalt thou trust: his truth shall be thy shield and buckler." (Psalm 91:4, KJV)

When chicks are cold or scared, they run under their mother's wings. God says He covers us the same way. A hen cannot read this verse, but she shows us a picture of it every day.

#### Practice answers

1. The hen lays the eggs. The rooster has the big comb and long tail; the chicks are the small fluffy ones.
2. The shell, the white and the yolk.
3. Feathers: chicken, duck, goose. Hair or fur: cow, sheep, horse.
4. 8 eggs.
5. She keeps the eggs warm so the chicks inside can grow, and she turns the eggs with her beak. After about three weeks the chicks hatch.

## 1.3 SHEEP AND WOOL

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### OBJECTIVES

- Name the ewe, the ram and the lamb, and tell that wool is the sheep's coat.
- Tell how wool is cut off, washed, combed and twisted into yarn.
- Say "The LORD is my shepherd; I shall not want" from memory and tell what a shepherd does.

**Warm-up.** Find a wool sweater, scarf, sock or mitten in the house. Feel it. Now feel a cotton T-shirt. Which one is scratchier? Which one feels warmer in your hands? Hold the wool up to your cheek. Guess which animal gave us this coat.

**Video.** Coming soon. Sheep shearing and how wool is washed, carded and spun into yarn, for young children; search farm tour footage, SciShow Kids, Homeschool Pop (Alternate), heritage craft channels and Moody Science classics.

### KEY TERMS

#### **fleece**

A sheep's whole wool coat. It is cut off in one big piece once a year.

#### **shear**

To cut the wool off a sheep. It is like a haircut. It does not hurt, and the wool grows back.

#### **lamb**

A baby sheep. The mother sheep is a ewe, and the father is a ram.

#### **shepherd**

A person who takes care of sheep. The shepherd leads them to grass and water and keeps them safe.

### CORE IDEAS

**The story.** It is spring on a sheep farm. The shearer arrives with his clippers. He sits a ewe gently on her bottom. She goes quiet and still. The clippers hum, and the thick wool peels away from her belly, her sides, her back. In a few minutes the whole **fleece** comes off in one piece, like a coat sliding off. The ewe trots away, thin and white and cool. The shearer rolls up the fleece. It is heavy and warm and it smells like sheep. One fleece can make a few sweaters.

**How they figured it out.** Pick up raw wool and feel it. It is greasy. The grease is called lanolin, and it is the sheep's own raincoat. Rain runs right off. People learned to wash the wool in warm soapy water until the water turns brown and the wool turns white. Then they comb it with brushes so all the fibers lie the same way. Then they twist it. Twist a little puff of wool between your fingers and it becomes a thread. Twist a lot and you have yarn. Yarn is knitted into socks and sweaters or woven into blankets. Look at one wool fiber. It is wavy,

like a tiny spring. Those waves trap little pockets of air, and air holds in warmth. That is why wool is warm even when it is wet.

**The big idea.** Sheep are followers. They stay in a flock and go where the one in front goes. They cannot fight a wolf and they cannot find their own way home. So every flock needs a **shepherd**. The shepherd leads them to green grass and quiet water. He carries the tired lambs. He knows each sheep, and the sheep know his voice. Long ago a shepherd boy named David guarded his father's sheep. When a lion and a bear came, David fought them to save the lambs (1 Samuel 17:34-36). David grew up to be a king, and he wrote a song that begins, "The LORD is my shepherd; I shall not want."

**God's handiwork.** God made the sheep with a coat that keeps her warm and dry, and He made it so the coat grows back after every shearing. He also made sheep to need a shepherd. The Bible says we are like sheep too. We need a Shepherd who leads us, protects us and knows our names. That Shepherd is the Lord.

### PICTURE STUDY



*Shepherdess with Her Flock*, Jean-François Millet, about 1863 · Oil on canvas · Musée d'Orsay, Paris

Jean-François Millet grew up on a farm in France, and he spent his life painting the people who worked the land. Here a young shepherdess watches over her flock at the end of the day. Her hands are busy knitting while her sheep eat.

The sun is low and golden. Millet wanted us to see that a quiet job done well, out in God's fields, is a beautiful thing.

#### Look closely

- Find the shepherdess. What is she holding in her hands?
- Look at the sheep. Are they spread out or close together? Are their heads up or down?

- Look at the ground near her feet. Can you find the tiny flowers?
- Look at the sky. Is it morning or evening? How can you tell?

### **Talk about it**

1. Why do the sheep stay near the shepherdess instead of running away?
2. What might the shepherdess be knitting, and where did the yarn come from?
3. What would happen to the sheep if nobody watched them?

**Safety first.** Raw wool comes straight off a farm animal and may carry dirt and droppings. Keep it away from mouths, use warm water rather than hot, and wash hands with soap when you are done.

### **MAKE AND DO: FEEL RAW WOOL**

Today you will handle wool the way a farm family did long ago: straight from the sheep, then washed, combed and twisted into your very own piece of yarn.

#### **You will need**

- A handful of raw, unwashed wool fleece (ask at a sheep farm, a farmers market, a fiber shop or order a small bag online). If you cannot get raw wool, use clean wool roving or pull apart some wool yarn.
- A bowl of warm soapy water and a towel
- Two pet slicker brushes or a wide comb
- A cotton ball
- A cup of water and a spoon

#### **Steps**

1. Feel the raw wool. Is it soft or greasy? Smell it. Look for bits of grass and dirt. That grease is lanolin, the sheep's raincoat.
2. Drop a spoonful of water onto the raw wool. Watch. Does the water soak in or bead up and roll off?
3. Put the wool in the warm soapy water. Squeeze it gently. Watch the water change color. Rinse it and lay it on the towel to dry.
4. Pull the dry wool apart with your fingers. Then brush it between the two slicker brushes so the fibers all lie the same way. This is called carding.
5. Pinch a little puff of wool and twist it between your fingers. Keep twisting and pulling gently. You are spinning a thread! See how long you can make it.
6. Wet a bit of wool and wet the cotton ball. Squeeze each one. Which one still feels warm in your hand? Which one feels cold?

#### **Tips**

- Wool that smells strongly of sheep is normal. The smell washes out.

- Twist always in the same direction, or your thread will come apart.

### Check your work

- I can tell what the grease on raw wool is for.
- I can tell the steps: shear, wash, comb, twist.
- I can tell which stays warmer when wet, wool or cotton.

### NATURE NOTEBOOK

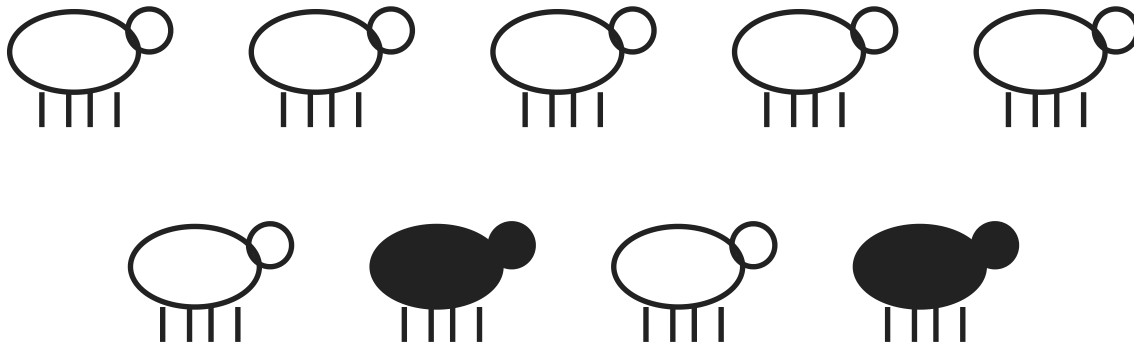
1. Draw a sheep before shearing (big and fluffy) and after shearing (thin and smooth).
2. Tape your twisted piece of wool thread into your notebook. Draw the sheep it came from.
3. Draw a shepherd with a staff and a flock of sheep. Your parent writes “The LORD is my shepherd” at the top.

**From history.** George Washington kept a large flock of sheep at his farm, Mount Vernon, and he wanted Americans to make their own cloth instead of buying it from England. When he became the first President in 1789, he wore a suit of plain brown wool cloth woven in Hartford, Connecticut, to show that American wool was good enough for a President.

## WORKED EXAMPLES

**Example 1.** Look at the picture chart of the pasture. Some sheep are white and some are black. Count the white sheep. Count the black sheep. How many sheep are there all together?

How many sheep in the pasture?



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*The pasture. Point to each sheep as you count.*

1. Point to each white sheep and count: 1, 2, 3, 4, 5, 6, 7. There are 7 white sheep.
2. Point to each black sheep and count: 1, 2. There are 2 black sheep.
3. Count every sheep in a row, white and black: 1, 2, 3, 4, 5, 6, 7, 8, 9.

**Answer:** 9 sheep. 7 white sheep and 2 black sheep make 9 sheep.

## PRACTICE

1. **EASY** What do we call the baby sheep? The mother? The father?
2. **EASY** Does shearing hurt the sheep? What is it like?
3. **MEDIUM** Parent lays out a wool sock, a cotton T-shirt, a plastic toy and a wool mitten. Child picks out everything that came from a sheep.
4. **MEDIUM** A farmer has 7 sheep. In spring, 3 lambs are born. Count on your fingers. How many sheep now?
5. **HARD** Say the first line of Psalm 23. Then tell two things a shepherd does for his sheep.

## COMMON MISTAKES

- Thinking shearing hurts the sheep. The clippers cut only the wool, like scissors cutting hair, and a sheared sheep feels cool and light in summer.

- Thinking all sheep are white. Sheep can be white, black, brown or gray. White wool is most common on farms because it can be dyed any color.
- Thinking a sheep can look after itself. Sheep follow, they do not fight, and they wander. Without a shepherd they are lost.

**Make it a game · Follow the Shepherd's Voice.** The child is the sheep and closes both eyes. The parent, the shepherd, moves quietly to another spot in the room and softly says the child's name. The sheep must walk slowly toward the voice until it finds the shepherd. Then another person tries calling in a silly voice. Does the sheep follow a stranger? Jesus said, "the sheep follow him: for they know his voice" (John 10:4). Switch roles and play again.

**Scripture.** "The LORD is my shepherd; I shall not want. He maketh me to lie down in green pastures: he leadeth me beside the still waters." (Psalm 23:1-2, KJV)

David wrote this as a man who had been a shepherd himself. A sheep with a good shepherd has everything it needs: grass, water, rest and safety. David says God is that kind of shepherd to him, and He can be that to you.

#### Practice answers

1. The baby is a lamb, the mother is a ewe, and the father is a ram.
2. No. It is like a haircut. The wool grows back.
3. The wool sock and the wool mitten. The cotton T-shirt came from a plant, and the plastic toy was made in a factory.
4. 10 sheep.
5. "The LORD is my shepherd; I shall not want." A shepherd leads the sheep to grass and water, keeps them safe from wolves, carries tired lambs, and knows each one.

## 1.4 HORSES AND WORK

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### OBJECTIVES

- Name the mare, the stallion and the foal, and tell what a horse eats.
- Tell two jobs horses did on farms before tractors, such as pulling the plow and the wagon.
- Measure something tall in hands, the way horses are measured.

**Warm-up.** Put a few heavy books in a box. Tie a rope to it and try to drag it across the floor. Is it hard? Now imagine dragging a heavy plow through dirt all day long in the sun. Who could do that job? A horse could. Say “Neigh!” and stamp your foot like a horse.

**Video.** Coming soon. Draft horses plowing and pulling wagons on a farm, horseshoeing by a farrier, and how horses are measured in hands, for young children; search farm and heritage footage, SciShow Kids, Homeschool Pop (Alternate), Smithsonian and Moody Science classics.

### KEY TERMS

#### plow

A heavy tool with a sharp blade that cuts and turns over the dirt so seeds can be planted. Horses or oxen pulled it before tractors.

#### hoof

The hard foot of a horse. It is like a very thick fingernail. A blacksmith nails a metal shoe to it, and it does not hurt.

#### harness

The straps and padded collar a horse wears so it can pull a plow or a wagon.

#### hand

The way we measure how tall a horse is. One hand is about as wide as a grown-up’s hand, four fingers across.

### CORE IDEAS

**The story.** It is spring on a farm, long before tractors. The farmer leads two big horses out of the barn. They are brown with white feet, and their backs are higher than his head. He slips a padded collar over each horse’s neck and buckles the **harness**. He hooks the horses to the **plow**. “Giddyup!” The horses lean into their collars and the plow blade sinks into the ground. Behind it the dirt rolls over in a long dark strip called a furrow. Back and forth, back and forth. At noon the horses rest in the shade and eat oats. By evening a whole field is ready for planting. Horses also pulled the hay wagon, the hay rake and the family buggy on the way to church.

**How they figured it out.** Why is a horse so good at pulling? Look at its legs: big muscles and a wide chest. Look at its feet: each foot is one hard **hoof**, like a huge fingernail. A blacksmith nails an iron shoe to the hoof so it does not wear down on stony roads. It does not hurt, just as cutting your fingernails does not hurt. Farmers also learned to make a padded collar. With a collar on its shoulders, a horse can push with its whole body and never choke. The biggest, strongest farm horses are called draft horses. Clydesdales, Percherons and Belgians have feet as big as dinner plates, and Clydesdales have long hair around their hooves. Before horses, many farmers plowed with oxen. Oxen are cattle, cousins of our milk cow. They are slower than horses, but very strong and very calm.

**The big idea.** A horse eats grass, hay and oats, and drinks many buckets of water every day. A working horse must be fed, watered, brushed and rested, or it cannot work. Farmer and horse were partners. The farmer cared for the horse, and the horse did the heavy work. Today tractors pull most plows, but some farmers, like the Amish, still plow with horses. Horses are measured in **hands**, from the ground to the top of the shoulders, which is called the withers. A pony might be twelve hands tall. A big draft horse might be seventeen hands tall.

**God's handiwork.** God asked Job, "Hast thou given the horse strength?" Of course not. God gave it. He made the horse with strong legs, a big heart and a willing spirit, and then He let people team up with it to feed their families. When you see a horse, you are looking at one of God's strongest gifts to farmers.

## PICTURE STUDY



*Plowing in the Nivernais*, Rosa Bonheur, 1849 · Oil on canvas · Musée d'Orsay, Paris

Rosa Bonheur was a French painter who loved animals more than almost anything. She went to farms, fairs and horse markets to draw them, and she kept animals of her own. The

French government asked her to paint this picture, and when it was shown it made her famous.

Here is a surprise: these working animals are not horses. They are oxen, which are cattle, like our milk cow. Oxen plowed fields long before horses did, and in this part of France farmers still used them. Rosa Bonheur painted the fall plowing, when the hard ground is turned over to rest for winter.

### Look closely

- Count the oxen in the team nearest you. What color are they?
- Find the man walking beside the oxen with a long stick. He guides them and keeps them moving.
- Look at the dirt in the front of the picture. Which part has been plowed? Which part has not?
- Look at the oxen's legs and necks. Do they look like they are working hard or resting?

### Talk about it

1. Why would a farmer need so many oxen to pull one plow?
2. How is an ox like a horse? How is it different?
3. What do you think the farmer will do with this field after it is plowed?

**Safety first.** In the pulling game, never put a rope around anyone's neck. Hold the rope in your hands or loop it under the arms across the chest, with a parent watching. Pull on a smooth floor and keep toes away from the box.

## MAKE AND DO: HORSE POWER PULL

Today you are the horse. You will find out why farmers put a collar on a horse, and you will plow a furrow of your own.

### You will need

- A cardboard box or laundry basket with a rope tied to it
- Six to ten books
- A thick sweatshirt
- A tray or pan of dirt, sand or dry rice
- A sturdy stick or a wooden spoon

### Steps

1. Put two books in the box. Pull it across the floor with just your hands on the rope. Easy?
2. Add books one at a time. Each time, try to pull. Count how many books you can pull with your hands before it gets too hard.

3. Now put on the sweatshirt. Loop the rope under your arms and across your chest, like a horse's collar. Lean forward and walk. Can you pull more books this way? Count them.
4. Tell your parent which way was easier and why a farmer gives his horse a collar.
5. Now plow. Press the stick into the tray of dirt and drag it slowly in a straight line. That is a furrow. Make three furrows side by side, straight and even, just like a good plow horse.
6. Pretend to plant a seed in each furrow. Then rest and eat your oats (a few oat cereal pieces).

### Tips

- Horses pull with their shoulders, not their necks. That is why the collar sits on the shoulders.
- Straight furrows are hard. Farmers were proud when their rows were straight.

### Check your work

- I can count how many books I pulled with my hands and with the collar.
- I can tell why a horse wears a collar.
- I can tell what a plow does to the dirt.

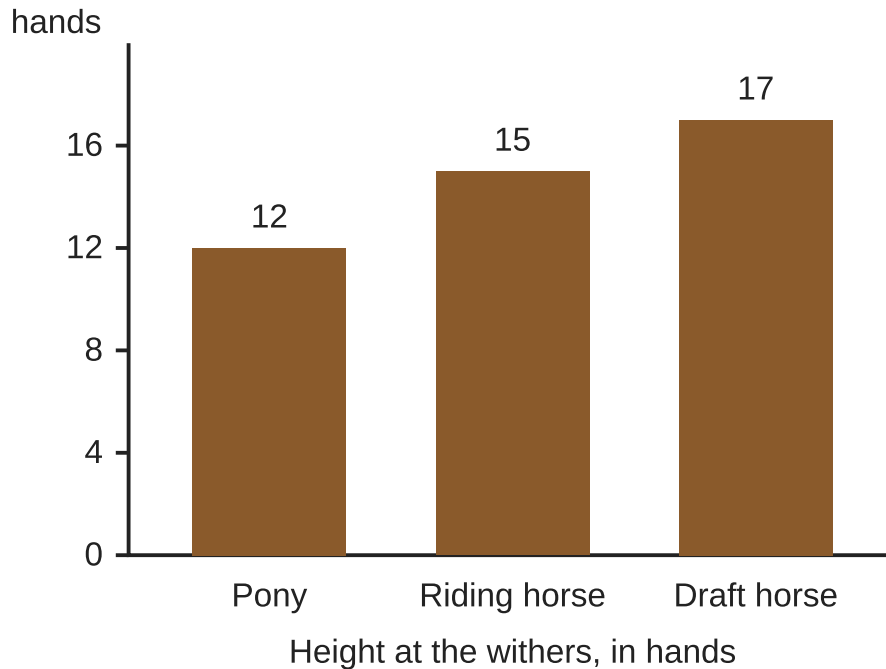
## NATURE NOTEBOOK

1. Draw a horse pulling a plow. Draw the farmer walking behind. Your parent writes *plow* and *harness*.
2. Trace your hand in your notebook. Then measure a chair or table in hands and have your parent write the number.
3. Draw one ox from Rosa Bonheur's painting. Give it horns and a cream-colored coat.

**From history.** About a hundred years ago there were more than twenty million horses and mules working on American farms. Then tractors came, and by the 1950s most farm horses had been replaced. Rosa Bonheur, who painted the oxen in our picture, also painted a huge picture of horses called *The Horse Fair*. It now hangs in the Metropolitan Museum of Art in New York. To draw the horses, she went to the Paris horse market again and again with her sketchbook.

## WORKED EXAMPLES

**Example 1.** Horses are measured in hands. Look at the picture chart. It shows how tall three horses are at the withers. Which horse is tallest? How many hands taller is the draft horse than the pony?



*How tall is a horse? Heights in hands, measured to the withers.*

1. Find the tallest bar. It is the draft horse, at 17 hands.
2. Find the shortest bar. It is the pony, at 12 hands.
3. Count up from 12 to 17 on your fingers: 13, 14, 15, 16, 17. That is 5 fingers.

**Answer:** The draft horse is tallest. It is 5 hands taller than the pony.

## PRACTICE

1. **EASY** What do we call a baby horse? A mother horse? A father horse?
2. **EASY** Name two jobs a horse did for a farmer long ago.
3. **MEDIUM** Measure the kitchen table from the floor to the top in hands. Put one hand above the other and count. How many hands tall is it?
4. **MEDIUM** Parent names these animals: horse, chicken, ox, sheep, cow, pony. Child stamps a foot for each one that pulled a plow.
5. **HARD** Why does a work horse wear a padded collar on its shoulders? Tell what you found out in the pulling game.

## COMMON MISTAKES

- Thinking horseshoes hurt the horse. The hoof is hard like a fingernail, and the nails go only into the hard part.
- Thinking the animals in Rosa Bonheur's painting are horses. They are oxen, which are cattle. Both horses and oxen pulled plows.
- Thinking horses are only for riding and racing. For most of history, horses were farm workers who pulled plows and wagons every day.

**Make it a game · Giddyup, Whoa.** The child is the horse and the parent is the farmer. The farmer calls out commands: "Giddyup" (walk), "Trot" (fast walk), "Whoa" (stop), "Back" (walk backward), and "Oats!" (pretend to munch). The horse must do each one right away. If the horse moves on "Whoa," the farmer gets a point. If the horse gets five in a row right, the horse earns a sugar cube (a small treat). Then switch roles.

**Scripture.** "Hast thou given the horse strength? hast thou clothed his neck with thunder?" (Job 39:19, KJV)

God asked Job this question to remind him who made the horse. People can train a horse and put a collar on it, but only God gave it its strength. Every strong, willing farm horse is a gift from Him.

### Practice answers

1. The baby is a foal, the mother is a mare, and the father is a stallion.
2. Any two: pulling the plow, pulling the hay wagon, pulling the hay rake, pulling the buggy to town or church, carrying a rider.
3. Answers vary; a child's hands are small, so a table is often about ten to fifteen child-hands tall. The point is to stack hands without gaps and count carefully.
4. Horse, ox and pony pulled plows (and cows have sometimes done it too). Chickens and sheep never did.
5. The collar lets the horse push with its whole body and shoulders instead of its neck, so it can pull much more without choking. In the game, pulling with the rope across the chest moved more books than pulling with the hands.

## UNIT 1 REVIEW

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Parent asks each question aloud and the child answers by talking, pointing, acting or drawing. No reading or writing is needed. The review is worth 20 points. Give full points for a complete answer in the child's own words.

1. (3 pts) Where does milk come from, and what does that animal eat? What happens to cream when you shake it for a long time?
2. (3 pts) Name the three main parts of an egg. Which chicken lays the eggs: the hen or the rooster?
3. (3 pts) What is a fleece? Does shearing hurt the sheep? Tell how wool becomes yarn.
4. (3 pts) Tell two jobs a horse did for a farmer long ago. Why does a work horse wear a collar?
5. (3 pts) Parent says: cow, chicken, sheep, horse. For each one, child names the baby.
6. (3 pts) Say the first line of Psalm 23. Who was the shepherd boy who wrote it?
7. (2 pts) Count: you gather 6 eggs in the morning and 4 eggs in the evening. How many eggs today?

### UNIT PROJECT: MY FARM ANIMAL BOOK

Make a four-page book, one page for each animal: cow, chicken, sheep and horse. On each page draw the animal and the thing it gives us (milk, an egg, wool, a plow). Tape in a real sample where you can: a bit of your twisted wool thread, a piece of eggshell, a label from the cream you shook into butter. Your parent writes one sentence you say about each animal.

On the last page, draw a shepherd with his sheep and have your parent write "The LORD is my shepherd; I shall not want." Then tell the whole book aloud to someone in your family.

- **All four animals:** Each page shows the animal and the gift it gives us, and the child can name the mother, father and baby.
- **Real samples:** At least two real items (wool thread, eggshell, cream label, horse drawing measured in hands) are included.
- **Telling:** The child tells the book aloud in his or her own words, including what happened when the cream was shaken.
- **Care:** Drawings are colored and neat, and the Psalm 23 page is complete.

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#### Answer key

1. Milk comes from a mother cow, who eats grass and hay. Shaken cream turns into butter and leaves buttermilk behind.
2. The shell, the white and the yolk. The hen lays the eggs.
3. A fleece is the sheep's whole wool coat. Shearing does not hurt; it is like a haircut. The wool is washed, combed and twisted into yarn.
4. Pulling the plow, the hay wagon, the hay rake or the buggy. The collar lets the horse push with its shoulders and pull hard without choking.

5. Calf, chick, lamb, foal.

6. "The LORD is my shepherd; I shall not want." David wrote it.

7. 10 eggs.

## PETS

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Pets are the animals that live closest to us, so they are the best animals for a young scientist to watch. In this unit the child looks hard at a dog, a cat and a goldfish: a wet nose that smells a trail in the snow, whiskers that measure a doorway in the dark, fins and gills that let a fish live in water. Each lesson begins with a real animal and a true story: Balto and the sled dogs of Nome, Trim the cat who sailed around Australia, the gold fish of China, and Henry Bergh stopping a cruel cart driver on a New York street.

Along the way the child learns two big ideas. First, God made each animal **after its kind** (Genesis 1:25): tiny dogs and giant dogs are all dogs, the house cat is a cousin of the lion, and goldfish have goldfish babies. Second, God put people in charge of the animals, and a good ruler is a kind one. The unit ends with Proverbs 12:10, “A righteous man regardeth the life of his beast,” and a week-long pet care chart the child keeps with a parent.

Everything is said aloud, pointed to, drawn, built or acted out. No reading is required of the child. The unit’s picture study is Sir Edwin Landseer’s *Dignity and Impudence* (1839), two very different dogs sharing one kennel.

### BEFORE YOU BEGIN

- Can count objects to 20 and compare which group has more
- Knows that cows, chickens, sheep and horses are farm animals (Unit 1)
- Can name the parts of an animal’s body: head, legs, tail, ears, eyes
- Can follow a two-step spoken direction and act out a simple story

### MASTERY CHECKLIST

- I can tell how a dog uses its nose, ears, tongue and tail.
- I can say that a dog and a cat are mammals with fur whose babies drink milk.
- I can tell what a cat’s whiskers, eyes and claws are for.
- I can point to a fish’s fins, tail, scales and gills and say how a fish breathes.
- I can name six things every pet needs.
- I can say Proverbs 12:10 and tell what it means to care for an animal.

### OPTIONAL BOOKS AND RESOURCES

- **American Kennel Club: dog breeds** (<https://www.akc.org/dog-breeds/>): Free. Pictures and sizes of hundreds of dog breeds. Use it with Lesson 2.1 to find the biggest and smallest dogs and compare them side by side.
- **ASPCA pet care pages** (<https://www.aspca.org/pet-care>): Free. Plain guides to feeding, water, exercise and vet care for dogs, cats and small pets, from the society Henry Bergh founded in 1866. For the parent to read before Lesson 2.4.

- ***Just So Stories* by Rudyard Kipling (free at Project Gutenberg)**

(<https://www.gutenberg.org/ebooks/search/?query=just+so+stories>): Free. Read aloud “The Cat that Walked by Himself,” a playful tale of how the dog, the horse, the cow and the cat each came to live with people. A story, not science, but a fine bedtime partner for this unit.

## 2.1 DOGS ★

### OBJECTIVES

- Tell how a dog uses its nose, ears, tongue and tail.
- Say that big dogs and little dogs are all one kind of animal, the dog kind God made.
- Tell the story of Balto and the sled dogs who carried medicine to Nome.

**Warm-up.** Get down on all fours. Try to walk like a dog across the room. Now stop and sniff the air. What do you smell? Pretend you are hot. How does a dog cool off? (It pants!) Pant like a dog for five seconds, then sit up and listen to the story.

**Video.** Coming soon. Dogs for young children: how a dog smells, hears, pants and wags; sled dogs and the 1925 serum run to Nome. Search SciShow Kids, Homeschool Pop (Alternate), National Geographic Kids, and nature footage of sled dogs and sheep dogs.

### KEY TERMS

#### mammal

An animal with fur or hair whose babies drink their mother's milk. Dogs, cats, cows and people are mammals.

#### puppy

A baby dog. Puppies are born with their eyes shut and drink milk from their mother.

#### pant

To breathe fast with the tongue out. Dogs pant to cool off, because they do not sweat the way we do.

#### sled dog

A strong dog that pulls a sled over the snow. Sled dogs work together in a team.

### CORE IDEAS

**The story.** In the winter of 1925, far up in Alaska, the little town of Nome had a big problem. Children were getting a very bad sickness, and the medicine that could help them was far away. No boat could come, and no airplane could fly in that cold. So the people sent for the dogs. Team after team of sled dogs ran through the snow, passing the box of medicine from one sled to the next like a relay race. The last team ran into Nome in a blizzard, with a black dog named Balto out in front. The medicine was safe, and the children got well. Today a statue of Balto stands in Central Park in New York City.

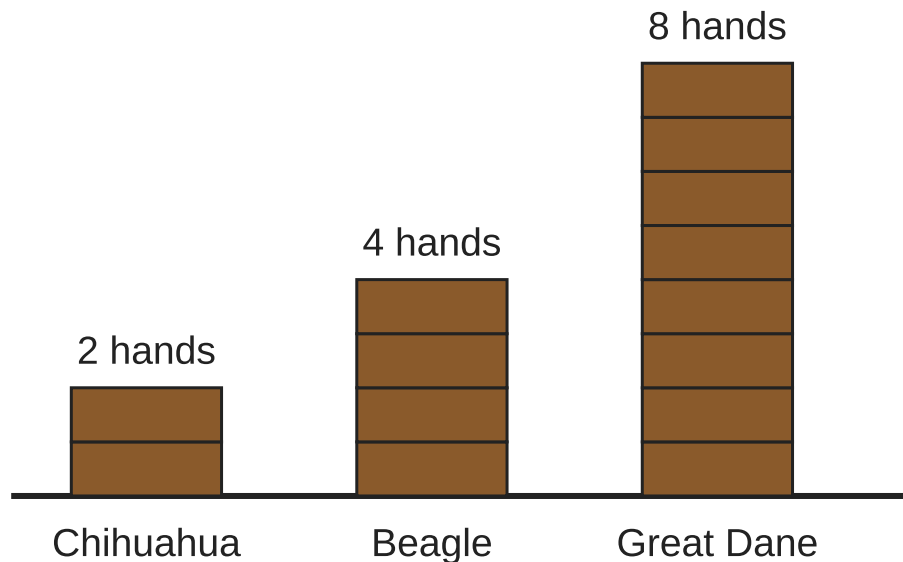
**How they figured it out.** How could dogs find the way when the men could hardly see? With their noses! A dog's nose is wet and cold, and it is a much better smeller than yours. Dogs also hear sounds too high and too soft for our ears. Dogs are **mammals**. They have warm fur, and their **puppies** drink milk from their mother. When a dog gets hot, it does not sweat all over like you. It **pants** with its tongue out, and the wet tongue helps it cool down. A

dog walks on its toes, not flat on its feet. And a dog talks with its tail: a wag, a droop, or a tail held high.

**The big idea.** God made the dog kind, and what a kind it is! A tiny Chihuahua can sit in a teacup. A Great Dane can look over the kitchen table. Yet both are dogs. A dog mother always has puppies, never kittens, because God made living things to have babies “after their kind” (Genesis 1:25). Curly or smooth, floppy ears or pointed, big or small, all are dogs. Dogs do many jobs: **sled dogs** pull, sheep dogs herd, and guide dogs lead people who cannot see.

**Try it and see.** Next time you meet a friendly dog, ask the owner if you may say hello. Hold out your hand low and let the dog sniff it first. Feel the fur. Is it soft or rough? Look at the wet nose and the toes. Then thank God for a wonderful, friendly animal.

How tall at the shoulder? (1 box = 1 grown-up hand)



*Three dogs measured in hands. Each box is one grown-up hand, just as we measured horses.*

## PICTURE STUDY



*Dignity and Impudence*, Sir Edwin Landseer, 1839 · Oil on canvas · Tate Britain, London

Edwin Landseer was an English painter who loved animals and painted them so well that even Queen Victoria asked him to paint her pets. Here he shows two real dogs sharing one kennel. The big bloodhound was named Grafton, and the little white terrier was named Scratch.

The title tells a joke. “Dignity” means calm and noble. “Impudence” means cheeky and bold. Which dog is which?

### Look closely

- Point to the big dog. Look at his long ears and his big soft paw. Does he look calm or excited?
- Point to the little dog. Where is he looking? Does he look like he wants to jump out?
- Find the dark doorway and the straw. Where do these dogs live?
- Compare the two dogs’ eyes and noses. What is the same? What is different?

### Talk about it

1. Both dogs are dogs, but one is huge and one is tiny. How do you know they are both dogs?
2. Which dog would you pick to pull a sled? Which one would fit on your lap?
3. If these dogs could talk, what would each one say right now?

**Safety first.** Never run up to a dog you do not know. Always ask the owner first, let the dog sniff your hand, and never bother a dog that is eating, sleeping or caring for puppies.

## MAKE AND DO: FOLLOW YOUR NOSE LIKE A DOG

Dogs find things with their noses. Today you will test your own nose, and then see how much better a dog's nose must be.

### You will need

- Four small cups or clean jars
- Four smells from the kitchen: a slice of lemon, a spoon of peanut butter or cinnamon, a drop of vanilla on a cotton ball, and a bit of soap
- A dish towel to cover the cups
- A scarf for a blindfold (or just shut your eyes)

### Steps

1. A parent puts one smell in each cup and covers the cups with the towel so you cannot see inside.
2. Shut your eyes. A parent holds one cup under your nose. Sniff! Say what you think it is.
3. Do all four cups. Count how many you got right.
4. Now hide one cotton ball with vanilla somewhere in the room. Try to find it by smell alone. Was that easy or hard?
5. Talk about it: a dog could find that cotton ball from across the house. Balto's team found the trail to Nome in a blizzard by smell.
6. Draw a big dog nose in your sketchbook and tell a parent one thing a dog can smell that you cannot.

### Tips

- Sniff with short little breaths, the way a dog does, and see if that helps.
- If you have a dog, hide a treat under one of three cups and watch the dog find it.

### Check your work

- I can say what dogs use their noses for.
- I can tell one way a dog's body is different from mine.
- I can tell the story of Balto in my own words.

## NATURE NOTEBOOK

1. Draw a dog you know or a dog from a picture. A parent labels: nose, ears, tail, four legs, fur.
2. Draw a sled with a team of dogs pulling a box of medicine through the snow. Put Balto in front.
3. Draw a very big dog and a very little dog side by side. Say out loud: "Both are dogs."

**From history.** Balto's statue in Central Park was put up in December 1925, the very same year as the great run to Nome. The words carved on it are "Endurance, Fidelity,

Intelligence.” Many dogs and many brave drivers shared the work of that relay. Another lead dog, Togo, ran the longest and hardest part of the trail.

## WORKED EXAMPLES

**Example 1.** Look at the dog chart. Each box is one grown-up hand. How tall is each dog? Which dog is tallest? How many more hands tall is the Great Dane than the Beagle?

*(Use the map or drawing “Count the boxes to compare the dogs.” shown earlier in this lesson.)*

1. Count the boxes over the Chihuahua: 1, 2. About 2 hands tall.
2. Count the boxes over the Beagle: 1, 2, 3, 4. About 4 hands tall.
3. Count the boxes over the Great Dane: 1, 2, 3, 4, 5, 6, 7, 8. About 8 hands tall.
4. The tallest stack is the Great Dane, so the Great Dane is tallest.
5. Start at the Beagle’s 4 and count up to 8: 5, 6, 7, 8. That is 4 more hands.

**Answer:** Chihuahua about 2 hands, Beagle about 4 hands, Great Dane about 8 hands. The Great Dane is tallest, 4 hands taller than the Beagle.

## PRACTICE

1. **EASY** Point to your nose. Point to your ears. Now say: which of these does a dog use best, its nose or its eyes?
2. **EASY** A dog is hot after running. What does it do to cool off? Show me.
3. **MEDIUM** A mother dog has 6 puppies. Count them on your fingers. Are the babies puppies or kittens? Why?
4. **MEDIUM** Sort these pictures or words into two piles: dog, cat, horse, dog, cow, dog. How many are dogs?
5. **HARD** Tell the story of Balto in three sentences. Who was sick? What did the dogs carry? How did they find the way?

## COMMON MISTAKES

- Thinking a dog sweats like we do. Dogs cool down mostly by panting; they sweat only a little through their paws.
- Thinking a wagging tail always means a happy dog. A wag can also mean excited or nervous, so always ask the owner before petting.
- Thinking a tiny dog and a giant dog must be different animals. They are both dogs, one kind with many sizes and shapes.

**Make it a game • Sled Dog Relay.** Put a small box (the medicine) at one end of the room or yard. Family members line up in a row, far apart. The first runner carries the box to the second, who carries it to the third, and so on, until it reaches the “town” at the

other end. Bark once when you hand it off! Then play again and try to beat your time. Finish by telling how Balto's team got the medicine to Nome.

**Scripture.** "But ask now the beasts, and they shall teach thee; and the fowls of the air, and they shall tell thee:" (Job 12:7, KJV)

God says we can learn from the animals. A dog teaches us about faithfulness, hard work and the wonderful noses God made.

#### Practice answers

1. Its nose. A dog's nose is far better than ours at smelling.
2. It pants, breathing fast with its tongue out. The child pants like a dog.
3. Six puppies. They are puppies because dogs always have dog babies, after their kind.
4. Three are dogs. The others are a cat, a horse and a cow.
5. Children in Nome, Alaska, were sick. Teams of sled dogs carried the medicine through the snow, and Balto led the last team. The dogs found the way with their noses, even in a blizzard.

## 2.2 CATS

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### OBJECTIVES

- Tell what a cat’s whiskers, eyes and claws are for.
- Say that a cat is a mammal and a quiet hunter, a little cousin of the lion.
- Tell the story of Trim, the cat who sailed around Australia.

**Warm-up.** Curl up on the floor like a sleepy cat. Now stretch long, front paws out. Pretend you see a toy mouse. Creep toward it very slowly and quietly. Pounce! Now sit and wash your “paw” with your tongue, the way a cat does. Cats do all these things every day.

**Video.** Coming soon. Cats for young children: whiskers, eyes that shine, claws that hide, purring, and how cats hunt and groom. Search SciShow Kids, Homeschool Pop (Alternate), National Geographic Kids, and slow-motion nature footage of house cats and big cats.

### KEY TERMS

#### **whiskers**

Long stiff hairs on a cat’s face. They feel things in the dark and tell the cat if a space is wide enough.

#### **kitten**

A baby cat. Kittens are born with their eyes shut and drink their mother’s milk.

#### **claws**

A cat’s sharp curved nails. A cat can pull them in or push them out.

#### **purr**

The soft rumbling sound a cat makes, often when it is happy and comfortable.

### CORE IDEAS

**The story.** Long ago, a sailor named Matthew Flinders had a cat named Trim. Trim was born on a ship, far out at sea. When he was a kitten he fell overboard into the ocean! But Trim swam back, caught a rope in his claws, and climbed up to the deck. He sailed with Captain Flinders all the way around Australia, the first ship ever to do so. Trim climbed the ropes in storms and sat at the captain’s table at dinner. Flinders loved him so much that he wrote a short story of Trim’s life. Today a statue of Trim sits on a window ledge in Sydney, Australia.

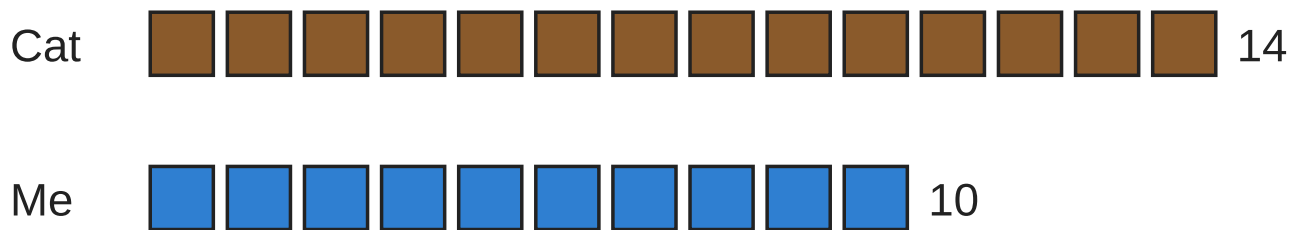
**How they figured it out.** How did Trim find his way on a rolling ship in the dark? God gave cats special tools. The long stiff hairs on a cat’s face are **whiskers**. They stick out about as wide as the cat’s body. If the whiskers fit through a gap, the cat fits too. Whiskers feel the air move, so a cat can find its way in the dark. Now look at a cat’s eyes. In bright sun the black

center shrinks to a thin slit. In a dim room it opens big and round to catch every bit of light. A cat walks on soft pads, and its **claws** stay hidden until it needs them to climb or catch.

**The big idea.** A cat is a **mammal**, like a dog. It has fur, it is warm, and its **kittens** drink milk. But a cat is not a dog. A cat is a quiet hunter. Look at a lion, then look at your cat. Same eyes, same whiskers, same soft paws, same hidden claws, same long tail. God made the cat kind, big and small, and the little cat in your lap is a cousin of the lion. A cat sleeps more than half the day, then plays and hunts when it wakes. And when a cat is happy, it **purrs**.

**Try it and see.** If you have a cat, sit still and watch. Count its whiskers on one side. Watch its eyes in a sunny window and then in a dim room. Listen for the purr when you stroke it gently from head to tail. If you do not have a cat, find every one of these tools on the cat in the picture study.

### Hours of sleep in one day (1 box = 1 hour)



*How much do we sleep in one day? Each box is one hour. A cat sleeps most of the day.*

## PICTURE STUDY



*Asakusa Ricefields and Torinomachi Festival (from One Hundred Famous Views of Edo)*, Utagawa Hiroshige, 1857 · Color woodblock print · Brooklyn Museum, New York (copies in many museums)

Hiroshige was a Japanese artist who made pictures by carving designs into wooden blocks, inking them and pressing paper on top. This picture is from a set of one hundred views of his city, which was then called Edo and is now Tokyo.

A white cat sits in a window, as cats love to do. Outside, a parade of people walks to a festival, and far away stands Mount Fuji, the great mountain of Japan.

### Look closely

- Point to the cat. What is it looking at? Where is its tail?
- Look at the cat's ears and the shape of its body. Does it look sleepy or watchful?
- Find the mountain with snow on top. Find the tiny people far away.
- Look at the wooden window bars. Would the cat's whiskers fit between them?

### Talk about it

1. Why do you think cats like to sit in windows?
2. Is the cat inside or outside? How can you tell?
3. What sounds might the cat hear from this window?

**Safety first.** Be gentle with cats. Never pull a tail or grab a cat that wants to get away, because frightened cats scratch. Never shine a flashlight into anyone's eyes, or a cat's eyes. Wash your hands after you play with a cat or touch its litter box.

## MAKE AND DO: MAKE WHISKERS AND TRY THEM

A cat's whiskers tell it whether a gap is wide enough to fit through. You will make your own whiskers and find out how they work.

### You will need

- A paper headband or a soft hat
- Six long pipe cleaners or six paper straws
- Tape
- Two chairs
- A scarf for a blindfold (or shut your eyes)

### Steps

1. Tape three pipe cleaners to each side of the headband so they stick out sideways like whiskers. Make them about as wide as your shoulders.
2. Put on your whiskers. Look in a mirror and say what a cat might say!
3. A parent sets two chairs with a gap between them, sometimes wide and sometimes narrow.
4. Shut your eyes. Walk slowly toward the gap. Stop as soon as a whisker touches a chair.
5. Did the whiskers touch the chairs before your shoulders did? That is how whiskers warn a cat before it bumps or gets stuck.
6. Try three different gaps. Count how many times your whiskers saved you from a bump.
7. Now look at your own eyes in a mirror in a bright room, then in a dim room. Did the black center change size? A cat's eyes change even more.

### Tips

- Keep your hands down so you are testing whiskers, not fingers.
- If you have a cat, gently watch it squeeze through a cat door or under a chair. Watch the whiskers go first.

### Check your work

- I can say what a cat's whiskers are for.
- I can tell how a cat's eyes change in bright light and dim light.
- I can tell the story of Trim the ship's cat.

## NATURE NOTEBOOK

1. Draw a cat's face. Put on the whiskers. A parent counts them with you.
2. Draw two cat eyes: one with a thin slit for sunshine, one big and round for the dark.
3. Draw Trim the cat climbing a rope on a ship, with the sea below.

**From history.** Samuel Johnson, the Englishman who wrote a famous dictionary in 1755, had a cat named Hodge. He went out to buy oysters for Hodge himself, so that his

servants would not have the trouble and come to dislike the cat. His friend James Boswell wrote that Johnson called Hodge “a very fine cat, a very fine cat indeed.” A statue of Hodge, with oysters at his feet, stands in Gough Square in London.

## WORKED EXAMPLES

**Example 1.** Look at the sleep chart. Each box is one hour. How many hours does the cat sleep? How many hours do you sleep? Who sleeps more, and by how many hours?

*(Use the map or drawing “Count the boxes in each row.” shown earlier in this lesson.)*

1. Count the cat’s boxes with your finger: 1, 2, 3 ... up to 14. The cat sleeps about 14 hours.
2. Count the child’s boxes: 1, 2, 3 ... up to 10. You sleep about 10 hours.
3. The cat’s row is longer, so the cat sleeps more.
4. Count up from 10 to 14: 11, 12, 13, 14. That is 4 more hours.

**Answer:** The cat sleeps about 14 hours and the child about 10 hours. The cat sleeps 4 more hours a day.

## PRACTICE

1. **EASY** Point to where a cat’s whiskers are. What do they help the cat do?
2. **EASY** Show me with your hands: what does the black center of a cat’s eye do in bright sunshine? What does it do in a dark room?
3. **MEDIUM** Is a cat a mammal? Give two reasons.
4. **MEDIUM** A cat has 5 toes on each front paw and 4 toes on each back paw. Count the toes on one front paw and one back paw together.
5. **HARD** Name three ways a lion and a house cat are alike. Then name one way they are different.

## COMMON MISTAKES

- Thinking cats can see in total darkness. They need a little light; their big pupils and shiny eyes just use it very well.
- Thinking a cat always lands safely, so it is fine to drop one. Never drop or toss a cat; it can be hurt.
- Thinking cats need a bowl of cow’s milk. Many cats get a tummy ache from milk; fresh water is what a cat needs to drink.

**Make it a game • Quiet Cat, Sleepy Mouse.** One player is the sleepy mouse and sits with eyes shut in the middle of the room. The others are cats. The cats creep toward the mouse as quietly as they can, on soft paws. If the mouse hears a sound, it points, and that

cat must freeze for a count of five. The first cat to touch the mouse gently on the shoulder becomes the next mouse. Finish by saying one tool God gave cats for quiet hunting.

**Scripture.** “Thou makest darkness, and it is night: wherein all the beasts of the forest do creep forth. The young lions roar after their prey, and seek their meat from God.” (Psalm 104:20-21, KJV)

Lions hunt at night, and so does your cat. The Bible says even the lions get their food from God. He cares for the big cats and the little ones.

#### Practice answers

1. On the sides of the face by the nose. They help the cat feel in the dark and know if it can fit through a gap.
2. In sunshine it gets thin like a slit (fingers close together). In the dark it gets big and round (fingers make a circle).
3. Yes. It has fur, and its kittens drink milk from their mother. (Also: it is warm.)
4.  $5 + 4 = 9$  toes.
5. Alike: whiskers, eyes that open wide in the dark, soft paws with hidden claws, long tail, both hunt quietly. Different: a lion is much bigger (and lives wild, roars instead of purring).

## 2.3 FISH IN A BOWL

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### OBJECTIVES

- Point to a fish's fins, tail, scales and gills and tell what each is for.
- Say that a fish breathes water through its gills and is as warm or as cool as the water around it.
- Tell why a goldfish needs clean water and plenty of room.

**Warm-up.** Fill a clear glass with water and set it in a sunny window. Look through it. Now hold your hand flat and wave it slowly through the air like a fish tail. Open and close your mouth slowly, like a fish. Fish do this all day. Why? Today we find out.

**Video.** Coming soon. Goldfish and pet fish for young children: fins, gills, scales, how fish breathe in water, and how to care for a fish tank. Search SciShow Kids, Homeschool Pop (Alternate), National Geographic Kids, and close-up aquarium footage of goldfish.

### KEY TERMS

#### **fin**

A thin flap on a fish's body. Fins push, steer and keep the fish steady in the water.

#### **gills**

The parts under the flaps on a fish's head that take air out of the water so the fish can breathe.

#### **scales**

Small hard plates that cover a fish like little shingles on a roof.

#### **goldfish**

A small orange or gold pet fish that first came from China, long ago.

### CORE IDEAS

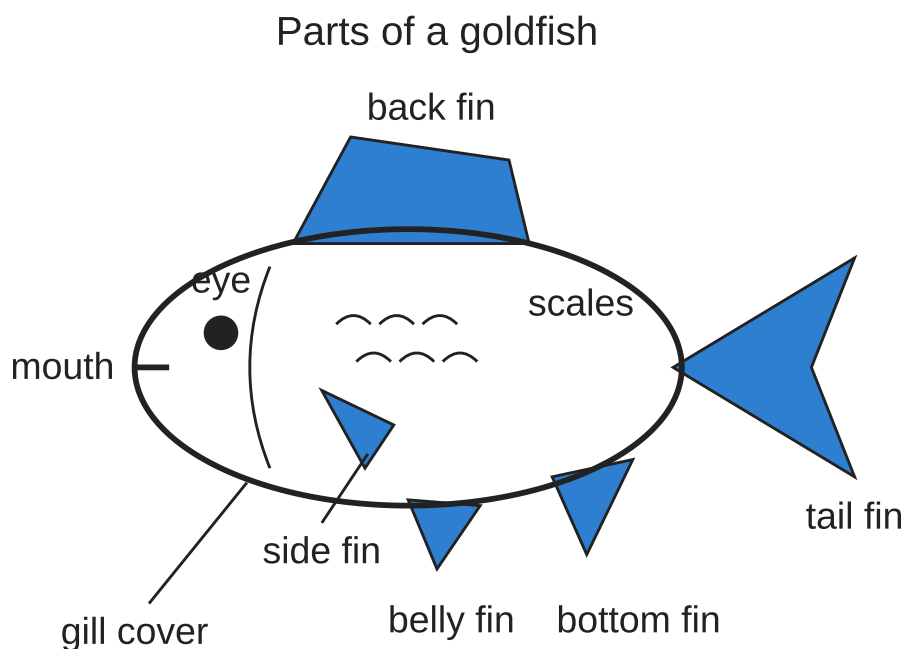
**The story.** Long, long ago in China, people found little fish in their ponds that were not gray like the others. They were gold! The people kept the gold ones, and the gold fish had gold babies. In time, people kept them in big pots and bowls in their houses so they could watch them swim. Much later, a doctor in Berlin named Marcus Bloch had hundreds of fish painted for a giant book. His goldfish is today's picture study.

**How they figured it out.** Stand still in front of a fish tank and watch. The fish never stops opening and closing its mouth. It is not eating. It is breathing! Water goes in the mouth and out through the flaps on the sides of its head. Under those flaps are the **gills**. Gills take the air that is hidden in water and pass it into the fish's body. Now watch the **fins**. The big tail fin pushes the fish forward. The fin on the back keeps it from tipping over. The little fins on the sides steer and brake. The body is covered with tiny **scales** that overlap like roof shingles.

Fish have no eyelids, so they never blink. And a fish is not warm like a dog or a cat. It is as warm or as cool as its water.

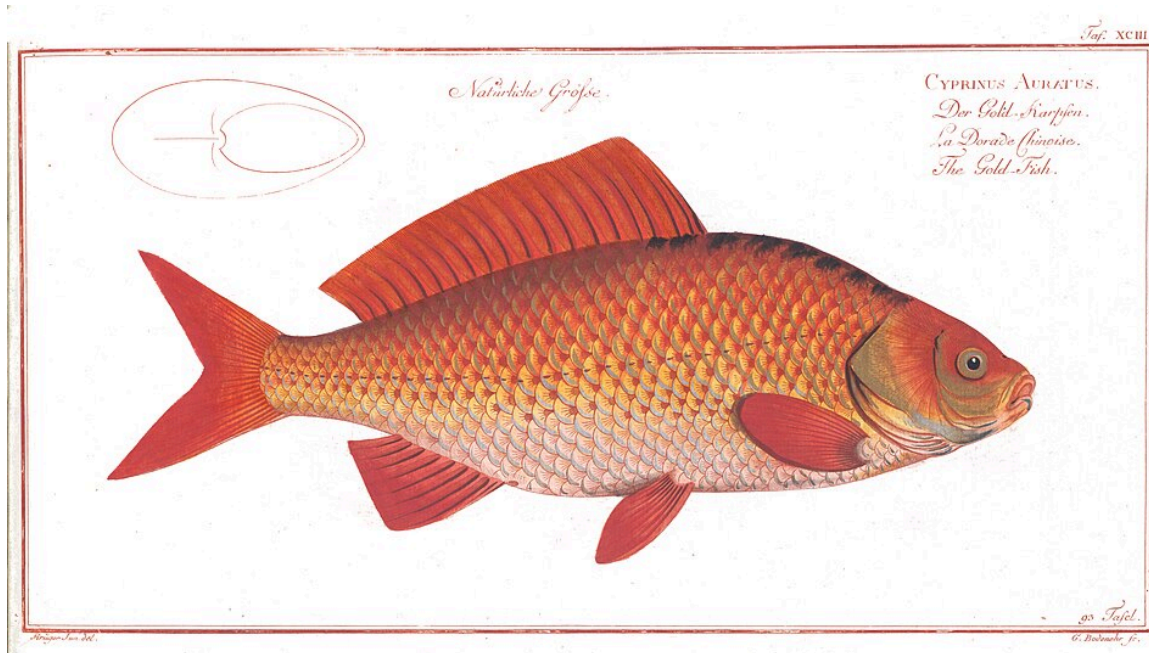
**The big idea.** A **goldfish** is a fish, not a mammal. It has no fur, it lays eggs instead of having babies that drink milk, and it breathes water with gills. God made the fish kind to live in water and gave them just what they need: fins to swim, gills to breathe, and scales to protect them. “And God created great whales, and every living creature that moveth, which the waters brought forth abundantly, after their kind” (Genesis 1:21). Goldfish have goldfish babies. Fancy tails or plain, they are all goldfish.

**Try it and see.** A little bowl is a window for watching, but a goldfish grows bigger than it looks. A happy goldfish needs lots of water, a filter or often-changed water, and just a pinch of food. Dirty water makes it sick. Next time you see a goldfish, count its fins, watch its gill flaps move, and thank God for a creature that breathes water.



*The parts of a goldfish. The side fin and belly fin come in pairs, one on each side.*

## PICTURE STUDY



*The Goldfish (Cyprinus auratus), a plate from Bloch's book of the fishes of Germany, Marcus Elieser Bloch (with his engravers and colorists), 1784 · Hand-colored copper engraving · Printed in Berlin; copies in many libraries*

Marcus Bloch was a doctor in Berlin who spent many years making books with pictures of fish. Artists drew each fish, engravers cut the lines into copper plates, and painters colored every print by hand.

This plate shows the goldfish, which had come from China all the way to Europe. Bloch wanted every scale and every fin to be exactly right, so people could learn from the picture.

### Look closely

- Point to the tail fin. Point to the fin on the back. Can you find the little fins underneath?
- Look at the scales. How did the artist show so many tiny scales?
- Find the eye and the mouth. Where are the gill covers?
- What colors do you see? Is the fish all one color?

### Talk about it

1. Why did Bloch want his fish pictures to be so careful and exact?
2. How many fins can you count in this picture?
3. What do you think this fish was doing just before the artist drew it?

**Safety first.** Always have a grown-up help with water and glass bowls. Never put soap in a fish tank, and wash your hands before and after touching tank water. Never put your fingers in a tank to catch a fish; it can hurt the fish.

## **MAKE AND DO: BUILD A GOLDFISH WITH ALL ITS FINS**

You will make a paper goldfish with every fin in the right place, and then watch a real fish (at home, at a pet store, or in a video) to see those fins at work.

### **You will need**

- Orange or yellow paper (or white paper and crayons)
- Scissors (a parent cuts)
- Glue or tape
- A paper plate for a “bowl”
- Blue crayon for water

### **Steps**

1. A parent cuts out a big oval for the body. Color it gold or orange.
2. Cut out seven fins: one tail fin, one back fin, two side fins, two belly fins and one bottom fin. Count them: seven!
3. Glue the fins on, using the fish diagram as your guide. Tail at the back, back fin on top, side fins behind the head, belly fins under the middle, bottom fin near the tail.
4. Draw one big round eye with no eyelid, a small mouth, and a curved line for the gill cover. Draw rows of little curved scales.
5. Color the paper plate blue and glue your fish in the middle. Now your fish is in a bowl.
6. Watch a real fish. Point to each fin on the real fish as it swims. Watch the gill covers open and close while a parent counts slowly to ten. How many times did they move?
7. Tell a parent two things a goldfish needs to stay healthy.

### **Tips**

- Make the tail fin biggest. It does the most pushing.
- If the real fish is in a small bowl, talk about why a bigger tank with clean water is a kinder home.

### **Check your work**

- I can point to the fins, tail, scales and gills on a fish.
- I can say how a fish breathes.
- I can name two things a pet fish needs.

## **NATURE NOTEBOOK**

1. Draw a goldfish and point to each fin as a parent names it. A parent writes the labels.
2. Draw a fish bowl with a fish inside, then draw a big tank beside it. Circle the better home.
3. Draw a row of scales overlapping like roof shingles. Color them gold.

**From history.** Marcus Bloch's book of fishes came out in Berlin in twelve parts between 1782 and 1795, with more than four hundred hand-colored plates. Bloch was a busy doctor who studied fish in his spare time, and his book was so careful that scientists used it for a hundred years. Several kinds of fish still carry the names he gave them.

## WORKED EXAMPLES

**Example 1.** Look at the goldfish diagram. The side fin and the belly fin come in pairs, one on each side of the fish. How many fins does the goldfish have in all?

*(Use the map or drawing "Count the fins. Remember the pairs." shown earlier in this lesson.)*

1. Start with the fins that come one at a time: 1 back fin, 1 tail fin, 1 bottom fin. That is 3.
2. Add the side fins. There are 2, one on each side. 3 and 2 make 5.
3. Add the belly fins. There are 2, one on each side. 5 and 2 make 7.
4. Check by counting your paper fish: 7 fins.

**Answer:** 7 fins: 1 back fin, 1 tail fin, 1 bottom fin, 2 side fins and 2 belly fins.

## PRACTICE

1. **EASY** Point to the part of a fish that pushes it through the water. What is it called?
2. **EASY** A fish opens and closes its mouth all day. Is it eating or breathing?
3. **MEDIUM** Sort these into two piles, mammals and fish: goldfish, dog, cat, goldfish, cow. How many are fish?
4. **MEDIUM** Feel a glass of cool water, then feel your warm cheek. Which one is a goldfish like, the cool water or your warm cheek? Why?
5. **HARD** Your friend says a tiny bowl is a perfect home for a goldfish forever. Tell your friend two things a goldfish really needs.

## COMMON MISTAKES

- Thinking a fish is drinking or eating when its mouth opens and closes. It is breathing, pulling water over its gills.
- Thinking goldfish forget everything in a few seconds. Goldfish can learn and remember, such as who feeds them and when.
- Thinking more food is kinder. Too much food rots and dirties the water. A pinch a day is enough.

**Make it a game • Fin, Gill, Scale!.** A parent calls out a fish part. For "fin," wave your arms like fins. For "gill," open and close your mouth and flap your hands by your cheeks. For "scale," hug yourself tight like a shiny coat. For "tail," wiggle your whole body. Go

faster and faster. Anyone who does the wrong move sits out until the next round. Finish by naming all seven fins on your paper fish.

**Scripture.** “And God created great whales, and every living creature that moveth, which the waters brought forth abundantly, after their kind, and every winged fowl after his kind: and God saw that it was good.” (Genesis 1:21, KJV)

God made the creatures of the water on the fifth day, each after its kind. A goldfish has goldfish babies, just as God planned.

#### Practice answers

1. The tail fin.
2. Breathing. Water goes in the mouth and over the gills.
3. Two are fish (the goldfish). Dog, cat and cow are mammals.
4. The cool water. A fish is as warm or as cool as the water around it, not warm like a mammal.
5. Lots of clean water (a bigger tank, with water changed or filtered) and only a little food each day. Goldfish grow big and dirty water makes them sick.

## 2.4 CARING FOR A PET

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### OBJECTIVES

- Name the things every pet needs: food, clean water, a safe home, exercise, gentle hands and a doctor when it is sick.
- Say Proverbs 12:10 and tell what it means to “regard the life” of an animal.
- Make and use a simple picture chart for caring for a pet.

**Warm-up.** Hold a stuffed animal in your lap. Pretend it is a real puppy or kitten that is yours to care for all day today. What will it need when it wakes up? When it is hungry? When it is thirsty? When it is tired? Say each thing out loud and act it out.

**Video.** Coming soon. Caring for a pet for young children: feeding, fresh water, exercise, grooming, gentle handling and visits to the veterinarian; what a vet does. Search SciShow Kids, Homeschool Pop (Alternate), National Geographic Kids, and footage of veterinarians at work with dogs and cats.

### KEY TERMS

#### care

Giving an animal what it needs every day, even when you do not feel like it.

#### veterinarian (vet)

A doctor for animals.

#### kindness

Being gentle and good to a creature, the way God is good to us.

#### needs

The things a living creature must have to stay alive and well: food, water, air, shelter and safety.

### CORE IDEAS

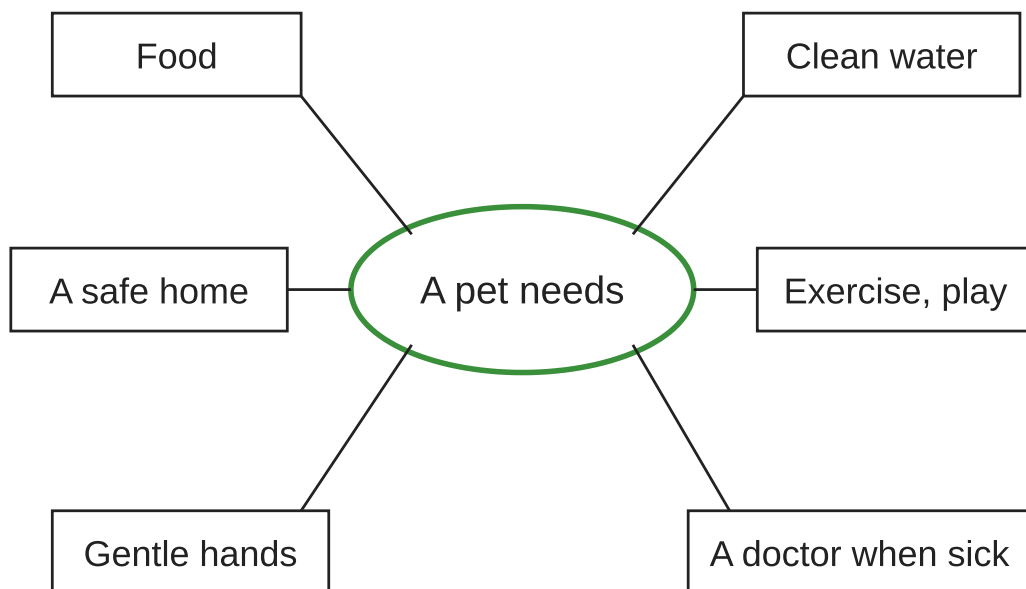
**The story.** In 1866, in New York City, a man named Henry Bergh gathered friends and started a society to protect animals, the first of its kind in America. Then he went out into the busy streets. When he saw a cart driver beating a tired horse, he made the driver stop. People laughed at first, but soon the laws of New York said that animals must not be treated cruelly. The Bible says: “A righteous man regardeth the life of his beast” (Proverbs 12:10). To *regard* means to look at carefully and to care.

**How they figured it out.** Every living creature God made has **needs**. A pet needs food, but not too much. It needs clean water every day. It needs a safe, dry home, not too hot and not too cold. It needs to move and play: a dog needs walks, a cat needs things to chase, a fish needs room to swim. It needs gentle hands. And when it is sick or hurt, it needs a

**veterinarian**, a doctor for animals. Watch your pet closely and it will show you what it needs. A dog by the door needs to go out. A cat by the empty bowl needs water.

**The big idea.** God made the animals, and He put people in charge of them. God told Adam and Eve to “have dominion” over the fish, the birds and every living thing (Genesis 1:28). Dominion does not mean doing anything we please. It means ruling the way God rules: with wisdom and **kindness**. A good child takes care of his pet. When you fill the water bowl, brush the fur or clean the tank, you are doing a job God gave you. The pet cannot thank you with words, but a wagging tail, a purr or a lively swim says it well.

**Try it and see.** Caring for a pet happens every day, not just when it is fun. So a chart helps. In today’s project you will make a picture chart with a box for each day. Each time you feed, water, walk or brush your pet, you color a box. If your family has no pet yet, care for a neighbor’s pet, put out a dish of fresh water for the birds, or practice with a stuffed animal until you are ready for a real one.



*Six things every pet needs. A parent reads each box aloud while the child points.*

## PICTURE STUDY



*Sympathy*, Briton Rivière, 1878 · Oil on canvas · Tate, London

Briton Rivière was an English painter who loved to paint animals and the people who loved them. In this picture a little girl has been sent to sit on the stairs, perhaps because she was naughty. She is sad. But she is not alone.

Her little dog has come to sit beside her. He leans against her and watches her face. He does not know why she is sad, but he knows she is his, and he stays.

### Look closely

- Point to the girl's face. How does she feel? Point to the dog's face. What is he doing?
- Look at how close the dog sits. Is he touching her?
- Find the girl's hands. Find the dog's paws. Who is comforting whom?
- Look at the stairs and the light. Where is this happening?

### Talk about it

1. Why do you think the painter called this picture "Sympathy"? What does that word mean?
2. This dog is caring for the girl. How does the girl care for her dog every day?
3. Have you ever had an animal stay beside you when you were sad?

**Safety first.** Wash your hands after you feed or touch any pet and before you eat. A parent handles pet medicines and cleaning. Never leave a pet shut in a hot car or in the sun without shade and water.

## **MAKE AND DO: MY PET CARE CHART**

You will make a picture chart to help you remember your pet's needs every day for one week. You will also measure how much water your pet drinks.

### **You will need**

- A large sheet of paper
- Crayons or markers
- Stickers or a crayon for checking off boxes
- A ruler (a parent helps draw lines)
- A pet water bowl and a strip of masking tape (if you have a pet)

### **Steps**

1. A parent draws a chart with 7 columns, one for each day of the week, and 4 rows.
2. In the first column, draw a picture for each row: a food bowl, a water bowl, a leash or toy (for exercise and play), and a brush (for gentle care). No reading needed, just pictures.
3. Each day, when you do a job, put a sticker or color the box. At the end of the week, count the stickers in each row.
4. Water test: fill your pet's bowl in the morning and put a strip of tape on the outside of the bowl at the water line. At bedtime, look. How far did the water go down? Mark the new line. That is how much your pet drank.
5. Do the water test for three days. Does your pet drink more on hot days or on cool days?
6. If you have no pet, do the chart for a stuffed animal or for a bird water dish outside, and refill the dish every day.
7. At the end of the week, tell a parent which job was easiest to remember and which was hardest.

### **Tips**

- Keep the chart where you can see it, near the pet's bowls.
- A pet cannot say "I am thirsty." Check the water bowl every time you walk by.

### **Check your work**

- I can name six things a pet needs.
- I kept my chart for a whole week.
- I measured how much my pet drank and told what I found.

## **NATURE NOTEBOOK**

1. Draw your pet, or the pet you would like to have. Around it, draw its food, water, home, toy and brush.
2. Draw a veterinarian helping an animal. A parent writes "vet" under it.

3. Draw Henry Bergh stopping to help a tired horse on a city street.

**From history.** The first society to protect animals began in London in 1824. A small group of Christian men, including a minister named Arthur Broome and William Wilberforce, who had worked to end the slave trade, met in a coffee house and formed the Society for the Prevention of Cruelty to Animals. Queen Victoria later let it add “Royal” to its name, and it is still at work today as the RSPCA. Henry Bergh in New York was following their example.

## WORKED EXAMPLES

**Example 1.** Max the dog eats 2 meals every day, one in the morning and one at night. How many meals does Max eat in 3 days? Use the chart to help.

1. Day 1: morning and night. That is 2 meals.
2. Day 2: 2 more. Count on from 2: 3, 4. That is 4 meals so far.
3. Day 3: 2 more. Count on from 4: 5, 6. That is 6 meals.
4. Check by counting all the food-bowl boxes for three days on your chart: 6 boxes.

**Answer:** 6 meals in 3 days.

## PRACTICE

1. **EASY** Point to the water bowl on your chart. How many times a day should a pet have fresh water?
2. **EASY** Name three things every pet needs.
3. **MEDIUM** A dog is sitting by the back door and whining. What does it probably need? A cat is sitting by an empty bowl. What does it probably need?
4. **MEDIUM** You walk the dog every day for 5 days. Count on your fingers. How many walks is that? If you also walk on Saturday and Sunday, how many walks in the whole week?
5. **HARD** Say Proverbs 12:10 with your parent. Then tell in your own words what it means to “regard the life” of an animal.

## COMMON MISTAKES

- Thinking more food means more love. Too much food makes a pet sick and fat. The right amount, at the right time, is kind.
- Thinking a pet can take care of itself for a day or two. Animals need fresh water and care every single day.
- Thinking a pet is a toy. A pet is a living creature God made, and it feels hunger, thirst, heat, cold and fear just as we do.

**Make it a game • What Does Pet Need?.** A parent acts out a pet with a need: panting and lying by an empty bowl (water), scratching at the door (go out), shivering (warmth

and shelter), limping (the vet), rolling a ball with its nose (play). You guess the need and act out how to help. Switch places and let the child be the pet. Play until you have acted out all six needs on the pet chart.

**Scripture.** “A righteous man regardeth the life of his beast: but the tender mercies of the wicked are cruel.” (Proverbs 12:10, KJV)

To regard means to look at carefully and to care. A good person notices when an animal is hungry, thirsty or hurting, and does something about it.

#### Practice answers

1. Every day, at least once (and any time the bowl is empty or dirty).
2. Any three of: food, clean water, a safe home, exercise and play, gentle hands, a doctor (vet) when sick.
3. The dog needs to go outside. The cat needs food or water.
4. 5 walks in 5 days; 7 walks in the whole week.
5. “A righteous man regardeth the life of his beast.” It means a good person looks carefully at his animal and takes care of it, giving it what it needs and being kind to it.

## UNIT 2 REVIEW

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An oral review. A parent asks each question aloud and the child answers by speaking, pointing or acting it out. Give full points for a correct idea in the child's own words. The review is worth 20 points.

1. (3 pts) Tell me the story of Balto. Who was sick, what did the dogs carry, and how did they find their way?
2. (2 pts) Show me what a dog does to cool off. Why doesn't it sweat like you?
3. (3 pts) Point to where a cat's whiskers go. What are they for? What does the black center of a cat's eye do in the dark?
4. (2 pts) Is a cat a mammal? Tell me two reasons.
5. (3 pts) Point to a fish's tail fin, its gills and its scales on your paper fish. How does a fish breathe?
6. (2 pts) Count the fins on your paper goldfish. How many are there?
7. (3 pts) Name as many things as you can that every pet needs. Try for six.
8. (2 pts) Say the Bible verse about a righteous man and his beast. What does it mean?

### UNIT PROJECT: MY PET BOOK

Make a little book about the pets in this unit. Fold three sheets of paper to make pages. On the first pages draw a dog, a cat and a goldfish, each with its special parts (nose and ears, whiskers and eyes, fins and gills), and tell a parent what each part is for while the parent writes the labels. On the next page glue in your finished pet care chart from Lesson 2.4. On the last page draw your favorite pet story (Balto, Trim or Henry Bergh) and tell it aloud to your family. Decorate the cover with the words "God Made the Animals."

- **Observation:** Each animal drawing shows its real parts in the right places: a dog's nose and tail, a cat's whiskers, a fish's fins and gills.
- **Telling:** The child can tell aloud what each labeled part is for and retell one pet story in his own words.
- **Care:** The pet care chart was kept for a week and the child can name six things every pet needs.
- **Neatness and effort:** The pages are colored with care, the book is put together in order, and the cover has a title.

#### Answer key

1. Children in Nome, Alaska, were sick. Teams of sled dogs carried the medicine through the snow in a relay, with Balto leading the last team. The dogs found the way with their noses.
2. It pants with its tongue out. Dogs sweat only a little through their paws, so panting is how they cool down.
3. Whiskers are on the sides of the face. They feel in the dark and tell the cat if it can fit through a gap. In the dark the pupil opens big and round to catch light.
4. Yes. It has fur, and its kittens drink their mother's milk. (It is also warm.)

5. The child points to each part. Water goes in the mouth and over the gills, which take air out of the water.
6. Seven: 1 back fin, 1 tail fin, 1 bottom fin, 2 side fins and 2 belly fins.
7. Food, clean water, a safe home, exercise and play, gentle hands, and a doctor (vet) when it is sick.
8. "A righteous man regardeth the life of his beast" (Proverbs 12:10). A good person looks carefully at his animal and takes kind care of it.

## BIRDS

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On the fifth day God said, “Let the waters bring forth abundantly the moving creature that hath life, and fowl that may fly above the earth in the open firmament of heaven” (Genesis 1:20). Birds are the easiest wild animals for a child to watch. They come to the yard, they sing in the morning, and they leave feathers on the ground. In this unit you will hold a feather and zip it back together, build a nest out of mud and grass, listen for bird songs and make a map of where they came from, and hang a pinecone feeder so the birds come to you.

Along the way you will meet Albrecht Dürer, who painted a single bird wing feather by feather, and John James Audubon, who drew hundreds of American birds life-size and tied silver threads on baby birds to see if they came back. You will look closely at Carel Fabritius’s little goldfinch. And you will hear Jesus say, “Behold the fowls of the air,” and learn that the God who feeds every sparrow cares even more for you.

### BEFORE YOU BEGIN

- Can count objects to 10 and tell which group has more
- Can sit still and listen quietly for one minute
- Can pinch small things with two fingers and draw a simple shape
- Knows that farm chickens lay eggs (Unit 1)

### MASTERY CHECKLIST

- I can tell that only birds have feathers and point to a feather’s shaft and vane.
- I can tell what down feathers do and show how a feather zips back together.
- I can name three things a bird uses to build a nest and tell why we never touch a nest.
- I can say two reasons a bird sings and tell a song from a call.
- I can match a thick beak, a long thin beak and a slim pointed beak to seeds, nectar and worms.
- I can say what Jesus said about the fowls of the air.

### OPTIONAL BOOKS AND RESOURCES

- **All About Birds, from the Cornell Lab of Ornithology** (<https://www.allaboutbirds.org/>): Free. Look up any bird by name to see pictures and hear its song and calls. Play the robin, chickadee and cardinal sounds for Lesson 3.3.
- **Merlin Bird ID app, from the Cornell Lab of Ornithology** (<https://merlin.allaboutbirds.org/>): Free app for a parent’s phone. Hold it up outside and it listens and names the birds singing around you. A fun check after the sound-map project.
- **Project FeederWatch** (<https://feederwatch.org/>): A winter feeder-counting project run by the Cornell Lab. The site has free bird-identification posters and tips on what to feed birds, which go with the pinecone feeder in Lesson 3.4.

## 3.1 FEATHERS ★

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### OBJECTIVES

- Tell that birds are the only animals God made with feathers.
- Point to the shaft and the vane of a feather and tell what a fluffy down feather is for.
- Show how feather barbs zip together and how a feather sheds water.

**Warm-up.** Hold a feather (a craft feather or a feather from a farm chicken is fine). Stroke it from bottom to top. Stroke it from top to bottom. Which way is smooth? Now blow on it. Does it float down slowly or drop fast? Tell your parent one thing you noticed.

**Video.** Coming soon. Feathers close up for kids: how feather barbs zip together, down feathers, birds preening. Try SciShow Kids, Smithsonian, Cornell Lab of Ornithology, Homeschool Pop (Alternate), and slow-motion nature footage of birds in flight.

### KEY TERMS

#### feather

The light covering God gave to birds. Only birds have feathers.

#### shaft

The stiff stick down the middle of a feather. The bare end is called the quill.

#### vane

The flat, soft part on each side of the shaft. It is made of tiny rows called barbs that hook together.

#### down

The small fluffy feathers close to a bird's skin. Down holds warm air like a blanket.

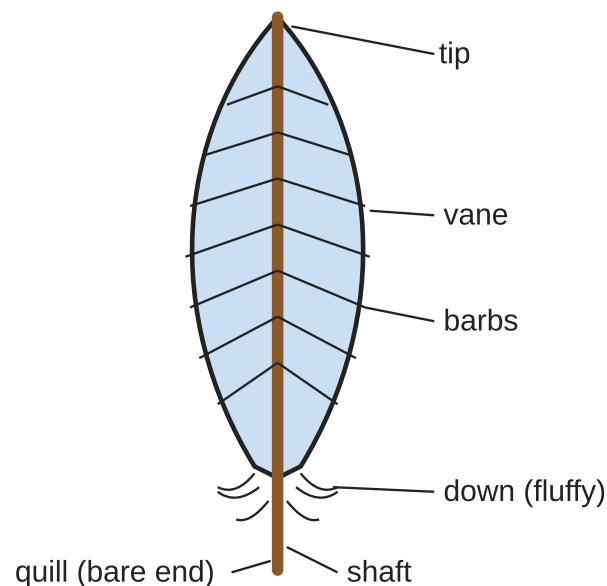
### CORE IDEAS

**The story.** Look at the feather in your hand. A bird once wore it. Every bird in the world, from a tiny hummingbird to a big ostrich, is covered in feathers. No other animal has them. A bat has fur. A butterfly has scales on its wings. A fish has scales too. But God gave feathers to birds alone. If an animal has feathers, it is a bird. If it has no feathers, it is not a bird, even if it can fly.

**How they figured it out.** Long ago, people who wrote with goose feathers looked at them very closely. The stiff stick down the middle is the **shaft**. The flat part on each side is the **vane**. Look even closer. The vane is made of many thin rows called barbs. Each barb has tiny hooks that catch the next barb, like a zipper. When a bird gets its feathers messy, it runs them through its beak and zips them back together. That is called preening. A bird also spreads a little oil from near its tail onto its feathers. The oil makes rain roll right off.

**The big idea.** Feathers do many jobs. Big, stiff feathers on the wings and tail are for flying and steering. Smooth feathers on the body make the bird sleek, so air slides past. Fluffy little **down** feathers next to the skin trap warm air, the way a puffy coat keeps you warm. Bright feathers help birds know their own kind. A cardinal is red, a blue jay is blue, a robin has an orange chest. A bird does not keep the same feathers forever. Old feathers fall out and new ones grow in. That is why you sometimes find a feather on the ground.

**God's handiwork.** A feather is light enough to float on your breath, yet strong enough to lift a bird into the sky. Feathers keep a bird warm in winter and dry in the rain. The Bible says God "shall cover thee with his feathers, and under his wings shalt thou trust" (Psalm 91:4). A mother hen spreads her wings over her chicks to keep them safe and warm. God cares for His people the same way.



*The parts of a feather. The barbs of the vane hook together like a zipper.*

## PICTURE STUDY



*Wing of a Blue Roller*, Albrecht Dürer, 1512 · Watercolor and gouache on vellum · Albertina Museum, Vienna

Albrecht Dürer was a German artist who loved to look closely at the things God made. He painted a hare, a clump of grass, and this single wing of a bird called a roller. He painted every feather one by one, so we can see the long stiff flight feathers at the edge and the soft small feathers near the top.

### Look closely

- Point to the longest feathers. Where are they on the wing?
- Find the small soft feathers near the top of the wing. Are they the same shape as the long ones?
- What colors do you see? Count the colors on your fingers.
- Can you find the shaft on one of the big feathers?

### Talk about it

1. Why do you think the long feathers are at the edge of the wing?
2. Dürer looked at this wing for a very long time. What would you look at for a long time?

**Safety first.** Wash hands after holding any feather. In the United States a law protects wild birds, so feathers of most wild birds should be looked at and left where they lie. Craft-store feathers and feathers from a farm chicken, duck or turkey are fine to keep.

## MAKE AND DO: ZIP IT AND DRIP IT: A FEATHER TEST

You will be a feather scientist. You will unzip a feather and zip it back. Then you will see what water does on a feather.

### **You will need**

- Two or three feathers (craft feathers or farm-bird feathers), one fluffy and one stiff if you can
- A cup of water and an eyedropper or a spoon
- A magnifying glass if you have one
- Your nature notebook and crayons

### **Steps**

1. Hold a stiff feather by the quill. Find the shaft and the vane. Say their names.
2. Gently pull two barbs apart so there is a gap in the vane. Now stroke the feather from bottom to top with your fingers. Watch the gap close. You zipped it, just like a bird preening.
3. Look at the vane with the magnifying glass. Can you see the tiny rows?
4. Put one drop of water on the feather. Does it soak in or sit like a little bead? Tilt the feather. Where does the drop go?
5. Now hold the fluffy down feather. Blow on it. Squeeze it in your hand and let go. Does it puff back up?
6. Drop the stiff feather and the fluffy feather from the same height at the same time. Which lands first?
7. Draw both feathers in your notebook. Your parent can write: stiff feather for flying, fluffy feather for warm.

### **Tips**

- If the barbs will not zip, stroke from the quill end toward the tip, the way the feather grows.
- A chicken feather from a farm works best for the water test. A dyed craft feather may soak a little.

### **Check your work**

- I can point to the shaft and the vane.
- I can zip a feather back together with my fingers.
- I can tell which feather is for flying and which is for keeping warm.

## **NATURE NOTEBOOK**

1. Draw one feather as big as your page. Color the shaft brown and the vane any color you like. Your parent labels shaft and vane.
2. Draw a bird you have seen in your yard. Give it wing feathers, tail feathers and a soft round chest.
3. Glue a craft feather in your notebook. Next to it, draw a bat and a butterfly. Circle the one animal that has feathers.

**From history.** For about a thousand years, people wrote with pens made from feathers. The best quill pens came from the big wing feathers of a goose. The writer cut the hollow quill to a point with a small knife called a penknife and dipped it in ink. The men who signed the Declaration of Independence in 1776 signed their names with quill pens.

## WORKED EXAMPLES

**Example 1.** You have two feathers. The stiff wing feather is as long as 4 of your fingers laid side by side. The fluffy down feather is as long as 1 finger. Which feather is longer? How many fingers longer is it?

1. Lay your fingers next to the stiff feather. Count: 1, 2, 3, 4 fingers.
2. Lay a finger next to the down feather. Count: 1 finger.
3. 4 is more than 1, so the stiff feather is longer.
4. Count up from 1 to 4: 2, 3, 4. That is 3 more fingers.

**Answer:** The stiff wing feather is longer. It is 3 fingers longer than the down feather.

## PRACTICE

1. **EASY** Which of these animals has feathers? Point to the right one: a dog, a robin, a fish, a bat.
2. **EASY** Point to the shaft of your feather. Now point to the vane.
3. **MEDIUM** A bird is cold in the snow. Which feathers keep it warm, the big stiff wing feathers or the little fluffy down feathers?
4. **MEDIUM** Count the feathers in this list on your fingers: 2 red feathers, 3 blue feathers, 4 brown feathers. How many feathers in all?
5. **HARD** Tell your parent in your own words what a bird does when it preens, and why.

## COMMON MISTAKES

- Thinking every animal that flies is a bird. Bats fly but have fur, and butterflies fly but have scales. Only birds have feathers.
- Thinking feathers are only for flying. Feathers also keep a bird warm and dry, and penguins and ostriches have feathers but do not fly.
- Stroking a feather from the tip down to the quill and thinking it is broken. Stroke it the other way and the barbs zip back together.

**Make it a game • Feather or Not?.** Your parent names an animal: eagle, cow, duck, bat, penguin, frog, chicken, butterfly, owl. If it has feathers, flap your arms and say “Bird!” If it has no feathers, sit very still. Then switch: you name an animal and your parent flaps or sits. Try to trick each other with a penguin or a bat.

**Scripture.** “He shall cover thee with his feathers, and under his wings shalt thou trust: his truth shall be thy shield and buckler.” (Psalm 91:4, KJV)

A mother bird spreads her wings and feathers over her chicks to keep them warm and safe. God says He will care for His people the same way.

#### **Practice answers**

1. The robin. Only birds have feathers.
2. The shaft is the stiff stick down the middle. The vane is the flat soft part on each side.
3. The little fluffy down feathers. They trap warm air next to the skin like a puffy coat.
4. 9 feathers. 2 and 3 make 5, and 4 more make 9.
5. The bird runs its feathers through its beak to zip the barbs back together and spread oil on them. This keeps the feathers smooth, warm and dry so rain rolls off.

## 3.2 NESTS ★

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### OBJECTIVES

- Tell that a nest is a cradle a bird builds to hold its eggs and babies.
- Name three things birds use to build nests, such as grass, mud, twigs and feathers.
- Show why we look at nests and eggs but never touch them.

**Warm-up.** Go outside or look out a window. Pick up three things a bird might use to build a nest: a twig, a bit of dry grass, a leaf, a bit of string, a feather. Hold them in your hand. Now try to make a tiny bowl out of them without glue or tape. Is it hard? A bird does it with only its beak.

**Video.** Coming soon. How birds build nests for kids: robin building a mud nest, weaver bird or oriole hanging nest, hummingbird nest, baby birds in a nest. Try Cornell Lab of Ornithology, Smithsonian, SciShow Kids, BBC Earth nature footage, Homeschool Pop (Alternate).

### KEY TERMS

#### **nest**

A cradle a bird builds to hold its eggs and keep its babies safe and warm.

#### **egg**

A baby bird grows inside the egg until it is ready to hatch.

#### **hatch**

When a baby bird breaks out of its egg.

#### **chick**

A baby bird. Many chicks hatch with no feathers and closed eyes, so they need the nest.

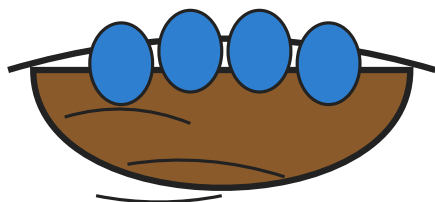
### CORE IDEAS

**The story.** In spring, watch a robin. She hops across the grass and picks up a dry stem. She flies to a tree. She comes back for a beakful of mud. Back and forth, back and forth, hundreds of times. In a few days she has a round cup of grass and mud, lined inside with soft fine grass. Then she lays her eggs in it. Robin eggs are a beautiful blue. A robin usually lays three or four. She sits on them to keep them warm, and after about two weeks the chicks hatch.

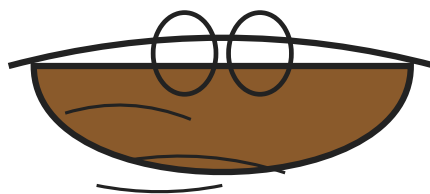
**How they figured it out.** A man named John James Audubon loved to watch birds. He walked in the woods in Pennsylvania and watched small birds called phoebes raise their babies in a nest by a creek. He tied a thin silver thread around the legs of the chicks. The next spring he found birds with silver threads back at the same creek, building new nests. He showed that birds come back to the place where they were born. Audubon spent his whole life drawing birds, and he drew many of them with their nests.

**The big idea.** Every kind of bird builds its own kind of nest. A robin makes a mud cup. An oriole weaves a hanging bag that swings from a branch. A hummingbird makes a nest as small as a walnut shell, glued together with spider silk. A woodpecker chips a hole in a tree. A killdeer lays its eggs right on the ground among pebbles. An eagle piles up sticks into a nest bigger than a bathtub. Nobody teaches the robin to make a mud cup. God put the plan inside her. A nest is not a bird's house. It is a cradle. When the chicks can fly, the family leaves the nest behind.

**Try it and see.** If you find a nest, be a good scientist. Look. Count the eggs from far away. Draw it. But do not touch, and do not stay long. A frightened mother may stay away, and the eggs will get cold. The Bible says even the sparrow and the swallow found a safe place for their nests near God's house (Psalm 84:3). Let us keep their nests safe too.



robin nest: 4 eggs



dove nest: 2 eggs

*A robin nest with 4 blue eggs and a mourning dove nest with 2 white eggs. Count them.*

## PICTURE STUDY



*Baltimore Oriole*, from *The Birds of America*, John James Audubon, 1827–1838 · Hand-colored engraving · Copies in many libraries and museums; Audubon's original watercolors are at the New-York Historical Society

John James Audubon drew every bird life-size, so his books were huge. In this picture he shows Baltimore orioles, bright orange and black, on a branch of a tulip tree. Hanging from the branch is their nest. An oriole does not make a cup. She weaves a long bag out of plant fibers and string, and it swings in the wind with the eggs safe inside.

### Look closely

- Find the nest. Does it sit on the branch, or hang from it?
- Point to the brightest bird. What two colors is it?
- Count the orioles in the picture on your fingers.
- Find the flowers on the tree. What season do you think it is?

### Talk about it

1. Why might a hanging nest be a safe place for eggs?
2. Audubon drew every feather. What is one thing in the picture you would have missed if you looked fast?

**Safety first.** Never touch a nest, eggs or baby birds, and never climb to reach one. In the United States a law protects wild birds and their nests. Wash hands after handling grass, mud and twigs for the nest project.

## MAKE AND DO: BUILD A NEST LIKE A ROBIN

You will build a nest the way a robin does, with grass and mud and no glue. Then you will test it: can it hold an egg?

### You will need

- A handful of dry grass, thin twigs, pine needles or straw
- A small cup of mud (dirt plus a little water)
- Soft things for the lining: a feather, a bit of cotton, moss or fine grass
- A small bowl to shape the nest in, and a tray or newspaper to keep the table clean
- A plastic egg, a ping-pong ball or a pebble to be the “egg”

### Steps

1. Press a little mud into the bottom of the bowl. This is the robin’s first beakful.
2. Lay grass and twigs around the inside of the bowl in a circle. Press them into the mud.
3. Add more mud, then more grass. Go round and round, just like a robin turning in her nest.
4. Line the inside with the softest things: fine grass, cotton or a feather.
5. Let the nest dry in the sun for a while. Then gently lift it out of the bowl.
6. Put your pretend egg in it. Does the nest hold it? Tip the nest a little. Does the egg stay?
7. Draw your nest in your notebook. Your parent writes what you used.

### Tips

- Try building a second nest with only your fingertips pinched together like a beak. It is much harder, and that is how the bird does it.
- If the nest falls apart, use more mud. Mud is the robin’s glue.

### Check your work

- I can name three things a bird uses to build a nest.
- My nest is a cup shape and holds a pretend egg.
- I can tell why we never touch a real nest.

## NATURE NOTEBOOK

1. Draw a robin nest with blue eggs in it. Count the eggs as you draw. Your parent writes the number.
2. Draw three kinds of nests: a mud cup, a hanging bag and a hole in a tree. Point to the one a woodpecker makes.
3. Draw a chick hatching out of its egg.

**From history.** John James Audubon tied silver threads on the legs of baby phoebes near Mill Grove, Pennsylvania, in 1804. When some of the birds came back the next spring, he

knew they were the same ones. This was the first known bird banding in America. Today scientists put tiny light bands with numbers on birds' legs to learn where they fly and how long they live.

## WORKED EXAMPLES

**Example 1.** Look at the picture of the two nests. The robin nest has 4 blue eggs. The dove nest has 2 white eggs. Which nest has more eggs? How many eggs are there in both nests together?

*(Use the map or drawing "Count the eggs in each nest." shown earlier in this lesson.)*

1. Count the blue eggs in the robin nest: 1, 2, 3, 4.
2. Count the white eggs in the dove nest: 1, 2.
3. 4 is more than 2, so the robin nest has more eggs.
4. Count all the eggs together: 1, 2, 3, 4, then 5, 6.

**Answer:** The robin nest has more eggs. Together there are 6 eggs.

## PRACTICE

1. **EASY** What is a nest for? Tell your parent.
2. **EASY** Point to the things on this list a robin uses for her nest: mud, grass, a brick, a feather, a hammer.
3. **MEDIUM** Which nest is bigger, a hummingbird nest or an eagle nest? Which bird is bigger?
4. **MEDIUM** A nest had 3 eggs. Then the mother laid 1 more. Count on your fingers: how many eggs now?
5. **HARD** You find a nest with eggs in a bush. Show your parent what a good scientist does, and say what a good scientist does not do.

## COMMON MISTAKES

- Thinking a nest is a bird's house where it lives all year. A nest is a cradle for eggs and chicks. When the chicks can fly, the family leaves it.
- Thinking all nests are cups in trees. Some birds weave hanging bags, some dig holes in trees or banks, and some lay eggs right on the ground.
- Thinking it is kind to take a nest or an egg home to keep it safe. The safest place for an egg is under its mother. Look and draw, but do not touch.

**Make it a game • Robin, Robin, Build Your Nest.** Put a bowl on one side of the room and a pile of nest things (grass, twigs, paper strips, cotton) on the other. You are the robin. Pinch one thing at a time between two fingers like a beak, fly it across the room,

and drop it in the bowl. Count your trips out loud. When the bowl is full, sit on it like a mother bird and say how many trips it took.

**Scripture.** “Yea, the sparrow hath found an house, and the swallow a nest for herself, where she may lay her young, even thine altars, O LORD of hosts, my King, and my God.” (Psalm 84:3, KJV)

Even little birds built their nests close to God’s house, and the psalm writer loved to see them there. God makes a safe place for birds and for us.

#### Practice answers

1. A nest holds the eggs and keeps the baby birds safe and warm until they can fly.
2. Mud, grass and a feather. Birds do not use bricks or hammers.
3. The eagle nest is much bigger, and the eagle is much bigger. Big birds build big nests.
4. 4 eggs.
5. Look from far away, count the eggs and draw them, then walk away quietly. Do not touch the nest or eggs, and do not stay long, so the mother can come back and keep the eggs warm.

## 3.3 BIRD SONGS

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### OBJECTIVES

- Tell two reasons a bird sings: to say “this is my place” and to call a mate.
- Tell the difference between a short call and a long song.
- Listen outside and point to where a bird sound comes from.

**Warm-up.** Sit very still with your parent for one minute, inside or outside, and close your eyes. Hold up one finger each time you hear a bird. When the minute is over, open your eyes. How many fingers are up? Try to copy one of the sounds you heard.

**Video.** Coming soon. Bird songs for kids: robin, cardinal, chickadee, mourning dove and owl calls with the bird shown; the dawn chorus; how birds sing. Try Cornell Lab of Ornithology, Macaulay Library, SciShow Kids, Smithsonian, and nature footage with clear bird audio.

### KEY TERMS

#### song

A long, pretty string of notes a bird sings, mostly in spring and mostly in the morning.

#### call

A short bird sound, like a chirp or a “chip.” Birds use calls to say “danger!” or “where are you?”

#### dawn chorus

The time just after sunrise in spring when many birds sing at once.

#### mate

A bird’s partner. A father bird and a mother bird raise their chicks together.

### CORE IDEAS

**The story.** Get up early on a spring morning and open the window. Before the sun is all the way up, the birds begin. First one robin, then another, then a cardinal, then the little chickadees. Soon the whole yard is singing. People call this the dawn chorus. Each bird sings its own song, and each kind of bird sings the same kind of song every year. A robin always sounds like a robin. A cardinal always sounds like a cardinal. If you learn a few songs, you can tell who is outside without even seeing them.

**How they figured it out.** People who listen carefully have made up words to help remember bird songs. The robin sings “cheerily, cheer up, cheerio.” The chickadee calls out its own name: “chick-a-dee-dee-dee.” The cardinal whistles “cheer, cheer, cheer” or “birdy, birdy, birdy.” The mourning dove makes a soft sad “coo-OO-oo-oo.” At night a barred owl asks, “Who cooks for you?” Say these out loud. Then listen for them outside. When you hear one, you will know the bird.

**The big idea.** Why do birds sing? Mostly it is the father bird who sings, and he is saying two things. First, “This is my place. Other robins, stay away.” Second, “I am here. Come and be my mate.” Songs are long and pretty. Calls are different. A call is short, like a chirp or a “chip.” Birds call to say “danger!” when a cat is near, or “where are you?” to their chicks. A bird does not sing with its mouth the way we do. God gave birds a special voice box deep down in the chest, where the windpipe splits in two. Some birds can even sing two notes at once.

**God’s handiwork.** The Bible says that God made the fowls of the heaven to live by the streams, “which sing among the branches” (Psalm 104:12). Nobody taught the robin his song. It is a gift. And here is a wonder: many young birds listen to their fathers and practice, a little wobbly at first, until they can sing it right. Just like you learning a hymn.

## Songs we heard



*A listening chart from one morning. Each mark is one time we heard that bird sing.*

## PICTURE STUDY



*Cardinal Grosbeak*, from *The Birds of America*, John James Audubon, 1833 · Hand-colored engraving and aquatint by Robert Havell after Audubon · National Gallery of Art, Washington, D.C. (one of many copies)

Audubon painted the cardinal, which he called the cardinal grosbeak. The father bird is bright red with a black face and a pointed crest on his head. The mother bird is soft brown with a little red on her wings and tail. Both have a thick orange beak. The cardinal is one of the loudest and clearest singers in an American yard, and unlike most songbirds, the mother cardinal sings too.

### Look closely

- Point to the father cardinal. Point to the mother cardinal. Which is brighter?
- Find the pointed crest on top of the cardinal's head.
- Look at the beak. Is it thin like a needle or thick like a nutcracker?
- Is a bird in the picture opening its beak? What might it be saying?

### Talk about it

1. Why might a bright red bird be easy for other cardinals to see and hear?
2. If you could paint one bird from your yard, which one would it be?

## MAKE AND DO: A SOUND MAP

Scientists who study bird songs sit still and listen. You will make a map of every bird sound you hear from one spot.

### You will need

- A piece of paper and a crayon

- A blanket or chair to sit on outside
- A watch or timer (a parent's phone is fine)

### Steps

1. Pick a spot outside: a porch, a yard, a park bench. Early morning is best.
2. Your parent draws a small X in the middle of the paper. That X is you.
3. Sit very still and quiet. Cup your hands behind your ears to make big ears like an owl.
4. When you hear a bird, point to where the sound came from. Your parent draws a little mark on that side of the X. Near sounds go close to the X, far sounds go near the edge.
5. Listen for five minutes. Then count the marks on your map.
6. Try to copy one of the sounds. Was it a long song or a short call?
7. Do the same map again at noon. Are there more marks in the morning or at noon?

### Tips

- If you hear the same bird sing again and again, make a mark each time. Birds repeat their songs many times.
- Say "song" or "call" out loud for each sound to practice telling them apart.

### Check your work

- I sat still and listened for five minutes.
- I can point to where a bird sound came from.
- I can say whether a sound was a song or a call.

## NATURE NOTEBOOK

1. Draw a robin on a branch with its beak open and little music notes coming out.
2. Draw a sun coming up and three birds singing. Your parent writes "dawn chorus."
3. Glue your sound map into your notebook and draw the bird you heard most.

**From history.** The composer Mozart kept a pet starling in Vienna. He bought it in 1784 and wrote in his notebook that the bird could whistle a tune almost like one from his new piano concerto. He wrote next to the bird's version, "That was beautiful!" Starlings are famous copycats and can learn whistles, other birds' songs and even ringing phones.

## WORKED EXAMPLES

**Example 1.** Look at the listening chart. The robin has 5 marks, the chickadee has 3 marks and the cardinal has 2 marks. Which bird sang the most? How many bird songs did we hear in all?

*(Use the map or drawing “Read the chart. Each mark is one song.” shown earlier in this lesson.)*

1. Count the robin marks: 1, 2, 3, 4, 5.
2. Count the chickadee marks: 1, 2, 3. Count the cardinal marks: 1, 2.
3. 5 is the biggest number, so the robin sang the most.
4. Add them up on your fingers: 5 and 3 make 8. 8 and 2 make 10.

**Answer:** The robin sang the most. We heard 10 songs in all.

## PRACTICE

1. **EASY** Make the chickadee’s sound. What is the chickadee saying?
2. **EASY** Is a quick “chip!” when a cat walks by a song or a call?
3. **MEDIUM** Tell your parent two reasons a father robin sings in spring.
4. **MEDIUM** In the morning you heard 6 bird songs. At noon you heard 2. Which time had more? How many more?
5. **HARD** Your parent hums or whistles a long tune, then makes one short chirp. Point to which one was like a song and which was like a call, and say why.

## COMMON MISTAKES

- Thinking birds sing only because they are happy. A bird’s song is a message: “this is my place” and “come be my mate.”
- Thinking every bird sound is a song. Short chirps and chips are calls, used for warnings and keeping in touch.
- Thinking birds sing from their mouths like people. A bird’s voice box is deep in its chest, where the windpipe splits in two.

**Make it a game · Who Is Singing?.** Your parent makes one of the bird sounds you learned: “cheerily, cheer up” for the robin, “chick-a-dee-dee-dee,” “cheer cheer cheer” for the cardinal, a soft “coo-OO-oo-oo” for the dove, or “Who cooks for you?” for the owl. You shout the bird’s name and flap. Then you make a sound and your parent guesses. Add a “chip!” now and then, and whoever hears it must freeze like a bird hiding from a cat.

**Scripture.** “By them shall the fowls of the heaven have their habitation, which sing among the branches.” (Psalm 104:12, KJV)

This psalm praises God for making streams for the animals to drink from and trees where the birds live and sing. Every bird song is part of the praise of God's creation.

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**Practice answers**

1. "Chick-a-dee-dee-dee." It says its own name.
2. A call. Calls are short and warn of danger. Songs are long and pretty.
3. To say "this is my place, stay away" to other robins, and to call a mate.
4. Morning had more. 6 is 4 more than 2.
5. The long tune is like a song because songs are long and have many notes. The short chirp is like a call because calls are short and quick.

## 3.4 BEHOLD THE FOWLS OF THE AIR

### OBJECTIVES

- Say what Jesus taught about the birds in Matthew 6:26: God feeds them, and He cares even more for us.
- Match a bird's beak to the food it eats: seeds, nectar or worms.
- Make a pinecone feeder and count the birds that come to it.

**Warm-up.** Put a few sunflower seeds, a raisin and a drop of honey on a plate. Pretend your fingers are a beak. Pinch with two fingers to pick up a seed. Now try to sip the honey with a straw. Which “beak” worked for which food? Birds have different beaks for different foods.

**Video.** Coming soon. Birds at a backyard feeder for kids: cardinals, chickadees, finches and woodpeckers eating seeds; hummingbird drinking nectar; bird beak shapes and what they eat. Try Cornell Lab of Ornithology, Project FeederWatch, SciShow Kids, Smithsonian, Homeschool Pop (Alternate), and live feeder-cam footage.

### KEY TERMS

#### beak

A bird's hard mouth. Its shape fits the food the bird eats.

#### seed

The hard little food from plants that many birds crack open and eat, like a sunflower seed.

#### nectar

The sweet juice inside a flower. Hummingbirds drink it.

#### feeder

Something people hang up with food in it for wild birds.

### CORE IDEAS

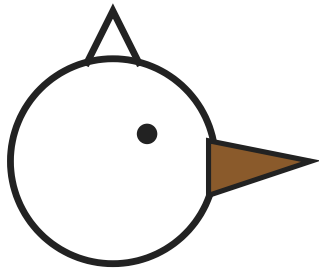
**The story.** One day Jesus sat on a hillside and taught a crowd of people. Many of them were poor. They worried about food and clothes. Jesus pointed to the birds. “Behold the fowls of the air,” He said. Look at them. They do not plant seeds. They do not gather a harvest into barns. Yet your heavenly Father feeds them. Then He asked, “Are ye not much better than they?” If God takes care of every sparrow, He will surely take care of you (Matthew 6:26).

**How they figured it out.** How does God feed the birds? Look at their beaks. A cardinal has a short, thick beak like a nutcracker. It cracks open sunflower seeds. A hummingbird has a long thin beak like a straw. It sips nectar deep inside flowers. A robin has a slim pointed beak. It pulls worms out of the grass and plucks berries. A woodpecker has a beak like a chisel to chip bugs out of wood. A duck has a flat beak to strain food out of pond water. Each

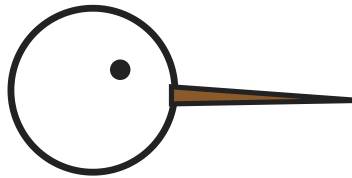
bird was given the right tool for its food. If you see a bird, look at its beak and guess what it eats.

**The big idea.** In winter the bugs are gone and the berries are mostly eaten. That is when a feeder helps. People all over the world hang up seeds and suet for the birds, and then the birds come close enough to watch. Scientists have learned a great deal just from people counting the birds at their feeders. You can do that too. Hang a feeder, sit by the window, and count. Chickadees come first, because they are brave. Cardinals like to come early in the morning and late in the day. Keep a count in your notebook.

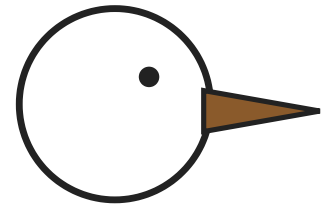
**God's handiwork.** God feeds the birds, and He often does it through people who care for them. When you hang a feeder, you are helping with God's work. And every time a chickadee lands on your pinecone, remember what Jesus said. The same Father who feeds that tiny bird knows what you need, and He loves you much more.



**cardinal**  
thick beak  
cracks seeds



**hummingbird**  
long thin beak  
sips nectar



**robin**  
slim pointed beak  
worms and berries

*Three beaks, three foods. Match the beak to the food.*

## PICTURE STUDY



*The Goldfinch*, Carel Fabritius, 1654 · Oil on panel · Mauritshuis, The Hague

Carel Fabritius was a painter in Holland. He painted this little goldfinch sitting on its feeding box. The picture is small, not much bigger than a sheet of paper, and it is painted so well that from a little way off the bird almost looks real. In Fabritius's day, people kept goldfinches as pets and taught them to pull up a tiny bucket of water with a string. That is why the bird is on a chain.

The painting was made in 1654. That same year a great explosion hurt the town of Delft where Fabritius lived. The painting survived, and today people line up to see it.

### Look closely

- Point to the bird's red face. Point to the yellow stripe on its wing.
- Find the little chain on the bird's leg. Where is it fastened?
- Look at the bird's beak. Is it short and thick, or long and thin? A goldfinch eats small seeds.
- Is the bird looking at you? How does that make you feel?

### Talk about it

1. Would this goldfinch rather be on its box or flying free? Why do you think so?
2. Jesus said God feeds the birds. Who fed this goldfinch?
3. The painter made a tiny bird look real. What would you need to look at very carefully to paint a bird?

**Safety first.** Peanut butter is a food allergy for some children; use vegetable shortening or plain suet instead if anyone in the family is allergic. Wash hands after mixing birdseed

and after touching the feeder. Hang the feeder either very close to a window or well away from it so birds do not fly into the glass. Keep cats indoors while the feeder is up.

## **MAKE AND DO: A PINECONE FEEDER**

You will make a feeder the way children have for a long time: a pinecone, something sticky and birdseed. Then you will watch and count who comes.

### **You will need**

- A large pinecone (or an empty toilet paper tube if there are no pinecones)
- Peanut butter, or vegetable shortening if anyone is allergic
- A plate of birdseed (sunflower seeds are the favorite)
- A piece of string or yarn about as long as your arm
- A butter knife, a spoon and a tray for the mess
- Your nature notebook and crayons

### **Steps**

1. Tie the string around the top of the pinecone and make a loop for hanging.
2. Use the knife or spoon to smear peanut butter into the pinecone. Push it into all the little cracks.
3. Roll the sticky pinecone in the plate of birdseed. Press the seeds on with your fingers.
4. Hang the feeder on a branch or hook where you can see it from a window.
5. Be patient. Birds may take a day or two to find it.
6. Sit by the window for ten minutes each day. Each time a bird comes, your parent makes a mark in your notebook next to the bird's color: red, brown, gray, blue.
7. After three days, count the marks. Which color bird came the most?

### **Tips**

- Birds find feeders faster if there is a bush or tree nearby where they can hide first.
- Put a little dish of water out too. Birds need to drink, even in winter.
- When the seeds are gone, make a new one. Birds come back to a place they know.

### **Check your work**

- My pinecone is covered in seeds and hangs where I can watch it.
- I watched and counted the birds for three days.
- I can say what Jesus said about the fowls of the air.

## **NATURE NOTEBOOK**

1. Draw your pinecone feeder with a bird on it. Color the bird the color of the first bird that came.

2. Draw three beaks: a thick one, a long thin one and a slim pointed one. Draw a seed, a flower and a worm, and draw a line from each beak to its food.
3. Draw a picture of yourself hanging the feeder. Your parent writes “Your heavenly Father feedeth them” under it.

**From history.** On Christmas Day in 1900, a bird lover named Frank Chapman asked people to go out and count birds instead of shooting them, which had been a holiday custom. Twenty-seven people counted that first day. The Christmas Bird Count has happened every winter since, and today tens of thousands of people join in, many of them counting the birds at their own feeders.

## WORKED EXAMPLES

**Example 1.** You watched the feeder for ten minutes. 3 chickadees came, 2 cardinals came and 1 blue jay came. Which kind of bird came the most? How many birds came in all?

1. Hold up 3 fingers for the chickadees, 2 for the cardinals, 1 for the blue jay.
2. 3 is the biggest number, so the chickadees came the most.
3. Count all the fingers: 1, 2, 3, 4, 5, 6.

**Answer:** The chickadees came the most. 6 birds came in all.

## PRACTICE

1. **EASY** Say what Jesus said we should look at. Who feeds them?
2. **EASY** Point to the beak in the picture that cracks seeds. Point to the beak that sips nectar.
3. **MEDIUM** A robin pulls a worm out of the grass. Does a robin need a thick nutcracker beak or a slim pointed beak?
4. **MEDIUM** On Monday 4 birds came to the feeder. On Tuesday 5 birds came. Which day had more? Count on from 4 to 5: how many more?
5. **HARD** Tell your parent why Jesus pointed to the birds when people were worried.

## COMMON MISTAKES

- Thinking all birds eat seeds. Hummingbirds drink nectar, robins eat worms and berries, and woodpeckers eat bugs from wood. The beak tells you the food.
- Thinking bread is good bird food. Bread fills birds up but gives them little that they need. Sunflower seeds, suet and water are much better.
- Thinking the birds do not need us because God feeds them. God often feeds the birds through people. Hanging a feeder is one way to help with God’s work.

**Make it a game • Beak Relay.** Put sunflower seeds, cooked spaghetti “worms” and a cup of juice “nectar” on a table. Give the child three tools: tweezers or two pinched fingers (cardinal beak), a straw (hummingbird beak) and a clothespin (robin beak). Your parent calls a food. Grab the right beak and “eat” one piece. Say the bird’s name each time. Then your parent is the bird and you call the food.

**Scripture.** “Behold the fowls of the air: for they sow not, neither do they reap, nor gather into barns; yet your heavenly Father feedeth them. Are ye not much better than they?” (Matthew 6:26, KJV)

Jesus told worried people to look at the birds. God feeds them every day, and we are worth far more to Him than birds. So we can trust Him for what we need.

#### Practice answers

1. The fowls of the air, the birds. God, our heavenly Father, feeds them.
2. The thick cone beak of the cardinal cracks seeds. The long thin beak of the hummingbird sips nectar.
3. A slim pointed beak, for grabbing worms and plucking berries.
4. Tuesday had more. 5 is 1 more than 4.
5. The birds do not plant or store food, yet God feeds them every day. If God takes care of little birds, He will take care of us, because we are worth much more to Him than they are. So we do not need to worry.

## UNIT 3 REVIEW

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Ask these questions aloud. Let the child answer by talking, pointing, drawing or acting it out. No reading or writing is needed. There are 8 questions worth 20 points in all. Give full points for an answer in the child's own words that has the main idea.

1. (2 pts) Which animal has feathers: a bat, a robin or a butterfly? What kind of animal has feathers?
2. (3 pts) Hold up a feather. Point to the shaft and the vane. Then tell me what a fluffy down feather does for a bird.
3. (2 pts) What is a nest for?
4. (3 pts) Name three things a robin uses to build her nest. Then tell me what we do if we find a nest.
5. (2 pts) Make the chickadee's sound. Then tell me two reasons a bird sings.
6. (3 pts) I will hum a long tune, then make one short chirp. Which one is a song and which is a call? How do you know?
7. (3 pts) Which bird has a thick beak for cracking seeds? Which bird has a long thin beak for sipping nectar? Which bird pulls worms with a slim pointed beak?
8. (2 pts) Jesus said, "Behold the fowls of the air." Who feeds the birds, and what does that teach us?

### UNIT PROJECT: MY BIRD BOOK

Make a four-page bird book to show what you learned. Page one: a feather glued in or drawn, with shaft and vane labeled by a parent. Page two: a drawing or photo of the nest you built, with the things you used. Page three: your sound map and a drawing of the bird you heard most. Page four: a drawing of your pinecone feeder with marks for the birds that came, and the words "your heavenly Father feedeth them."

Then tell the book to a parent or grandparent page by page, like a storyteller.

- **Feathers:** The feather page shows a real or drawn feather and the child can point to the shaft and vane and say what down is for.
- **Nests:** The nest page shows the nest the child built and names the materials used, and the child can tell why we never touch a real nest.
- **Songs and Feeder:** The sound map and feeder count are included, and the child can read the marks and say which bird came or sang the most.
- **Telling:** The child tells the book aloud in order, in complete thoughts, and can say what Jesus said about the fowls of the air.

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#### Answer key

1. The robin. Only birds have feathers.
2. The shaft is the stiff stick in the middle; the vane is the flat soft part on each side. Down feathers trap warm air and keep the bird warm.

3. To hold the eggs and keep the baby birds safe and warm until they can fly.
4. Mud, grass, twigs, feathers or fine grass (any three). We look from far away, count and draw, but never touch it or stay long.
5. "Chick-a-dee-dee-dee." A bird sings to say "this is my place" and to call a mate.
6. The long tune is a song because songs are long with many notes. The short chirp is a call because calls are short, like a warning.
7. The cardinal cracks seeds. The hummingbird sips nectar. The robin pulls worms.
8. Our heavenly Father feeds them. If God feeds the birds, He will take care of us too, because we are worth much more to Him. So we do not need to worry.

## UNIT 4: BUGS

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God made “every thing that creepeth upon the earth after his kind” (Genesis 1:25), and some of the smallest creepers are the most wonderful. In this unit you will get down low and look at insects: little animals with six legs, three body parts and two feelers. You will open an ant café and watch the ants follow a trail, make a plate that tells a butterfly’s whole life, build a ladybug with wing covers that open like doors, and trace six-sided rooms to see why bees build honeycomb the way they do.

Along the way you will meet Maria Sibylla Merian, who sailed across the ocean to draw ants and butterflies on the very plants where they lived, and you will look at her pictures. You will hear King Solomon say, “Go to the ant,” and you will taste honey like Samson. By the end you will know that a tiny bug on a leaf has a job to do, a family to go home to, and a Maker who made it in wisdom.

### BEFORE YOU BEGIN

- Can count objects to 10 and tell which group has more
- Can sit still and watch something small for a few minutes
- Can trace a shape, glue, and fold paper with help
- Knows that only birds have feathers (Unit 3), so that bugs with wings are not birds

### MASTERY CHECKLIST

- I can point to an insect’s head, middle, back part, six legs and two feelers.
- I can tell that ants live in a colony with a queen and workers, and say what we learn from the ant in Proverbs.
- I can say the four stages of a butterfly’s life in order: egg, caterpillar, chrysalis, butterfly.
- I can tell that a ladybug is a beetle with wing covers and that it eats aphids.
- I can tell that bees make honey from nectar, store it in six-sided honeycomb, and carry pollen so fruit can grow.
- I can read a simple picture chart and say which bug we saw most.

### OPTIONAL BOOKS AND RESOURCES

- **Monarch Watch, from the University of Kansas** (<https://monarchwatch.org/>): Free. Pictures of every stage of the monarch’s life, tips on finding eggs and caterpillars on milkweed, and a tagging program families can join in the fall (Lesson 4.2).
- **Journey North** (<https://journeynorth.org/>): Free. Maps that fill in week by week as families report the first monarchs they see each spring and fall. Find your state on the map and watch the butterflies come north (Lesson 4.2).

## 4.1 ANTS ★

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### OBJECTIVES

- Point to the three body parts, six legs and two feelers of an ant and tell that an ant is an insect.
- Tell that ants live together in a colony with a queen and many workers, and that each ant does its work without a boss.
- Say what Proverbs 6:6 tells us to learn from the ant.

**Warm-up.** On a warm day, put a few crumbs of bread or a drop of honey on the sidewalk or a stone outside. Sit down and watch. How long until the first ant comes? What happens next? Count the ants on your fingers. Tell your parent what the ants are doing.

**Video.** Coming soon. Ants for kids: ant colony, queen and workers, ants following a scent trail, leafcutter ants carrying leaves, harvester ants storing seeds. Try SciShow Kids, Smithsonian, National Geographic Kids, Homeschool Pop (Alternate), Moody Science classics, and close-up nature footage of ant nests.

### KEY TERMS

#### **insect**

A small animal with six legs and three body parts. Ants, butterflies, ladybugs and bees are all insects.

#### **colony**

A big family of ants that live together in one nest.

#### **queen**

The one big mother ant. She lays all the eggs in the colony.

#### **antennae**

The two feelers on an ant's head. An ant smells and touches with them.

### CORE IDEAS

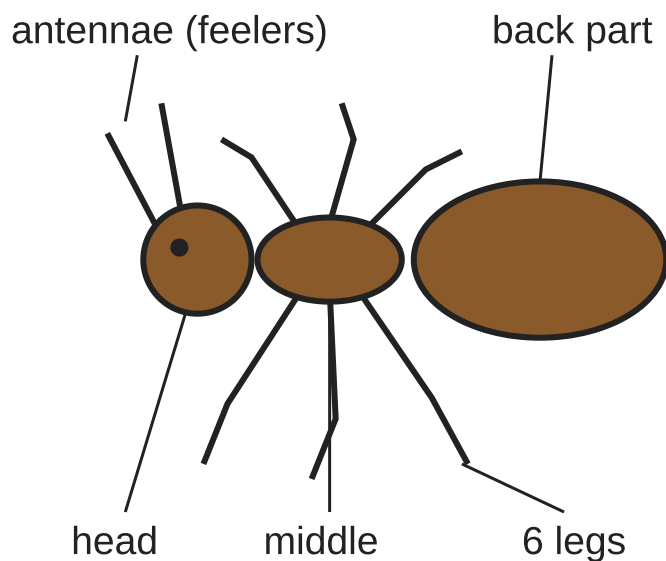
**The story.** Drop a crumb on the sidewalk and wait. Soon one ant finds it. She runs home. Then more ants come, and more, all walking in one line. How did they know? The first ant left a smell on the ground with her body, like a little trail of perfume. The other ants follow the smell with their **antennae**, the two feelers on the head. When two ants meet, they tap feelers to say hello. Look at an ant up close. It has three body parts: a head, a middle part and a big back part. It has six legs. Every animal with six legs and three parts is an **insect**. An ant is an insect.

**How they figured it out.** A woman named Maria Sibylla Merian loved to watch insects. She sailed across the ocean to a hot land called Suriname and drew what she saw. She wrote about ants that cut pieces of leaf and carry them home over their heads like little green

flags. These are leafcutter ants. They do not eat the leaves. They chew them up deep under the ground, and a fuzzy garden grows on the chewed leaves. The ants eat the garden. She also saw ants hold on to each other to make a bridge, so the rest could cross a gap. Nobody told them to do it.

**The big idea.** Ants do not live alone. They live in a **colony**, a big family in one nest. In many nests there is just one **queen**. She is the mother, and she lays all the eggs. The other ants are workers, and they are all sisters. Some workers dig rooms and tunnels. Some carry food. Some feed the baby ants. Some stand at the door and guard it. No ant is the boss. Each ant sees what needs doing and does it. An ant can carry a load much heavier than itself. That is like you carrying a couch over your head.

**God's handiwork.** King Solomon, the wisest king, told lazy people to go and look at the ant. In the land where he lived, some ants gather seeds all summer and carry them into rooms under the ground. When winter comes, the colony has food. The Bible says the ant has "no guide, overseer, or ruler," yet she "provideth her meat in the summer" (Proverbs 6:7-8). God made the little ant wise. When you see one, remember to do your work well without being told.



*An ant has three body parts, six legs and two antennae. That makes it an insect.*

## PICTURE STUDY



*Branch of a Guava Tree with Ants, Spiders and a Hummingbird (Plate 18 of Metamorphosis insectorum Surinamensium), Maria Sibylla Merian, 1705 · Hand-colored engraving after a watercolor · Printed in Amsterdam; copies in many libraries and museums, including the British Museum and the Royal Collection*

Maria Sibylla Merian was a German artist who sailed all the way to Suriname in South America to draw the insects there. She watched them for a long time and painted them doing real things. In this picture ants march along a guava branch, and some of them hold on to each other to make a living bridge from twig to twig.

### Look closely

- Find the line of ants. Now find a leaf with holes chewed in it.
- Find the ants holding on to each other to make a bridge. Where does the bridge go?
- Find the big hairy spiders. Count their legs. Do they have more legs than an ant?
- Find the little bird and its nest with eggs. One of the big spiders has caught the bird. Merian drew what she really saw, even the sad parts.

### Talk about it

1. Why do you think the ants walk in a line instead of all over the place?
2. Merian sat very still and watched for a long time to see the ant bridge. What would you like to sit and watch?

**Safety first.** Look at ants, but do not pick them up or poke a nest. In some places red fire ants bite and sting and should always be left alone. Keep food crumbs outside, not in the house, and wash hands after the ant watch.

## **MAKE AND DO: THE ANT CAFÉ**

You will open a tiny restaurant for ants. You will set out four foods and watch which one the ants like best. Then you will count the ants at each food.

### **You will need**

- A paper plate or a flat stone
- Four tiny bits of food: a crumb of bread, a pinch of sugar, a small piece of apple, a tiny bit of cheese
- A magnifying glass if you have one
- Your nature notebook and crayons

### **Steps**

1. Find a spot outside where you have seen ants, such as a sidewalk crack or the edge of a garden.
2. Put the four foods on the plate, far apart from each other. Say the name of each food.
3. Guess first. Point to the food you think the ants will like best. Your parent writes your guess in the notebook.
4. Go away and play for a while. Then come back quietly and look.
5. Count the ants at each food on your fingers. Your parent makes a tally mark for each ant next to the food's name.
6. Watch one ant with the magnifying glass. Find its head, its middle, its back part, its six legs and its two feelers.
7. Follow the ants with your eyes. Can you find the line they walk in? Where does it go?
8. Draw the plate in your notebook with the winning food circled. Was your guess right?

### **Tips**

- If no ants come, try a warmer, sunnier day or a different spot. Ants are slow on cold days.
- Keep the foods very small. We want to watch ants, not feed the whole neighborhood.

### **Check your work**

- I can point to an ant's head, middle and back part.
- I can count six legs and two feelers.
- I can tell which food the ants liked best.

## **NATURE NOTEBOOK**

1. Draw one big ant with three body parts, six legs and two feelers. Your parent writes head, middle, back part.
2. Draw a line of ants carrying crumbs home to their nest. Draw the nest under the ground with little rooms.

3. Draw a seed. Next to it draw a room full of seeds under the ground. Your parent writes:  
The ant gathers her food in summer.

**From history.** For a long time some people said Solomon was wrong, because the ants they knew in cold northern lands do not store seeds. Then in the 1870s an Englishman named John Traherne Moggridge sat in the sunshine of southern France and watched harvester ants carry seeds into their nests all summer long. He dug up the nests and found rooms packed with seeds, just as Proverbs says.

## WORKED EXAMPLES

**Example 1.** An ant has 6 legs. A spider has 8 legs. Which one has more legs? How many more?

1. Hold up 6 fingers for the ant. Count: 1, 2, 3, 4, 5, 6.
2. Hold up 8 fingers for the spider. Count: 1, 2, 3, 4, 5, 6, 7, 8.
3. 8 is more than 6, so the spider has more legs.
4. Count up from 6 to 8: 7, 8. That is 2 more legs.

**Answer:** The spider has more legs. It has 2 more legs than the ant. An ant with 6 legs is an insect. A spider is not.

## PRACTICE

1. **EASY** Look at the ant drawing. Point to the head. Point to the middle part. Point to the big back part.
2. **EASY** How many legs does an ant have? How many feelers?
3. **MEDIUM** Four ants are carrying crumbs. Three more ants come to help. How many ants are carrying crumbs now? Count on your fingers.
4. **MEDIUM** Who lays the eggs in the ant colony? Who digs the tunnels and carries the food?
5. **HARD** Tell your parent in your own words what the Bible says we should learn from the ant.

## COMMON MISTAKES

- Thinking a spider is an insect. A spider has eight legs and two body parts. An insect has six legs and three body parts.
- Thinking the queen ant is the boss who tells the others what to do. She only lays the eggs. Each worker does her job on her own.
- Thinking all ants are pests. Ants in the house are a bother, but ants outside clean up crumbs and dead bugs and loosen the soil for plants.

**Make it a game • Follow the Trail.** Your parent lays a trail of paper dots across the room and around corners to a hidden “crumb,” such as a cracker. You are the ant. Hold

two fingers up on your head for feelers and follow the trail on hands and knees. When you find the crumb, carry it back to the nest. Then you lay the trail and your parent is the ant. Tap feelers (fingers) when you pass each other.

**Scripture.** “Go to the ant, thou sluggard; consider her ways, and be wise:” (Proverbs 6:6, KJV)

A sluggard is a lazy person. Solomon says to watch the ant. She works hard without anyone telling her to, and she gets ready for winter in summer. God wants us to be wise and busy like the ant.

#### Practice answers

1. The child points to the three body parts: head in front, middle part, and the big back part.
2. Six legs and two feelers (antennae).
3. 7 ants. 4 and 3 more make 7.
4. The queen lays the eggs. The workers dig the tunnels and carry the food.
5. The ant has no boss telling her what to do, but she works hard and gathers food in summer so she has food in winter. We should do our work without being told and not be lazy.

## 4.2 BUTTERFLIES

### OBJECTIVES

- Tell the four stages of a butterfly's life in order: egg, caterpillar, chrysalis, butterfly.
- Tell that a caterpillar eats leaves and a butterfly drinks nectar from flowers.
- Tell a butterfly from a moth by looking at its antennae.

**Warm-up.** Fold a piece of paper in half and open it. Put three small drops of paint on one side, close to the fold. Fold it shut and press with your hand. Open it. What shape do you see? Both sides match, just like a butterfly's wings. Hold your paper butterfly up and flap it.

**Video.** Coming soon. Butterfly life cycle for kids: monarch egg, caterpillar, chrysalis, butterfly coming out and drying its wings, butterfly drinking nectar, butterfly or moth antennae. Try SciShow Kids, Smithsonian, Homeschool Pop (Alternate), Moody Science classics, and time-lapse nature footage of a chrysalis opening.

### KEY TERMS

#### caterpillar

The baby butterfly. It hatches from the egg and eats leaves all day.

#### chrysalis

The hard little case a caterpillar makes around itself. Inside, it changes into a butterfly.

#### butterfly

The grown-up insect with four big wings covered in tiny scales.

#### nectar

The sweet juice inside a flower. A butterfly drinks it through a long tongue like a straw.

### CORE IDEAS

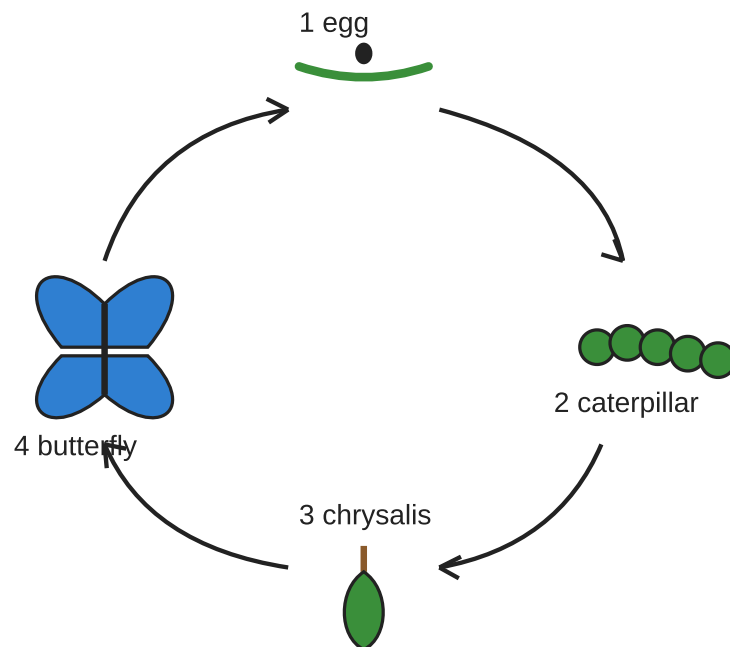
**The story.** In the garden a monarch butterfly lands on a milkweed plant. She lays one tiny egg under a leaf. It is about as big as the head of a pin. In a few days the egg hatches. Out crawls a tiny **caterpillar**. It eats the leaf. It eats and eats. It gets so fat that its skin gets too tight, so it splits its skin and crawls out with a new, bigger skin. It does this again and again. Now it has yellow, black and white stripes. One day it stops eating. It hangs upside down from a twig in the shape of a letter J. Its skin splits one last time, and under it is a smooth green case with little gold dots. That is the **chrysalis**.

**How they figured it out.** Long ago, many people thought a caterpillar and a butterfly were two different animals. Some even thought bugs grew out of mud. A girl named Maria Sibylla Merian did not believe it. When she was young she raised silkworms in boxes and fed them leaves every day. She watched them spin and change and come out as moths. When she grew up she kept caterpillars of every kind, painted each one on its own plant, and painted the

chrysalis and the butterfly beside it. Her pictures showed everyone the truth: the caterpillar and the butterfly are the very same animal.

**The big idea.** A butterfly's life has four stages: egg, caterpillar, chrysalis, **butterfly**. After some days the chrysalis turns clear, and you can see orange wings inside. It cracks open and the butterfly crawls out. Its wings are wet and crumpled. It hangs still until they are flat and dry. Then it flies. A butterfly is an insect, so it has six legs. It has four wings covered with tiny scales, like colored dust. It does not eat leaves anymore. It unrolls a long tongue, like a party horn, and sips **nectar** from flowers. Look at the feelers on its head. A butterfly's antennae have little knobs on the ends. A moth's antennae have no knobs. Many look like tiny feathers or thin threads, and most moths fly at night.

**God's handiwork.** The crawling, leaf-chewing caterpillar and the bright flying butterfly are one animal that God made to change. The Bible says that when a person belongs to Jesus, "he is a new creature: old things are passed away; behold, all things are become new" (2 Corinthians 5:17). Every butterfly in the garden is a little picture of that.



*The four stages of a butterfly's life. After the butterfly lays an egg, the circle starts again.*

## PICTURE STUDY



*Pineapple with Caterpillar and Butterfly (Plate 2 of Metamorphosis insectorum Surinamensium)*, Maria Sibylla Merian, 1705 · Hand-colored engraving after a watercolor · Printed in Amsterdam; copies in many libraries and museums, including the British Museum and the Royal Collection

Maria Sibylla Merian painted every butterfly together with the plant its caterpillar ate, so that you could see its whole life in one picture. Here the plant is a pineapple, a fruit most people in Europe had never seen. Look for the caterpillar, the butterfly, and, if you can find it, the chrysalis hiding somewhere on the plant.

### Look closely

- Find the caterpillar. What is it crawling on?
- Find a butterfly with its wings open. Find one with its wings closed. Do the two sides of the open wings match?
- Can you find a chrysalis? Look carefully. It may be hanging under a leaf.
- Point to the pineapple. Have you ever eaten one? What does its skin look like?

### Talk about it

1. Why did Merian paint the caterpillar and the butterfly on the same plant?
2. What do you think happened to the caterpillar in the picture after Merian painted it?

**Safety first.** Only handle smooth caterpillars that a parent knows are safe, such as monarch or black swallowtail caterpillars. Never touch fuzzy or spiny caterpillars, because some have hairs that sting. Wash hands after touching any caterpillar. If you raise a caterpillar, let the butterfly go outside on a warm day.

## **MAKE AND DO: A LIFE-CYCLE PLATE**

You will make a plate that shows the four stages of a butterfly's life with pasta. Then you will tell the story around the plate with your finger.

### **You will need**

- A paper plate
- A crayon or marker
- A grain of rice or a small white bead (the egg)
- A piece of spiral pasta (the caterpillar)
- A piece of shell pasta (the chrysalis)
- A piece of bow-tie pasta (the butterfly)
- Glue and a green leaf cut from paper

### **Steps**

1. Draw a cross on the plate to make four parts. Your parent writes 1, 2, 3, 4 in the parts, going around.
2. In part 1 glue the paper leaf and the grain of rice on it. That is the egg on a leaf.
3. In part 2 glue the spiral pasta. That is the caterpillar. Color stripes on it.
4. In part 3 glue the shell pasta hanging from a drawn twig. That is the chrysalis.
5. In part 4 glue the bow-tie pasta. Color the wings. That is the butterfly.
6. Draw arrows from 1 to 2, 2 to 3, 3 to 4, and from 4 back to 1.
7. Put your finger on the egg and tell the whole story around the plate. Say each stage's name out loud.
8. If it is summer, look under milkweed or parsley leaves outside for a real egg or caterpillar. If you find one, watch it on the plant every day.

### **Tips**

- If you do not have these pasta shapes, draw the four stages instead.
- A monarch caterpillar eats only milkweed. A black swallowtail caterpillar eats parsley, dill and carrot leaves. That is where to look.

### **Check your work**

- I can say the four stages in order.
- I can tell what the caterpillar eats and what the butterfly drinks.
- I can tell the story around my plate.

## **NATURE NOTEBOOK**

1. Draw a big butterfly with wings open. Make the left wing and the right wing match. Draw two antennae with little knobs on the end.

2. Draw a leaf with a caterpillar on it and little holes where it has eaten. Your parent writes: The caterpillar eats leaves.
3. Draw a flower with a butterfly on it. Draw the butterfly's long tongue going down into the flower. Your parent writes: The butterfly drinks nectar.

**From history.** Every fall, monarch butterflies from all over the eastern United States and Canada fly south to the mountains of Mexico, where they rest on fir trees by the millions. For a long time no one knew where they went. A Canadian scientist named Fred Urquhart and his helpers glued tiny paper tags on monarch wings for many years to follow them. In 1975 two of his helpers finally found the mountain forest where the monarchs spend the winter.

## WORKED EXAMPLES

**Example 1.** Look at the life-cycle picture. How many stages are there? Which stage comes right after the chrysalis?

*(Use the map or drawing "Follow the arrows with your finger and count." shown earlier in this lesson.)*

1. Put your finger on the egg. Say "1, egg."
2. Move your finger along the arrow. Say "2, caterpillar."
3. Move again. Say "3, chrysalis."
4. Move again. Say "4, butterfly." You counted 4 stages.
5. The arrow after the chrysalis points to the butterfly.

**Answer:** There are 4 stages. The butterfly comes right after the chrysalis.

## PRACTICE

1. **EASY** Point to the egg in the life-cycle picture. Now point to the caterpillar. Now the chrysalis. Now the butterfly.
2. **EASY** What does a caterpillar eat? What does a butterfly drink?
3. **MEDIUM** A butterfly has 4 wings. Two butterflies land on a flower. How many wings in all? Count on your fingers.
4. **MEDIUM** I will draw two heads. One has feelers with little knobs on the end. One has feelers like tiny feathers. Which is the butterfly? Which is the moth?
5. **HARD** Tell the story of a monarch butterfly's life in your own words, from the egg to the flying butterfly.

## COMMON MISTAKES

- Thinking the caterpillar and the butterfly are two different animals. They are the same animal at different stages of its life.

- Calling a chrysalis a cocoon. A moth caterpillar spins a soft silk cocoon. A butterfly caterpillar makes a hard chrysalis from its own skin, with no silk blanket.
- Picking a butterfly up by its wings. The scales rub off and the wings can tear. Let it walk onto your finger instead.

**Make it a game · Egg, Caterpillar, Chrysalis, Butterfly.** Your parent calls out a stage, and you act it out. Egg: curl up small on the floor. Caterpillar: crawl and pretend to chew leaves. Chrysalis: stand very still with your arms wrapped around you. Butterfly: spread your arms and fly around the room. Play faster and faster. Then switch, and you call the stages while your parent acts them out. Try calling them out of order to trick each other.

**Scripture.** “Therefore if any man be in Christ, he is a new creature: old things are passed away; behold, all things are become new.” (2 Corinthians 5:17, KJV)

The caterpillar goes into the chrysalis one way and comes out new. When a person trusts in Jesus, God makes him new too. The butterfly in your garden can remind you of that.

#### Practice answers

1. The child points to the four stages in order: egg, caterpillar, chrysalis, butterfly.
2. A caterpillar eats leaves. A butterfly drinks nectar from flowers.
3. 8 wings. 4 and 4 make 8.
4. The one with knobs on the ends is the butterfly. The one with feathery feelers is the moth.
5. The butterfly lays an egg on a milkweed leaf. A tiny caterpillar hatches and eats leaves and grows, shedding its skin. It hangs upside down and becomes a green chrysalis. Inside it changes. The chrysalis opens, the butterfly comes out, dries its wings and flies away to drink nectar.

## 4.3 LADYBUGS

### OBJECTIVES

- Tell that a ladybug is a beetle with hard wing covers and thin flying wings folded underneath.
- Tell that ladybugs eat aphids and help gardeners.
- Count the spots on a ladybug and read a simple picture chart of bugs.

**Warm-up.** Go outside and look on rose bushes, bean plants or tall weeds for a ladybug. If you find one, let it walk onto your finger. Watch it climb to the tip of your finger. What does it do when it gets there? If there are no ladybugs today, look at a picture of one and count its spots on your fingers.

**Video.** Coming soon. Ladybugs for kids: ladybug opening its wing covers and flying, ladybug eating aphids, ladybug larva and pupa, ladybugs huddling for winter. Try SciShow Kids, Smithsonian, Homeschool Pop (Alternate), National Geographic Kids, and slow-motion nature footage of beetles taking off.

### KEY TERMS

#### beetle

An insect with hard wing covers over its back. A ladybug is a beetle.

#### wing covers

The two hard, shiny halves on a ladybug's back. They open like doors so the thin wings underneath can fly.

#### aphid

A tiny soft green bug that sucks juice from plants. It is a ladybug's favorite food.

#### larva

A baby ladybug. It looks like a tiny black alligator with orange spots.

### CORE IDEAS

**The story.** A ladybug walks up your finger. When it gets to the tip, something surprising happens. Its round red shell splits down the middle and opens up like two little doors. Under the doors are two thin, clear wings, folded up small. The wings unfold, buzz, and the ladybug flies away. The red shell is not wings at all. The red halves are **wing covers**. An insect with hard wing covers is a **beetle**. A ladybug is a beetle. Of all the kinds of animals God made, more are beetles than anything else. Ladybugs are the beetles we love best.

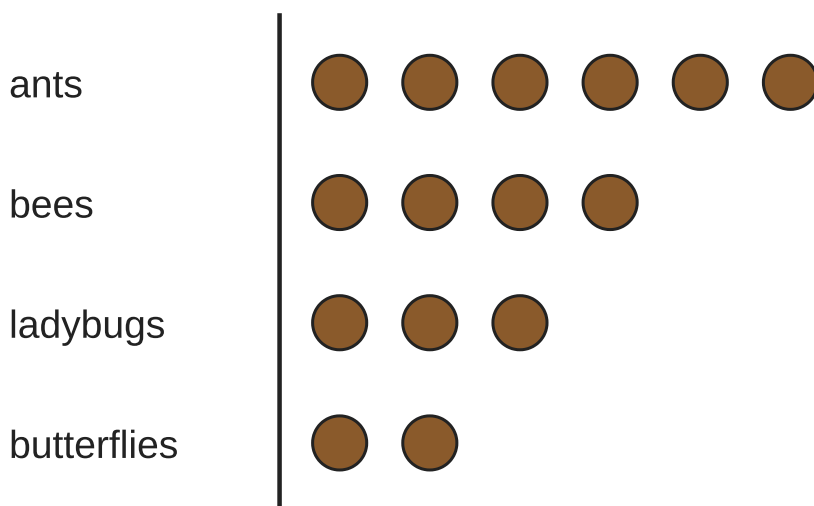
**How they figured it out.** Gardeners figured out long ago that ladybugs are friends. Look under the leaves of a rose or a bean plant. You may find a crowd of tiny soft green bugs called **aphids**. They suck juice out of the plant and make it sick. Now watch a ladybug. It walks right into the crowd and eats aphid after aphid. One ladybug can eat a great many

aphids in a day. People in Europe long ago named the little beetle after “Our Lady,” the mother of Jesus. That is why we say ladybird or ladybug. The ladybug’s baby, called a **larva**, eats aphids too. It looks like a tiny black alligator with orange spots.

**The big idea.** A ladybug’s life goes around in a circle like a butterfly’s. The mother lays little yellow eggs under a leaf, right next to the aphids. The larva hatches and eats. Then it sticks itself to a leaf and goes still, and in a few days a round ladybug crawls out. At first it is pale with no spots. The red and the spots come in a few hours. Why is a ladybug red? Red and black say to a bird, “I taste bad.” And it does. When a ladybug is scared, it squeezes out a smelly yellow drop from its leg joints. Birds spit it out and remember. In the fall, ladybugs crowd together under bark or in a pile of leaves and sleep through the winter.

**God’s handiwork.** Count the spots on a ladybug. Some kinds have two, some have seven, some have many. God made each kind with its own number, and a ladybug keeps the same spots all its life. The Bible says, “O LORD, how manifold are thy works! in wisdom hast thou made them all” (Psalm 104:24). Even a beetle as small as a pea has doors on its back, folded wings, a warning coat and a job to do in the garden.

Bugs we saw on our walk (1 dot = 1 bug)



*Bugs we saw on our walk. Each dot is one bug. Which row has the most?*

## PICTURE STUDY



*Study of Butterflies and Insects*, Jan van Kessel the Elder, about 1655-1660 · Oil on panel · Museum of Fine Arts, Houston (Sarah Campbell Blaffer Foundation)

Jan van Kessel was a painter from Antwerp who loved to paint tiny creatures on small panels and sheets of copper. He arranged butterflies, beetles and other insects on a plain background so you can look at each one by itself, the way a scientist lays out a collection. Every leg and spot is painted with a tiny brush.

### Look closely

- Find all the beetles. Beetles have hard, shiny backs. Count them on your fingers.
- Find the butterflies. How are their wings different from a beetle's back?
- Look for a caterpillar or any insect that crawls instead of flies. What do you think it will turn into?
- Pick the smallest insect in the picture. Pick the biggest. Which one would you like to hold?

### Talk about it

1. Why do you think the painter put the insects on a plain background with nothing else around them?
2. If you could add one bug from your yard to this picture, which one would it be?

**Safety first.** Ladybugs are safe to hold, but a scared one may leave a smelly yellow drop on your hand. It will not hurt you. Do not squeeze the ladybug, and put it back on a plant when you are done. Wash hands afterward.

## **MAKE AND DO: PAPER-PLATE LADYBUG WITH DOORS THAT OPEN**

You will make a ladybug whose wing covers open like doors to show the flying wings underneath. Then you will go on a bug walk and make a picture chart of what you find.

### **You will need**

- Two paper plates
- Red and black paint or crayons
- Scissors (a parent cuts)
- A paper fastener (brad) or a piece of tape
- A sheet of white tissue paper or wax paper
- Glue, your nature notebook and crayons

### **Steps**

1. Paint the bottom of one plate black. That is the ladybug's body. Let it dry.
2. Paint the bottom of the other plate red. Your parent cuts it in half. Those are the two wing covers.
3. Put black spots on the red halves with your finger dipped in black paint. Count the spots as you make them.
4. Cut two thin wing shapes from the tissue paper. Glue them on the black body, near the top.
5. Your parent fastens the two red halves to the top of the black body with the brad, so they can swing open and shut like doors.
6. Draw a little head with two feelers at the top of the black plate.
7. Open the doors. Say: wing covers open, wings come out, ladybug flies! Shut the doors. Say: wing covers shut, ladybug walks.
8. Now go on a bug walk with your notebook. Every time you see an ant, a bee, a ladybug or a butterfly, your parent draws a dot in that bug's row. At home, look at your chart and tell which bug you saw most.

### **Tips**

- If you have no brad, tape the two red halves along the top edge so they flap open.
- Sunny mornings are best for finding ladybugs. Look low, on the undersides of leaves.

### **Check your work**

- I can open my ladybug's wing covers and show the wings underneath.
- I can tell what a ladybug eats.
- I can read my bug chart and tell which bug we saw most.

## NATURE NOTEBOOK

1. Draw a big round ladybug. Draw a line down the middle of its back for the two wing covers. Give it seven spots and six legs.
2. Draw a leaf with tiny green aphids on it and a ladybug coming to eat them. Your parent writes: The ladybug helps the garden.
3. Draw a ladybug larva, the tiny black alligator with orange spots. Next to it draw the grown-up ladybug.

**From history.** In the 1880s the orange trees of California were dying. A tiny white pest called cottony cushion scale covered the branches. In 1888 a scientist named Albert Koebele sailed to Australia, where the pest came from, and brought back a small red and black ladybug called the vedalia beetle. The beetles were let loose in the orchards, ate the scale, and within about two years the orange trees were saved.

## WORKED EXAMPLES

**Example 1.** Look at the bug chart. Each dot is one bug we saw. How many ladybugs did we see? Which bug did we see the most? Did we see more ladybugs or more butterflies?

*(Use the map or drawing “Touch each dot as you count.” shown earlier in this lesson.)*

1. Find the ladybug row. Touch each dot and count: 1, 2, 3. We saw 3 ladybugs.
2. Look at all the rows. The longest row has the most dots. The ant row is longest. Count its dots: 1, 2, 3, 4, 5, 6.
3. Count the butterfly row: 1, 2. That is 2 butterflies.
4. 3 is more than 2, so we saw more ladybugs than butterflies.

**Answer:** We saw 3 ladybugs. We saw ants the most, 6 of them. We saw more ladybugs than butterflies.

## PRACTICE

1. **EASY** On your paper-plate ladybug, point to the wing covers. Now open them and point to the flying wings.
2. **EASY** What does a ladybug eat? Does that help or hurt the garden?
3. **MEDIUM** One ladybug has 7 spots. Another has 2 spots. Which has more spots? How many more?
4. **MEDIUM** Look at the bug chart. How many bees did we see? Count the bees and the butterflies together. How many is that?
5. **HARD** Why is a ladybug bright red with black spots instead of green like a leaf? Tell your parent.

## COMMON MISTAKES

- Thinking the number of spots tells how old a ladybug is. Each kind of ladybug has its own number of spots, and it keeps the same spots all its life.
- Thinking the red shell is the ladybug's wings. The red halves are hard covers. The real wings are thin and folded underneath.
- Thinking a ladybug is a bug like a stink bug. Scientists call it a beetle, because beetles have hard wing covers. We still say ladybug because that is its everyday name.

**Make it a game · Spot Hop.** Draw a big red ladybug on the sidewalk with chalk, or lay a red towel on the floor. Your parent calls out a number of spots, from 1 to 10. You hop that many times and then place that many black paper circles (or stones) on the ladybug. Count them out loud. Then take them off and try a new number. For a harder game, your parent calls "two more" or "one fewer" and you fix the spots.

**Scripture.** "O LORD, how manifold are thy works! in wisdom hast thou made them all: the earth is full of thy riches." (Psalm 104:24, KJV)

Manifold means many and all different. God made so many kinds of creatures, even thousands of kinds of beetles, and He made every one of them wisely.

### Practice answers

1. The red halves are the wing covers. The thin tissue wings underneath are the flying wings.
2. A ladybug eats aphids, the tiny green bugs that suck juice from plants. That helps the garden.
3. The one with 7 spots has more. It has 5 more spots. Count up from 2 to 7: 3, 4, 5, 6, 7.
4. 4 bees. 4 bees and 2 butterflies make 6.
5. Red and black warn birds that the ladybug tastes bad. A bird that tries one spits it out and leaves ladybugs alone after that.

## 4.4 BEES AND HONEY

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### OBJECTIVES

- Tell that honeybees make honey from flower nectar and store it in six-sided wax cells called honeycomb.
- Tell that a hive has one queen and many workers, and that bees carry pollen from flower to flower so fruit can grow.
- Tell the story of Samson and the honey in the lion (Judges 14).

**Warm-up.** Ask your parent for a little honey on a spoon. Smell it. Look at it in the light. Is it thick or thin? Taste it. Where do you think it came from? Then go outside and look at a flower. Can you find a bee at work?

**Video.** Coming soon. Honeybees for kids: inside a beehive, queen and workers, bees gathering nectar and pollen, building honeycomb, the waggle dance, a beekeeper opening a hive. Try SciShow Kids, Smithsonian, Homeschool Pop (Alternate), Moody Science classics, and beekeeper and nature footage of a hive.

### KEY TERMS

#### **honeybee**

A furry striped insect that gathers nectar from flowers and makes honey.

#### **hive**

The home of a bee colony. It can be a hollow tree or a wooden box a beekeeper makes.

#### **nectar**

The sweet juice in a flower. Bees turn nectar into honey.

#### **honeycomb**

The wax that bees build inside the hive. It is made of little six-sided rooms that hold honey and baby bees.

### CORE IDEAS

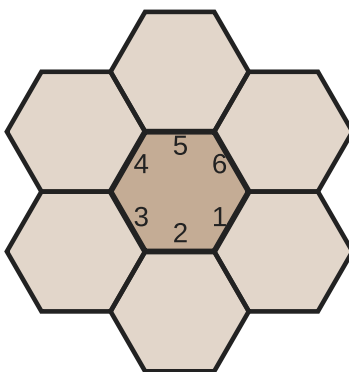
**The story.** Long ago a strong man named Samson was walking to a town called Timnath. A young lion roared at him, and God gave Samson strength to kill it with his hands. Later, when he came back the same way, he turned aside to look at the lion. Inside it was a swarm of bees and honey! Samson scooped the honey out in his hands and ate it as he walked, and he gave some to his father and mother (Judges 14:5–9). Bees like to build in hollow places: a hollow tree, a crack in a rock, or a wooden box a beekeeper gives them. Any of these is a **hive**.

**How they figured it out.** Beekeepers have watched bees for a very long time. Inside the hive the bees build **honeycomb** out of wax. The wax comes out of the worker bee's own body, and she shapes it into little rooms. Every room has six sides, and they fit together with

no gaps at all. A worker **honeybee** flies out to a flower and drinks the sweet **nectar** with her tongue. She carries it home in a special honey stomach and passes it to a sister bee. The sisters fan it with their wings until it gets thick. Now it is honey. They put it in the rooms and seal each room with a wax lid. The bee also brushes yellow pollen from the flower into little baskets on her back legs, like yellow pants. Pollen is food for the baby bees.

**The big idea.** A hive is a family. There is one queen, and she lays all the eggs. There are thousands of worker bees, all sisters, who do every other job. A few bigger bees, the drones, are the brothers. When a worker finds a field of flowers, she comes home and dances in a circle or a wiggle, and the dance tells her sisters which way to fly. When a bee goes from flower to flower, pollen sticks to her fur and rubs off on the next flower. That is how apple, pumpkin, cherry and almond flowers turn into fruit. No bees, no apples. A worker bee has a stinger, but she only uses it if she thinks the hive is in danger. Leave bees alone and they will leave you alone.

**God's handiwork.** Samson made a riddle about the lion: "Out of the eater came forth meat, and out of the strong came forth sweetness" (Judges 14:14). God made the little bee to build perfect six-sided rooms, to turn flower juice into honey that never spoils, and to help the fruit trees grow. The Bible says God's words are "sweeter also than honey and the honeycomb" (Psalm 19:10). Next time you taste honey, remember who made the bee.



Each room has 6 sides and no gaps.

*Honeycomb. Each room has six sides, and the rooms fit together with no gaps.*

## PICTURE STUDY



*The Beekeepers*, Pieter Bruegel the Elder, about 1568 · Pen and brown ink on paper · Kupferstichkabinett, Staatliche Museen zu Berlin

Pieter Bruegel was a painter from the Netherlands who loved to draw ordinary people at work. Here he drew beekeepers. Their faces are hidden by woven masks so the bees cannot sting them, and they carry round hives made of straw, called skeps. In the back a boy is climbing a tree, maybe to reach a nest.

### Look closely

- Find the three beekeepers. What is on their faces? Why?
- Find the round straw hives. Count them on your fingers.
- Find the boy in the tree. What do you think he is after?
- Look at the beekeepers' hands. Are they wearing gloves?

### Talk about it

1. Why does a beekeeper cover his face but still go close to the bees?
2. What do you think the beekeepers will do with the honey?

**Safety first.** Never poke at a bee nest or hive, and never swat at a bee. If a bee comes near, stand still or walk away slowly. A parent should decide about bee watching if anyone in the family is allergic to stings. Never give honey to a baby under one year old. Wash sticky hands when you are done.

## **MAKE AND DO: BUILD A HONEYCOMB**

You will find out why bees build six-sided rooms instead of round ones. Then you will taste honey like Samson.

### **You will need**

- A sheet of paper and a pencil
- A six-sided shape to trace (a parent can cut one from cardboard, or use a hexagon block or a nut from the toolbox)
- A round shape to trace, such as a coin or a bottle cap
- Yellow crayon
- Honey, a spoon, and a piece of bread or a cracker
- A piece of real honeycomb from a farm stand or store, if you can find one

### **Steps**

1. Trace the round shape on the paper. Trace it again right next to the first one, touching. Keep going until you have a bunch of circles. Look between them. Do you see empty gaps?
2. Now trace the six-sided shape. Trace it again so one side touches the first one. Keep going all the way around. Look between them. Are there any gaps?
3. Color your six-sided rooms yellow. You built honeycomb like a bee.
4. Count the sides of one room on your fingers: 1, 2, 3, 4, 5, 6.
5. If you have real honeycomb, look at it closely. Count the sides of one room. Press one room gently with your finger. Is it waxy?
6. Put a little honey on bread or a cracker and eat it. Say Samson's riddle: "Out of the strong came forth sweetness."
7. Draw a bee in your notebook flying from a flower to the hive. Draw yellow pollen on her back legs.

### **Tips**

- Six-sided rooms fit tight with no wasted wax, and that is why bees build them. Round rooms would leave gaps.
- A farmers' market or a local beekeeper is the best place to see real comb. Many beekeepers love to show children a frame of bees from a safe distance.

### **Check your work**

- I can show that six-sided rooms fit together with no gaps.
- I can tell what bees make honey from.
- I can tell what Samson found in the lion.

## NATURE NOTEBOOK

1. Draw a honeybee with a striped back part, four wings and six legs. Color yellow pollen baskets on its back legs.
2. Draw a flower, then an arrow, then a hive, then an arrow, then a jar of honey. Your parent writes: nectar becomes honey.
3. Draw Samson finding honey in the lion. Draw the bees flying around.

**From history.** Until the 1800s most beekeepers kept bees in straw skeps like the ones in Bruegel's drawing, and to get the honey they often had to break the comb apart. In 1851 Lorenzo Langstroth, a pastor in Philadelphia, noticed that bees always leave a small walking space between their combs. He built a hive box with wooden frames hung that same small space apart, so each frame of comb could be lifted out and put back without hurting the bees. Almost every beehive box you see today is a Langstroth hive.

## WORKED EXAMPLES

**Example 1.** Look at the honeycomb picture. How many sides does one room have? A square has 4 sides. Which has more sides, a honeycomb room or a square? How many more?

*(Use the map or drawing "Trace the numbered sides with your finger." shown earlier in this lesson.)*

1. Put your finger on side 1 of the middle room. Trace around and count: 1, 2, 3, 4, 5, 6.
2. A honeycomb room has 6 sides.
3. A square has 4 sides. 6 is more than 4.
4. Count up from 4 to 6: 5, 6. That is 2 more sides.

**Answer:** A honeycomb room has 6 sides. It has 2 more sides than a square.

## PRACTICE

1. **EASY** What do bees make honey from? Where do they get it?
2. **EASY** Who lays the eggs in a hive? Who gathers the nectar?
3. **MEDIUM** A bee visits 5 flowers. Then she visits 4 more. How many flowers did she visit? Count on your fingers.
4. **MEDIUM** Point to the shape of a honeycomb room: a circle, a square or a six-sided shape. Why do bees use that shape?
5. **HARD** Tell your parent why an apple farmer wants bees in his orchard.

## COMMON MISTAKES

- Thinking bees are only out to sting. A worker bee stings only to protect the hive, and she dies after she stings, so she does not want to. Most bees you see are busy

gathering nectar and will not bother you.

- Thinking honey is made from pollen. Honey is made from nectar. Pollen is the yellow dust that feeds baby bees and makes fruit grow.
- Thinking every striped buzzing insect is a honeybee. Yellow jackets and wasps are not bees and do not make honey. Honeybees are fuzzy and golden brown.

**Make it a game • The Waggle Dance.** Hide a paper flower (or a cup with a drop of honey) somewhere in the house while your parent waits in the “hive,” which is the kitchen. Come back and, without talking, do a bee dance: wiggle your body and point the way with your whole self, then walk in a circle and do it again. Your parent follows your dance to find the flower. Then switch. Buzz the whole time you fly.

**Scripture.** “And after a time he returned to take her, and he turned aside to see the carcase of the lion: and, behold, there was a swarm of bees and honey in the carcase of the lion.” (Judges 14:8, KJV)

Samson found sweet honey in the strong lion he had killed. God can bring something sweet and good out of a hard thing. And He made the bees that were busy in there the whole time.

#### Practice answers

1. From nectar, the sweet juice they drink from flowers.
2. The queen lays the eggs. The worker bees gather the nectar.
3. 9 flowers. 5 and 4 make 9.
4. The six-sided shape. Six-sided rooms fit together with no gaps, so no wax is wasted.
5. Bees carry pollen from flower to flower on their fur. The apple flowers need the pollen to turn into apples. Without bees there would be few apples.

## UNIT 4 REVIEW

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Ask these questions aloud. Let the child answer by talking, pointing, drawing or acting it out. No reading or writing is needed. There are 8 questions worth 20 points in all. Give full points for an answer in the child's own words that has the main idea.

1. (2 pts) How many legs does an insect have? How many body parts? Point to them on your ant drawing.
2. (3 pts) Who lays the eggs in an ant colony? What do the worker ants do? What does the Bible tell us to learn from the ant?
3. (3 pts) Say the four stages of a butterfly's life in order. Act each one out.
4. (2 pts) What does a caterpillar eat? What does a butterfly drink?
5. (2 pts) What are the red halves on a ladybug's back? Where are its flying wings?
6. (3 pts) What does a ladybug eat, and why does a gardener like that? Then look at your bug chart from the walk and tell me which bug we saw most.
7. (3 pts) What do bees make honey from? What shape are the rooms in a honeycomb? How many sides does one room have?
8. (2 pts) What did Samson find inside the lion? Why does an apple farmer want bees in his orchard?

### UNIT PROJECT: MY BUG BOOK

Make a four-page bug book to show what you learned. Page one: a big ant with its three parts, six legs and two feelers, and a drawing of the Ant Café with the winning food circled. Page two: your pasta life-cycle plate, or a drawing of it, with arrows from egg to caterpillar to chrysalis to butterfly. Page three: your paper-plate ladybug glued in or drawn with its doors open, and your bug chart from the walk. Page four: your traced honeycomb colored yellow, a bee with pollen on her legs, and the words "Out of the strong came forth sweetness."

Then tell the book to a parent or grandparent page by page, like a storyteller.

- **Ants:** The ant page shows three body parts, six legs and two feelers, and the child can tell what the queen and the workers do and what Proverbs says about the ant.
- **Butterflies:** The life-cycle page shows the four stages in the right order and the child can say them and tell what the caterpillar eats and the butterfly drinks.
- **Ladybugs and Bees:** The ladybug page shows wing covers with wings underneath and a readable bug chart; the honeycomb page shows six-sided rooms with no gaps, and the child can tell what bees make honey from.
- **Telling:** The child tells the book aloud in order, in complete thoughts, and can retell the story of Samson and the honey.

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#### Answer key

1. Six legs and three body parts: head, middle part and back part.

2. The queen lays the eggs. The workers dig, carry food, feed the babies and guard the nest. The ant works hard and gathers food in summer with no boss telling her to, so we should not be lazy.
3. Egg, caterpillar, chrysalis, butterfly.
4. A caterpillar eats leaves. A butterfly drinks nectar from flowers.
5. They are hard wing covers. The thin flying wings are folded underneath them.
6. A ladybug eats aphids, the tiny green bugs that hurt plants, so it helps the garden. The child reads the chart and names the row with the most dots.
7. Nectar from flowers. Six-sided rooms. Each room has six sides.
8. A swarm of bees and honey. Bees carry pollen from flower to flower so the flowers can turn into apples.

## SEEDS AND PLANTS

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On the third day of creation God said, “Let the earth bring forth grass, the herb yielding seed, and the fruit tree yielding fruit after his kind, whose seed is in itself” (Genesis 1:11). In this unit your child will hold a seed, open it, and find the baby plant God tucked inside. Then the seed goes into a jar and the whole family watches the root go down and the shoot go up.

Every lesson is something to do with your hands: soak and open a bean, grow a bean against the glass, run a light-and-dark test with two cups, and grow a dish of mustard seeds that sprout in just a few days. Along the way your child will measure with a ruler, count leaves, and color a growing chart, the first steps of being a real scientist.

The unit ends with the parable of the mustard seed (Matthew 13:31–32). The smallest seed a farmer plants grows into a plant taller than a man. Your child will have grown that very seed and will understand, with hands and eyes, what Jesus meant.

### BEFORE YOU BEGIN

- Can count objects aloud up to ten
- Can hold a crayon and draw simple shapes
- Can point to a few plants in the yard or in a window
- Has a parent to read aloud, handle small seeds, and help with the ruler

### MASTERY CHECKLIST

- I can open a soaked bean and point to the seed coat, the food store and the baby plant.
- I can tell which way roots grow and which way shoots grow, and name two jobs of roots.
- I can say that leaves use sunlight to make food, and tell a plant grown in the light from one grown in the dark.
- I can grow a seed, measure it with a ruler, and color a bar on a growing chart.
- I can tell the story of the mustard seed and say what Jesus taught with it.

### OPTIONAL BOOKS AND RESOURCES

- ***The Tale of Peter Rabbit* by Beatrix Potter (free at Project Gutenberg)** (<https://www.gutenberg.org/>): Free. Search Project Gutenberg for the title. Read it aloud and find every plant in Mr. McGregor’s garden: lettuces, French beans, radishes, parsley, cabbages. Which ones are roots, which are leaves, which are seeds in pods?
- **USDA PLANTS Database** (<https://plants.usda.gov/>): Free. A parent can look up a plant from the yard (dandelion, plantain, clover, mustard) and show the child photos of its flowers, leaves and seeds.

## 5.1 WHAT'S INSIDE A SEED ★

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### OBJECTIVES

- Open a soaked bean and point to its three parts: seed coat, food store and baby plant.
- Tell that a seed is alive and waiting, and that it grows into its own kind of plant.
- Sort seeds from things that are not seeds.

**Warm-up.** Go to the kitchen with a parent. Put a dry bean, a grain of rice, a popcorn kernel, a button and a small pebble on the table. Pick up each one. Which ones could grow into a plant? Which ones never will? Put the seeds in one pile and the not-seeds in another.

**Video.** Coming soon. Inside a bean seed, seed parts and germination for young children: search SciShow Kids, Homeschool Pop (Alternate), Smithsonian, or time-lapse nature footage of a bean seed sprouting.

### KEY TERMS

#### **seed coat**

The thin skin on the outside of a seed. It keeps the seed safe and dry while it waits.

#### **food store**

The two fat halves inside a bean. They are the packed lunch for the baby plant.

#### **baby plant**

The tiny plant tucked inside every seed, with a little root and two folded leaves.

#### **sprout**

What a seed does when it wakes up and starts to grow.

### CORE IDEAS

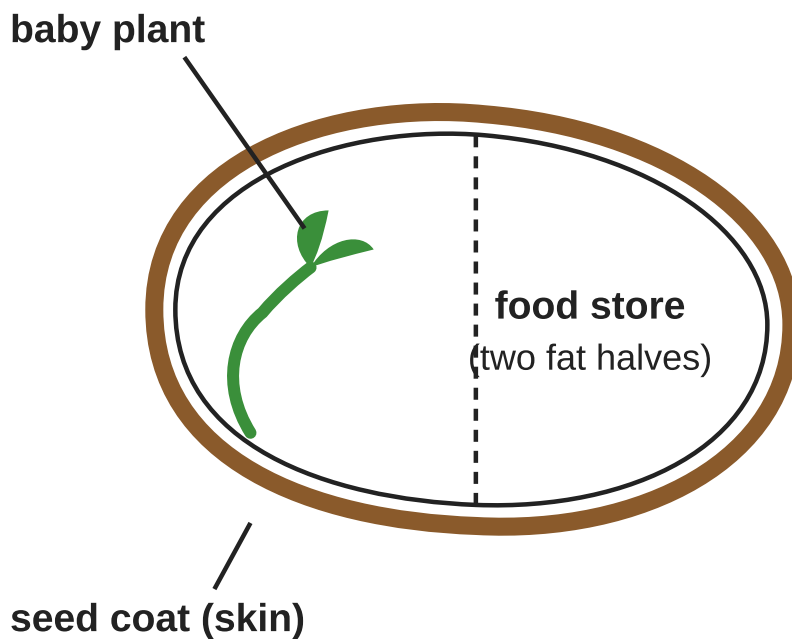
**The story.** Hold a dry bean in your hand. It is hard and smooth. It looks like a little stone. But it is not a stone. It is alive, and it is waiting. Look around the kitchen. The rice is seeds. The popcorn is seeds. The beans in the bag are seeds. Cut an apple across the middle and you will find seeds sitting in a little star. Every one of these is a tiny package. Inside the package is a baby plant and the lunch it will need.

**How they figured it out.** How do we know what is inside? We open one and look. Soak a big bean in water overnight. In the morning it is fat and soft. The thin skin slips right off. That skin is the **seed coat**. It keeps the seed safe and dry while it waits. Now the bean splits into two fat halves. That is the **food store**, the packed lunch for the baby plant. Look at the edge where the two halves join. There is a tiny white plant lying in a bed, with a little root and two folded leaves. That is the **baby plant**. Long ago a doctor in England named Nehemiah Grew looked at seeds with one of the first microscopes. In 1682 he drew what he

saw in a big book called *The Anatomy of Plants*, so everyone could see the baby plant hiding inside.

**The big idea.** Every seed has three parts: a seed coat, a food store and a baby plant. Seeds come in many sizes. A poppy seed is as small as a dot. A coconut is a seed as big as your head. But big or small, each seed grows into its own kind of plant. A bean seed makes a bean plant. It never makes a pumpkin. A seed waits until it gets water and warmth. Then it wakes up and begins to grow. We say it **sprouts**.

**God's handiwork.** On the third day of creation God said, "Let the earth bring forth grass, the herb yielding seed, and the fruit tree yielding fruit after his kind, whose seed is in itself" (Genesis 1:11). God put the seed inside the fruit. He put the baby plant inside the seed. He even packed its lunch. A seed is a little promise that more plants are coming.



*Inside a bean seed: the seed coat, the food store and the baby plant.*

## PICTURE STUDY



*The Sower*, Jean-François Millet, 1850 · Oil on canvas · Museum of Fine Arts, Boston

Jean-François Millet grew up on a farm in France and loved to paint the people who worked the land. Here a farmer walks down a hill at the end of the day. He has a bag of seed on his hip, and with each step he throws a handful across the fresh dirt.

Look at how big his step is and how wide his arm swings. He is not being careful with each seed. He is trusting that the seeds will do their own work in the ground.

### Look closely

- Find the farmer's right hand. What is he throwing? Where will it land?
- Find the bag on his hip. What do you think is inside it?
- Look at the sky. Is it morning or evening? How can you tell?
- Find the birds behind him. Why might birds follow a man who is sowing seed?

### Talk about it

1. The farmer cannot see a baby plant inside each seed, but he throws it anyway. What does he believe will happen?
2. If you had a bag of seeds, where would you plant them?
3. What three things are inside each seed the farmer throws?

**Safety first.** Dry beans and small seeds are a choking hazard for little children. A parent handles the seeds and keeps them away from mouths. Raw beans are not for eating. Wash hands when you are done.

## **MAKE AND DO: OPEN A SEED**

You will soak big beans overnight, open them up and find the baby plant hiding inside. Then you will draw what you found like a real scientist.

### **You will need**

- 6 large dried beans (lima beans or kidney beans work best)
- A cup of water
- A paper towel
- A magnifying glass (if you have one)
- Paper and crayons
- A small cup of soil for planting two beans at the end

### **Steps**

1. Put 4 beans in the cup of water. Keep 2 beans dry. Leave them overnight.
2. In the morning, put a soaked bean next to a dry bean. Which is bigger? Which is softer? Feel them both.
3. Rub the soaked bean with your thumb. The thin skin slips off. Say its name: seed coat.
4. Gently pull the bean into its two fat halves. Say its name: food store.
5. Look at the inside edge of one half. Find the tiny white plant with a little root and two folded leaves. Say its name: baby plant. Use the magnifying glass if you have one.
6. Draw the open bean on your paper. Have your parent write the three names next to the parts you point to.
7. Plant the last 2 soaked beans in the cup of soil, about as deep as your fingernail. Put the cup in a sunny window and keep the soil damp. You will watch them in the next lesson.

### **Tips**

- If the baby plant is hard to see, soak a fresh bean a little longer and try again. Lima beans show the baby plant most clearly.
- Keep the dry bean next to the soaked one all through the project so you can compare.

### **Check your work**

- I can point to the seed coat, the food store and the baby plant.
- I can tell which bean is bigger, the dry one or the soaked one.
- I drew my open bean and had the parts labeled.

## **NATURE NOTEBOOK**

1. Draw a big bean cut open. Color the seed coat brown, the food store white and the baby plant green.

2. Glue five different kinds of seeds from the kitchen onto a page (rice, bean, popcorn, sunflower, apple seed). Have your parent write each name.
3. Draw a dry bean and a soaked bean side by side. Circle the bigger one.

**From history.** In 2008, on a cold island in the far north of Norway, people opened the Svalbard Global Seed Vault. It is a long tunnel dug into a frozen mountain. Inside, in boxes on shelves, are seeds from farms all over the world, kept safe and cold so they will still sprout many years from now. It is a seed bank, and the seeds are the savings.

## WORKED EXAMPLES

**Example 1.** Open two pea pods from the store. The first pod has 7 peas inside. The second pod has 5 peas. Which pod has more peas? How many more?

1. Count the peas from the first pod: 1, 2, 3, 4, 5, 6, 7. That is 7 peas.
2. Count the peas from the second pod: 1, 2, 3, 4, 5. That is 5 peas.
3. Line the peas up in two rows, one row under the other. The first row sticks out by 2 peas.
4. 7 is more than 5, and 7 is 2 more than 5.

**Answer:** The first pod has more peas. It has 2 more than the second pod. Each pea is a seed with a baby plant inside.

## PRACTICE

1. **EASY** Point to the three parts of your open bean and say their names.
2. **EASY** Your parent puts these on the table: a bean, a pebble, a popcorn kernel, a button, an apple seed. Which ones are seeds? Put them in a pile.
3. **MEDIUM** Have your parent cut an apple across the middle. Count the seeds in the star. How many did you find?
4. **MEDIUM** Which is bigger: a sunflower seed or a poppy seed? Which is bigger: a bean or a grain of rice?
5. **HARD** Tell your parent in your own words: What does a dry seed need before it will wake up and sprout? What is it waiting for?

## COMMON MISTAKES

- Thinking a dry seed is dead because it does not move. A seed is alive and resting. It will wake up with water and warmth.
- Thinking the two fat halves are the baby plant. The halves are the food store. The baby plant is the tiny white plant at the edge.
- Thinking a seed can grow into any plant. Each seed grows only into its own kind: a bean seed grows a bean plant.

**Make it a game • Seed Detective.** Your parent puts ten small things in a bowl: some seeds (beans, rice, popcorn, sunflower seeds, apple seeds) and some not-seeds (buttons, pebbles, beads, a paper clip). Close your eyes while the bowl is mixed. Then sort as fast as you can into a seed pile and a not-seed pile. Get a point for each one in the right pile. Then tell your parent one thing that is inside every seed.

**Scripture.** “And God said, Let the earth bring forth grass, the herb yielding seed, and the fruit tree yielding fruit after his kind, whose seed is in itself, upon the earth: and it was so.” (Genesis 1:11, KJV)

God put the seed inside the fruit and the baby plant inside the seed. Each kind of seed grows its own kind of plant, just as God said.

#### Practice answers

1. The child points to the thin skin (seed coat), the two fat halves (food store) and the tiny white plant at the edge (baby plant).
2. The bean, the popcorn kernel and the apple seed are seeds. The pebble and the button are not.
3. Answers vary. Most apples have between 5 and 10 seeds. The child counts them aloud and the parent checks.
4. The sunflower seed is bigger than the poppy seed. The bean is bigger than the grain of rice.
5. A seed needs water and warmth. It waits until it is wet and warm, then it wakes up and sprouts. Example: The bean waited in the bag until we soaked it.

## 5.2 ROOTS AND SHOOTS ★

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### OBJECTIVES

- Tell that roots grow down and shoots grow up, and point to each on a real sprouting bean.
- Name two jobs of roots: holding the plant in the ground and drinking water.
- Watch a bean sprout day by day and measure its root with a ruler.

**Warm-up.** Go outside with a parent and find a weed in a crack or at the edge of the yard. Hold it near the bottom and pull gently. Feel how it holds on. Now pull it all the way out. Look at the stringy part that was under the ground. Those are the roots. Brush off the dirt and look at how many there are.

**Video.** Coming soon. Bean seed germination time-lapse, roots growing down and shoots growing up, for young children: search SciShow Kids, Homeschool Pop (Alternate), Smithsonian, or nature time-lapse footage of seedlings.

### KEY TERMS

#### **root**

The part of a plant that grows down into the ground. It holds the plant tight and drinks water.

#### **shoot**

The part of a plant that grows up toward the light. It becomes the stem and the leaves.

#### **stem**

The plant's stalk. It holds the leaves up and carries water from the roots to the leaves.

#### **seedling**

A baby plant that has just sprouted from its seed.

### CORE IDEAS

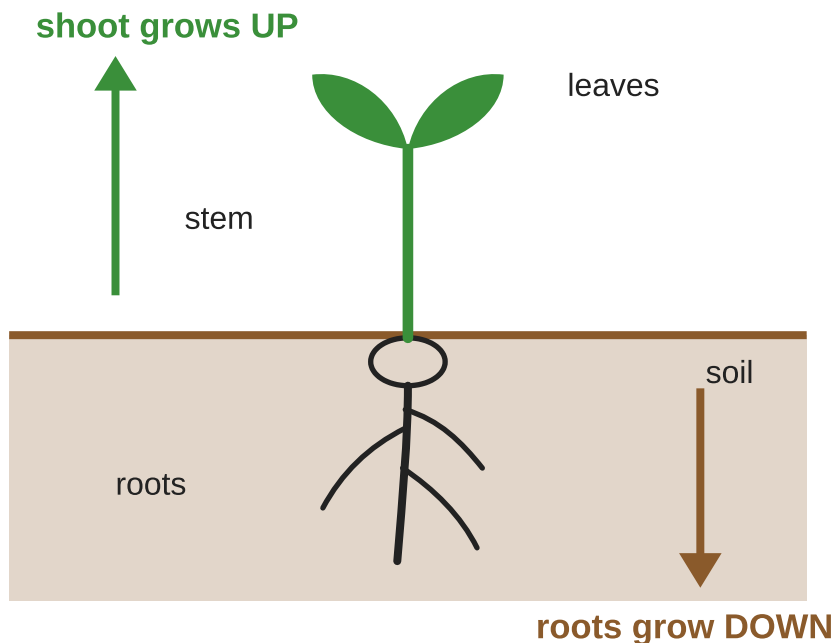
**The story.** On Monday you tuck a soaked bean into a wet paper towel inside a clear jar. On Tuesday nothing seems to happen. On Wednesday the seed coat cracks, and a little white root pokes out. It bends and points down. On Thursday the root is longer and has tiny hairs. On Friday a pale green hook pushes up the other way. It is the shoot. It straightens and two little leaves open like hands. Now your bean is a **seedling**. It did all of this on its own, with only water and warmth.

**How they figured it out.** Why does the root always go down and the shoot always go up? What if you turn the jar on its side? Try it. In a day or two the root bends and points down again. The shoot bends and points up again. The plant can feel which way is down. A farmer and scientist in England named Thomas Andrew Knight wanted to know more. In 1806 he tied bean seeds to a wheel that a little stream kept spinning round and round. The spinning

gave a strong pull outward, like the pull you feel on a merry-go-round. The roots grew out toward that pull, and the shoots grew in, away from it. The roots were following a pull. In the ground, the pull they follow is the pull of the earth, the same pull that makes a ball fall down.

**The big idea.** A plant has two main parts. The **roots** grow down. They have two jobs. They hold the plant tight in the ground, so the wind cannot blow it over. And they drink water from the soil, like a straw. The **shoot** grows up toward the light. It becomes the **stem** and the leaves. The stem carries the water up from the roots to the leaves. Pull a carrot and you are holding a root. Snap a stalk of celery and you are holding a stem. Jesus said a plant comes “first the blade, then the ear, after that the full corn in the ear” (Mark 4:28). First the small shoot, then the big plant.

**Try it and see.** Put a stalk of celery in a glass of water with red food coloring. Leave it overnight. In the morning the leaves have red lines. Cut the stalk across and you can see red dots. Those are the little tubes that carry water up the stem. The roots drink, the stem carries, the leaves use. God made every part with its job.



*Roots grow down into the soil. The shoot grows up toward the light.*

## PICTURE STUDY



*The Large Piece of Turf*, Albrecht Dürer, 1503 · Watercolor and gouache on paper · Albertina, Vienna

Albrecht Dürer lived in Nuremberg, Germany. He was one of the greatest artists who ever lived, and he loved to look closely at small things. One day he dug up a clump of grass and weeds from a meadow and painted it just as it was, as if you were a beetle lying in the grass looking up.

He did not make the plants prettier than they were. He painted every blade and leaf, and he even painted the roots and the dirt at the bottom. It is a picture of the most ordinary thing in the world, painted with great love.

### Look closely

- Look at the very bottom of the picture. Can you find the roots and the dark soil? Which way do the roots go?
- Find the tallest grass stems. Which way do they go? Trace one with your finger from the ground to its tip.
- Find the wide, flat leaves of the dandelion near the bottom. Can you find a plant with round leaves on long stalks?
- Count how many different kinds of plants you can find in the clump.

### Talk about it

1. Why do you think Dürer painted the roots and dirt, instead of just the pretty green tops?
2. What two jobs are the roots in this picture doing for the plants above them?
3. If you dug up a clump of grass from your yard, what would you find at the bottom?

## **MAKE AND DO: BEAN IN A JAR**

You will grow a bean against the glass of a jar so you can watch the root go down and the shoot go up. You will check it every day, draw it, and measure the root with a ruler.

### **You will need**

- A clear glass jar or clear plastic cup
- Paper towels
- Water
- 3 large dried beans, soaked overnight
- A ruler
- Paper and crayons for a daily drawing

### **Steps**

1. Fold a paper towel and wet it. Press it around the inside of the jar so it hugs the glass. Stuff a loose wad of damp paper towel in the middle to hold it there.
2. Tuck 3 soaked beans between the paper towel and the glass, about halfway down, where you can see them.
3. Put the jar in a warm spot with some light. Add a little water each day so the towel stays damp but not soaking.
4. Every day, look at the beans. Which comes out first, the root or the shoot? Which way does each one point?
5. Each day, draw your bean on a new piece of paper. Have your parent write the day number.
6. When the root is long enough, hold the ruler against the glass and measure it. Have your parent write the number on your drawing.
7. After the root is as long as your finger, lay the jar on its side for two days. Watch what the root and the shoot do.
8. When the seedling has two open leaves, plant it in a cup of soil and put it in a sunny window. You will need it for the next lesson.

### **Tips**

- If the beans get moldy, the towel was too wet. Start again with a damp towel, not a dripping one.
- Three beans are better than one, because not every seed sprouts.

### **Check your work**

- I can point to the root and the shoot on my bean.
- I can tell which way the root grew and which way the shoot grew.
- I measured my root with a ruler and drew it.

## NATURE NOTEBOOK

1. Draw your bean jar every day for five days in a row of little boxes. Show the root getting longer and the shoot coming up.
2. Draw a plant with a line for the ground. Color the roots brown under the line and the shoot green above the line. Draw an arrow down for the roots and an arrow up for the shoot.
3. Draw a carrot and a stalk of celery. Have your parent write root under one and stem under the other.

**From history.** Charles Darwin and his son Francis spent years watching seedlings bend and turn. In 1880 they wrote a book called *The Power of Movement in Plants*. They found that the very tip of a root is the part that feels which way is down. If the tip was cut off, the root lost its way. They said the root tip acts a little like the brain of a lowly animal, taking in what it senses and steering the growing root.

## WORKED EXAMPLES

**Example 1.** On Day 3 your bean's root was 2 centimeters long on the ruler. On Day 5 it was 6 centimeters long. How much did the root grow in those two days?

1. Find 2 on the ruler. That is where the root ended on Day 3.
2. Find 6 on the ruler. That is where the root ended on Day 5.
3. Count the spaces from 2 up to 6: 3, 4, 5, 6. That is 4 spaces.
4. The root grew 4 centimeters.

**Answer:** The root grew 4 centimeters. It grew longer, and it grew down.

## PRACTICE

1. **EASY** Point to the root on your bean. Point to the shoot. Which one grew first?
2. **EASY** Your parent holds up a picture of a plant upside down. Point to which way the roots should really grow. Point to which way the shoot should really grow.
3. **MEDIUM** Name two jobs that roots do for a plant.
4. **MEDIUM** Your parent sets out a carrot, a stalk of celery, a lettuce leaf and a potato. Which one is a root? Which one is a stem?
5. **HARD** Tell your parent what happened when you laid the jar on its side. What did the root do? What did the shoot do? Why?

## COMMON MISTAKES

- Thinking the root grows down because it is heavy. The root grows down because the plant can feel the pull of the earth and steers toward it, even when it is tiny and light.

- Thinking roots eat dirt. Roots drink water from the soil. The plant makes its own food in its leaves.
- Thinking a seed must be planted the right way up. The seed can lie any way. The root will find its way down and the shoot will find its way up.

**Make it a game · Root or Shoot.** Stand up tall. When your parent calls out “Root!” crouch down low and wiggle your fingers at the floor. When your parent calls out “Shoot!” stretch up tall and open your hands like two leaves. When your parent calls “Stem!” stand straight and stiff with your arms at your sides. Go faster and faster. Then switch and you call the words while your parent does the moves.

**Scripture.** “For the earth bringeth forth fruit of herself; first the blade, then the ear, after that the full corn in the ear.” (Mark 4:28, KJV)

Jesus watched plants grow just as you are doing. First the little shoot comes up, then the plant, then the grain. The farmer does not make it grow. God does, step by step.

#### Practice answers

1. The child points to the white root below the seed and the green shoot above it. The root came out first.
2. The child points down for roots and up for the shoot.
3. Roots hold the plant tight in the ground, and roots drink water from the soil.
4. The carrot is a root. The celery stalk is a stem. The lettuce is a leaf. The potato is a swollen underground stem, so a parent may simply say it grows under the ground like a root.
5. The root bent and turned to point down again. The shoot bent and turned to point up again. The plant can feel which way is down, so the root follows the pull of the earth and the shoot grows away from it toward the light.

## 5.3 LEAVES NEED LIGHT

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### OBJECTIVES

- Tell that leaves use sunlight to make food for the plant.
- Compare a plant grown in the light with a plant grown in the dark and tell which is healthy.
- Show how a plant leans and turns its leaves toward the light.

**Warm-up.** Find a houseplant or your bean seedling sitting in a window. Look at the leaves. Which way do they face? Are they facing into the room, or out toward the window? Turn the pot halfway around so the leaves face the room. Leave it there. In a few days, look again and see what the leaves have done.

**Video.** Coming soon. Why plants need sunlight, leaves make food, plants growing toward light, for young children: search SciShow Kids, Homeschool Pop (Alternate), Science Max, Smithsonian, or time-lapse footage of seedlings bending toward a window.

### KEY TERMS

#### leaf

The flat green part of a plant. Leaves catch sunlight and make the plant's food.

#### sunlight

The light that comes from the sun. Leaves need it to make food.

#### green

The color of a healthy leaf. The green stuff inside the leaf is what catches the light.

#### pale

Whitish or yellowish, not a strong color. A plant kept in the dark turns pale.

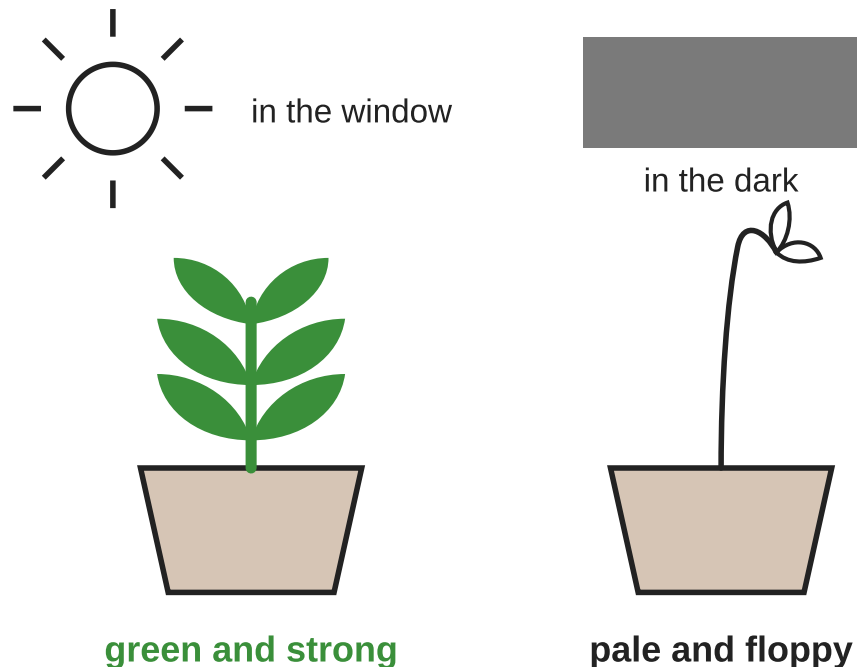
### CORE IDEAS

**The story.** Lift a flowerpot or a board that has been sitting on the lawn for a week. The grass under it is yellow and flat. The grass all around it is green and strong. What happened? The grass under the board had water. It had dirt. It had air. But it had no light. Now look at a tree. Every leaf is spread out flat, and the leaves do not all pile up in one spot. They are spread out like hands held up to the sun. The plant is reaching for light.

**How they figured it out.** A doctor from Holland named Jan Ingenhousz loved to try things. In 1779 he put green leaves in a jar of water and set it in the sunshine. Soon tiny bubbles came out of the leaves, like the bubbles in a glass of soda. He moved the jar into the shade. The bubbles stopped. He put it back in the sun. The bubbles came back. Only the green parts made bubbles, and only in the light. The bubbles were fresh air, the kind of air we breathe. The leaves were busy working, and they could only work in the light.

**The big idea.** A leaf is the plant's kitchen. It takes three things: sunlight, air and water from the roots. It mixes them and makes sugar, which is food for the whole plant. It also lets out fresh air for us to breathe. That is why leaves are flat and wide: to catch as much light as they can. That is why leaves are green: the green stuff inside them is what catches the light. No light means no food. A plant kept in the dark uses up its stored food, turns **pale**, gets thin and floppy, and at last it dies. Put it back in the light before it is too late, and it turns green again.

**God's handiwork.** You cannot make food out of sunshine. No animal can. Only green plants can. And every animal, from the cow to the sparrow to you, eats plants or eats something that ate plants. So every meal you have ever eaten started in a leaf in the sun. God made the light on the first day and the plants on the third day, and He made them to work together. The Bible says a man who loves God's word is like a tree by the water, and "his leaf also shall not wither" (Psalm 1:3).



*Same seeds, same soil, same water. The only difference is light.*

## PICTURE STUDY



*Sunflowers*, Vincent van Gogh, 1888 · Oil on canvas · National Gallery, London

Vincent van Gogh painted these sunflowers in the south of France in August of 1888. He wanted bright, cheerful pictures to hang in the room of a painter friend who was coming to visit. He painted fast, while the flowers were fresh, and he used thick paint so you can almost feel the petals.

Sunflowers love light more than almost any plant. In the field, young sunflowers turn their faces to follow the sun across the sky. Van Gogh loved yellow, the color of sunshine, and here he painted yellow flowers on a yellow table against a yellow wall.

### Look closely

- Find a sunflower that is wide open and fresh. Now find one that has lost its petals and shows its round seed head.
- Find the green leaves. Are they flat and wide, or thin and curly? Where are they on the stems?
- Count how many sunflowers you can find in the jug.
- Look at the big round centers. What is packed inside a sunflower's center? (Seeds!)

### Talk about it

1. Sunflowers in a field turn to face the sun. Why do you think a plant would do that?
2. These flowers are cut and in a jug. Do they have roots any more? What will happen to them?
3. What color are healthy leaves? What color would they be if the plant sat in a dark closet?

## **MAKE AND DO: THE LIGHT AND DARK TEST**

You will grow two little plants exactly the same way, except one gets light and one gets none. Then you will compare them and see what light does.

### **You will need**

- 2 small cups or pots with soil
- Grass seed, bean seeds or the seedlings from the last lesson (2 that look about the same)
- Water
- A sunny window
- A dark cupboard or closet
- Paper and crayons, and a ruler

### **Steps**

1. Plant the same seeds in both cups, or put one seedling in each. Give each cup the same little drink of water.
2. Put one cup in the sunny window. Put the other cup in the dark cupboard and shut the door.
3. Every day, give both cups the same small drink of water. Peek at the dark one only for a moment, then shut the door again.
4. After a week, set the two cups side by side on the table. Look at the color. Look at how tall and how thick the stems are. Feel the leaves.
5. Draw both plants side by side. Color one the color you really see. Color the other the color you really see.
6. Measure each plant with the ruler. Have your parent write the numbers under your drawings. Tell your parent which plant is healthy and which is not.
7. Now put the pale plant in the window next to the green one. Watch it for a few more days. Does it turn green?

### **Tips**

- Keep everything the same except the light. Same cups, same soil, same water. Then you know light made the difference.
- The dark plant is often taller but thin and pale. It is stretching to find light. Taller is not always healthier.

### **Check your work**

- I can point to the plant that grew in the light and the plant that grew in the dark.
- I can say which plant is healthy and why.
- I drew and measured both plants.

## NATURE NOTEBOOK

1. Draw your two test plants side by side. Draw a sun over the green one and a dark box over the pale one.
2. Collect three different leaves from the yard. Lay each one on paper and trace around it. Color them green.
3. Draw a leaf as a kitchen. Draw the sun shining on it, air going in, and water coming up from the roots.

**From history.** A few years before Ingenhousz, in 1771, an English minister named Joseph Priestley put a sprig of mint in a jar where a candle had burned out and used up the good air. After some days a candle would burn in the jar again. The green plant had made the air fresh. Ingenhousz then showed that the plant did this only in the light. Together they found that green leaves in the sunshine give the world the fresh air that people and animals breathe.

## WORKED EXAMPLES

**Example 1.** After a week, the plant in the window has 6 leaves. The plant in the dark cupboard has 2 leaves. Which plant has more leaves? How many more?

1. Count the leaves on the window plant: 1, 2, 3, 4, 5, 6. That is 6.
2. Count the leaves on the dark plant: 1, 2. That is 2.
3. Hold up 6 fingers. Fold down 2 of them for the dark plant's leaves. Count the fingers still up: 4.
4. The window plant has 4 more leaves.

**Answer:** The window plant has more leaves. It has 4 more. Leaves need light to grow well.

## PRACTICE

1. **EASY** Point to a leaf on a real plant. What color is a healthy leaf?
2. **EASY** Name the three things a leaf needs to make food. (Your parent can give a hint: one comes from the sky, one is all around us, one comes up from the roots.)
3. **MEDIUM** Your parent shows you your two test plants. Which one was in the dark? How can you tell?
4. **MEDIUM** Look at your window plant. Turn the pot around so the leaves face the room. What do you think the leaves will do in a few days? Check and see.
5. **HARD** Tell your parent why the grass under a board turns yellow, even though it has dirt and water.

## COMMON MISTAKES

- Thinking plants get their food from the dirt. Roots drink water from the soil, but the plant makes its food in its leaves using sunlight.
- Thinking the taller plant is always the healthier one. A plant in the dark stretches tall and thin looking for light, but it is pale and weak.
- Thinking a plant in the dark only needs more water. Water cannot take the place of light. The plant needs light to make food.

**Make it a game · Sun and Shadow.** You are a plant. Crouch down small like a seed. When your parent holds up a yellow paper sun and says “Sunshine!” grow up slowly and spread your arms out like wide green leaves, turning to face the sun wherever your parent moves it. When your parent hides the sun behind a dark cloth and says “Dark!” let your arms droop and go floppy and pale. Then switch and you hold the sun.

**Scripture.** “And he shall be like a tree planted by the rivers of water, that bringeth forth his fruit in his season; his leaf also shall not wither; and whatsoever he doeth shall prosper.” (Psalm 1:3, KJV)

A tree by the river has all it needs: water for its roots and light for its leaves, so its leaves stay green. God says a person who loves His word is like that tree.

### Practice answers

1. The child points to a leaf. A healthy leaf is green.
2. Sunlight, air and water.
3. The pale, thin, floppy one was in the dark. The green, strong one was in the light.
4. The leaves will slowly turn back toward the window, because they are reaching for the light.
5. The board blocks the light. Without light the leaves cannot make food, so the grass turns pale and yellow. When the board is taken away, the light comes back and the grass turns green again.

## 5.4 THE MUSTARD SEED

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### OBJECTIVES

- Hold a mustard seed and tell that it is one of the smallest seeds a farmer plants, yet it grows into a plant taller than a man.
- Grow mustard seeds and measure them day by day on a picture chart.
- Retell the parable of the mustard seed from Matthew 13:31–32 and say what it teaches.

**Warm-up.** Ask a parent for the jar of whole mustard seed from the spice shelf. Shake one seed into your palm. Look how small it is. Put a dried bean next to it. Put a grain of rice next to it. Which is smallest? Now hold the mustard seed up to the window. Can you believe a plant taller than Dad could come out of that dot?

**Video.** Coming soon. Mustard seed sprouting time-lapse and the parable of the mustard seed for young children: search SciShow Kids, Homeschool Pop (Alternate), Moody Science classics, children’s Bible story channels, or nature footage of a mustard field in bloom.

### KEY TERMS

#### **mustard seed**

A tiny round seed, about the size of a dot. It grows into a tall plant with yellow flowers.

#### **parable**

A short story Jesus told about ordinary things, like seeds and farmers, to teach about God.

#### **kingdom of heaven**

God’s rule in the hearts of His people. Jesus said it starts small and grows very big.

#### **herb**

A plant with soft green stems instead of wood. Mustard is a garden herb.

### CORE IDEAS

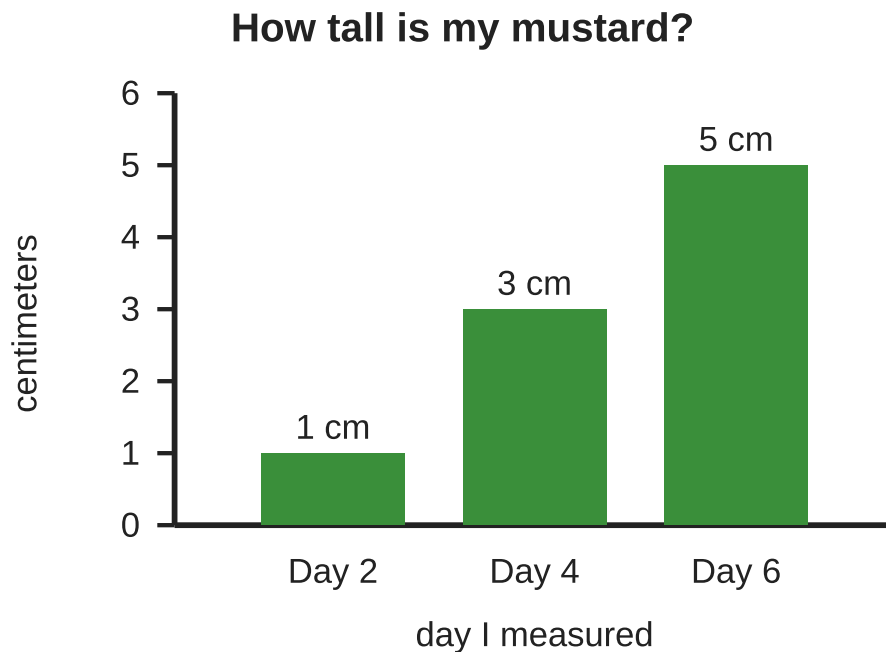
**The story.** Jesus grew up in a village with farmers all around. He walked past their fields. He saw them sow seed. One day, sitting in a boat by the Sea of Galilee, He told the crowd on the shore a story about a seed. “The kingdom of heaven is like to a grain of mustard seed, which a man took, and sowed in his field.” Every farmer listening knew that seed. It was the smallest seed they planted, no bigger than a dot. And they knew what it grew into. In that warm country, a mustard plant grows into a great bushy herb, taller than a man, with yellow flowers. Birds come and sit in its branches.

**How they figured it out.** You do not have to take anyone’s word for it. You can try it. Sprinkle mustard seeds on wet cotton in a dish. In two or three days, white roots poke out. Then green shoots come up. In a week you have a little green forest, and you can measure it with a ruler. Every day it is taller. If you plant a few in a pot of soil in the sun and keep them

watered, they keep growing: a stem, then big leaves, then yellow flowers, then skinny seed pods full of new tiny seeds. Each new seed is a dot again, with a whole plant folded inside.

**The big idea.** Small seeds grow big plants. A seed does not have to be big to be mighty. What matters is what is inside it, and the life God put there. Jesus said the kingdom of heaven is like that. It starts small, like a seed, like a few friends by a lake, like one small prayer. Then it grows and grows until there is room for the birds to rest in its branches. And it grows the same way your mustard grows: a little each day, without anyone pushing it, because God gives the growing. Paul said it this way: “I have planted, Apollos watered; but God gave the increase” (1 Corinthians 3:6).

**God’s handiwork.** In this unit you opened a seed and found a baby plant inside. You watched roots go down and shoots go up. You saw that leaves need light. Now you have grown a tiny seed into a plant you can measure. All of this happens in a dot you can hardly see. God made the seed. God made it grow after its kind. And He made His kingdom to grow the same way, from something small to something big, so that even a child can understand.



*A growing chart. Each bar shows how tall the mustard sprouts were on that day.*

## PICTURE STUDY



*Black Mustard (Brassica nigra)*, Walther Otto Müller, for Köhler's Medizinal-Pflanzen, late 1800s · Color printed plate (chromolithograph) in a book · Printed in Gera, Germany; copies in libraries and botanical gardens

In the late 1800s a German publisher made a big book of careful plant pictures so doctors and shopkeepers could tell plants apart. Every page shows one plant with its flowers, its seed pods and its seeds all drawn side by side and printed in color.

This page shows black mustard, the kind that grows wild around the Sea of Galilee. Look how the artist shows you the whole plant and then zooms in on the tiny parts, just as a scientist would.

## Look closely

- Find the yellow flowers at the top. Count the petals on one flower. (There are four, shaped like a little cross.)
- Find the long thin seed pods on the stem. Those are full of mustard seeds.
- Find the close-up drawings of the tiny seeds. Are they big or small next to the flower?
- Find the biggest leaf. Is it smooth-edged or jagged?

## Talk about it

1. Why would an artist draw the seeds so much bigger than they really are?
2. Where on the plant are the new seeds made?
3. If one plant makes hundreds of seeds, and each seed makes a plant, what happens to a field after a few years?

**Safety first.** Mustard seeds are tiny and can be a choking hazard, so a parent handles the jar. Eat sprouts only if the seeds came from the grocery spice aisle or a packet marked for sprouting, and only a small taste. Mustard sprouts taste hot and peppery.

## **MAKE AND DO: GROW A MUSTARD FOREST**

You will grow a dish of mustard seeds on wet cotton, watch them sprout in just a few days, and measure them with a ruler to make a growing chart.

### **You will need**

- Whole mustard seeds from the spice shelf (yellow or brown), or a packet of mustard or cress seed
- A shallow dish or saucer
- Cotton balls or a folded paper towel
- Water
- A ruler
- A sheet of paper for a chart and a green crayon

### **Steps**

1. Spread cotton balls or a folded paper towel in the dish. Wet them well and pour off any extra water.
2. Sprinkle a pinch of mustard seeds over the cotton. Spread them out so they are not in a pile.
3. Put the dish in a warm spot with light. Keep the cotton damp every day.
4. Each day, look closely. On which day do you see the first root? On which day do you see green?
5. On the paper, have your parent draw a ruler line up the side marked 0, 1, 2, 3, 4, 5, 6 centimeters. Every two days, stand the ruler next to the tallest sprouts, measure, and color a green bar up to that height. Have your parent write the day under each bar.
6. After a week, look at your chart. Are the bars getting taller or shorter? Compare the tallest sprout to one mustard seed still in the jar.
7. If you like, move a few sprouts into a pot of soil in a sunny window and keep them watered to see leaves and, if you wait long enough, yellow flowers.

### **Tips**

- Spice-shelf mustard seed usually sprouts. If nothing happens after five days, try a fresh jar or a packet of cress seed from a garden store.
- Measure the tallest sprouts each time, so you are comparing the same thing.

### **Check your work**

- I grew mustard seeds and saw the root first, then the green shoot.
- I measured my sprouts and colored a bar on the chart.

- I can tell the story of the mustard seed.

## NATURE NOTEBOOK

1. Glue one mustard seed to a page. Next to it, draw the tall mustard plant with yellow flowers and a bird in its branches.
2. Draw your growing chart with green bars for each day you measured.
3. Draw a picture of Jesus in a boat telling the story to the people on the shore.

**From history.** People have ground mustard seeds to make a hot sauce for a very long time. In 1814 a miller named Jeremiah Colman began grinding mustard at a water mill near Norwich, England. His bright yellow tins are still sold today. The next time you see mustard on a hot dog, remember that every bit of it began as a tiny seed in a field, a seed just like the one Jesus talked about.

## WORKED EXAMPLES

**Example 1.** Read the growing chart. On Day 2 the mustard sprouts were 1 centimeter tall. On Day 6 they were 5 centimeters tall. Which day were they tallest? How much taller were they on Day 6 than on Day 2?

*(Use the map or drawing “Read the height of each bar on the ruler line at the left.” shown earlier in this lesson.)*

1. Find the tallest bar on the chart. It is Day 6. It reaches 5 on the ruler line.
2. Find the Day 2 bar. It reaches 1 on the ruler line.
3. Count up from 1 to 5 on the ruler: 2, 3, 4, 5. That is 4 steps.
4. The sprouts were 4 centimeters taller on Day 6.

**Answer:** Day 6 was the tallest. The sprouts grew 4 centimeters taller between Day 2 and Day 6.

## PRACTICE

1. **EASY** Your parent puts a mustard seed, a bean and a grain of rice on the table. Point to the smallest. Point to the biggest.
2. **EASY** Look at your mustard dish. What came out of the seed first, the root or the green shoot?
3. **MEDIUM** Count the green sprouts in one corner of your dish, up to ten. How many did you count?
4. **MEDIUM** Look at the growing chart. On Day 4 the bar reaches 3. On Day 6 the bar reaches 5. Which bar is taller? Did the sprouts grow or shrink between those days?
5. **HARD** Tell the story of the mustard seed in your own words. What did the tiny seed grow into? What did Jesus say the kingdom of heaven is like?

## COMMON MISTAKES

- Thinking a small seed grows a small plant. The size of the seed does not tell you the size of the plant. A tiny mustard seed grows a plant taller than a man.
- Thinking a seed grows because we make it grow. We plant and water, but God gives the growing.
- Thinking mustard is only the yellow sauce in a jar. The sauce is made from ground mustard seeds, which come from a real green plant with yellow flowers.

**Make it a game · Tiny Seed, Giant Plant.** Curl up on the floor as small as a mustard seed. Your parent says, “Rain!” and you wiggle one toe, the root. Your parent says, “Sun!” and you lift one arm, the shoot. With each “Day!” your parent calls, you grow a little taller, until you are standing on tiptoe with arms spread wide as branches. Then your parent flaps like a bird and lands on your branch. Switch and let your parent be the seed while you call the days.

**Scripture.** “Another parable put he forth unto them, saying, The kingdom of heaven is like to a grain of mustard seed, which a man took, and sowed in his field: Which indeed is the least of all seeds: but when it is grown, it is the greatest among herbs, and becometh a tree, so that the birds of the air come and lodge in the branches thereof.” (Matthew 13:31-32, KJV)

Jesus used the smallest seed the farmers planted to teach that God’s kingdom starts small and grows very big. You have watched that seed grow with your own eyes.

### Practice answers

1. The mustard seed is the smallest. The bean is the biggest.
2. The white root came out first. Then the green shoot came up.
3. Answers vary. The child counts aloud and the parent checks, stopping at ten.
4. The Day 6 bar is taller. The sprouts grew.
5. A man planted a tiny mustard seed in his field. It grew into a great plant, so big that birds came and sat in its branches. Jesus said the kingdom of heaven is like that: it starts very small and grows very big.

## UNIT 5 REVIEW

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Ask each question aloud and let your child answer by talking, pointing, or showing you with real seeds and plants. No reading or writing is needed. Give the points for a good answer in the child's own words. The review is worth 20 points.

1. (3 pts) Open a soaked bean. Point to the three parts and tell me their names.
2. (2 pts) I will put a bean, a pebble, a popcorn kernel and a button on the table. Put the seeds in a pile. What does a seed need to wake up and sprout?
3. (3 pts) Which way do roots grow? Which way does the shoot grow? What happened when we laid the jar on its side?
4. (3 pts) Tell me two jobs that roots do. Is a carrot a root or a stem?
5. (3 pts) Leaves are the plant's kitchen. What three things does a leaf use to make food?
6. (2 pts) Point to the plant that grew in the dark cupboard. How could you tell?
7. (4 pts) Hold a mustard seed. Is it big or small? Tell me the story Jesus told about it, and what the seed grew into.

### UNIT PROJECT: MY SEED-TO-PLANT BOOK

Make a little book with a page for each lesson: the open bean with its three parts, the bean jar drawn day by day with the root measured, the light-and-dark test plants side by side, and the mustard growing chart with its green bars. On the last page, glue one real mustard seed and draw the tall plant with a bird in its branches.

Show the book to a grandparent or friend along with your real bean plant or mustard dish. Tell the story of the mustard seed in your own words while you turn the pages.

- **Seed parts:** The open bean drawing shows the seed coat, food store and baby plant, and the child can point to and name each one.
- **Roots and shoots:** The day-by-day drawings show the root growing down and the shoot growing up, with at least one root measurement written by a parent.
- **Light test and chart:** The two test plants are drawn in their true colors, and the mustard chart has bars that get taller over the days measured.
- **Telling:** The child retells the mustard seed story and explains that the tiny seed grew into a big plant, in his or her own words.

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#### Answer key

1. Seed coat (the thin skin), food store (the two fat halves), baby plant (the tiny white plant with a little root and two leaves). One point each.
2. The bean and the popcorn kernel are seeds. A seed needs water and warmth to sprout.
3. Roots grow down. The shoot grows up. When the jar lay on its side, the root bent to point down again and the shoot bent to point up again.
4. Roots hold the plant tight in the ground, and roots drink water from the soil. A carrot is a root.

5. Sunlight, air and water (the water comes up from the roots). One point each.
6. The child points to the pale, thin, floppy plant. It had no light, so it could not make food and turned pale.
7. The mustard seed is very small, one of the smallest seeds a farmer plants. Jesus said the kingdom of heaven is like a mustard seed a man sowed in his field. It grew into a great plant, so big that the birds came and sat in its branches. God's kingdom starts small and grows very big.

## MY BODY

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After five units of looking at the animals God made, this unit turns the magnifying glass on the child. King David looked at his own body and sang, “I am fearfully and wonderfully made” (Psalm 139:14). Your child will feel a heartbeat, count fingers and toes, make a fingerprint, and learn that God made each person, boy or girl, in His own image and one of a kind.

Then we go inside. Your child will feel the hard bones under the skin, build a cotton-swab skeleton, and hear how Wilhelm Röntgen first saw the bones of a living hand. Next come the five senses, tried out one at a time on an orange and in a mystery box, with the story of Helen Keller at the water pump. The unit ends at the sink, where Dr. Semmelweis’s hand-washing rule and Louis Pasteur’s germs show why soap and water matter.

Everything is said, pointed to, built or drawn. No reading is required of the child. A parent reads aloud, asks the questions, and writes the labels.

### BEFORE YOU BEGIN

- Can count objects to 20 and count on from a number
- Can name a few body parts (head, arms, legs) and point to them
- Can follow a two-step direction, such as close your eyes and feel
- Has done at least one notebook drawing with a parent writing the label

### MASTERY CHECKLIST

- I can point to and name the head, trunk, arms, legs, hands and feet, and say that God made me in His image.
- I can feel my heart beat and tell what the heart, lungs and brain do.
- I can point to my skull, ribs and backbone and tell what each one protects.
- I can name the five senses and touch the body part that does each one.
- I can show the five steps of washing hands and name three times to wash.
- I can say Psalm 139:14 from memory with help.

### OPTIONAL BOOKS AND RESOURCES

- ***A Child’s Garden of Verses* by Robert Louis Stevenson (free at Project Gutenberg)** (<https://www.gutenberg.org/>): Free. Search the site for the title. Read aloud “My Shadow,” “Looking-Glass River” and “The Swing” during this unit. The poems are full of a child noticing his own body, his eyes and ears, and the world around him.
- **Smithsonian Learning Lab** (<https://learninglab.si.edu/>): Free. Search for skeleton, X-ray or Louis Pasteur to find real museum photographs and old prints to look at with your child.

## 6.1 FEARFULLY AND WONDERFULLY MADE ★

### OBJECTIVES

- Point to and name the big parts of the body: head, trunk, arms, legs, hands and feet.
- Tell that the heart, lungs and brain work inside the body, and feel the heart beat.
- Say that God made each person, boy or girl, in His own image, and that no two people are exactly alike.

**Warm-up.** Stand in front of a mirror. Wiggle your fingers. Blink your eyes. Stick out your tongue. Now put your hand flat on your chest and stay very still. Do you feel a little thump, thump, thump? That is your heart. Tell your parent what else you can feel moving in your body.

**Video.** Coming soon. My body for kindergarten: parts of the body, the heart beating, the lungs breathing, fingerprints up close. Try SciShow Kids, Homeschool Pop (Alternate), Smithsonian, Moody Science classics, and simple body-parts songs for young children.

### KEY TERMS

#### body

All of you that you can touch: your head, trunk, arms and legs, and everything inside.

#### heart

The strong pump inside your chest. It pushes blood all through your body and never stops.

#### lungs

Two soft bags inside your chest that fill with air when you breathe in.

#### fingerprint

The tiny lines on the tip of your finger. Your fingerprints are yours alone.

### CORE IDEAS

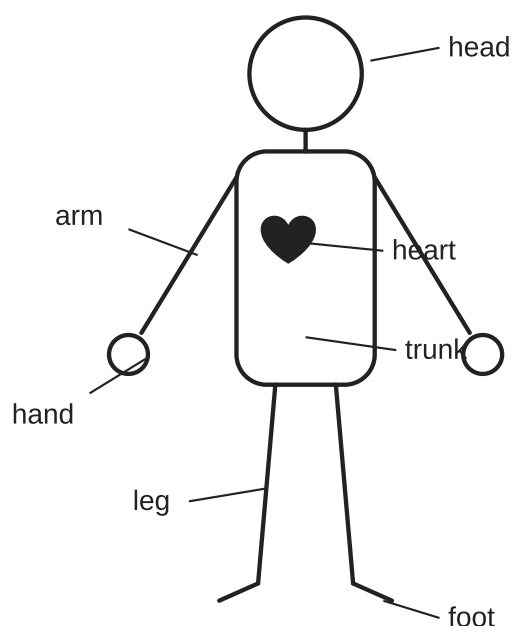
**The story.** Long ago a shepherd boy named David became king of Israel. David wrote many songs. In one of them he looked at his own body and was amazed. He wrote, “I am fearfully and wonderfully made” (Psalm 139:14). Fearfully does not mean scary. It means made with awe, so carefully that it makes you say “Oh!” Look at your own hand. Open it and close it. Touch your thumb to each finger. Nobody built that hand in a shop. God made it, and He made all of you.

**How they figured it out.** Press your fingertip on a window and look at the smudge. Do you see little lines? Those are your fingerprints. Long ago a doctor named Henry Faulds was working in Japan. He looked closely at fingerprints and saw that every person has a different pattern. Even twins do not match. Today police can tell who touched something just from the lines on one finger. Now put two fingers on the side of your neck, under your jaw. Press gently. Feel the thump? That is your **heart** pushing blood through a tube called a blood

vessel. Your heart is about the size of your fist, and it pumps all day and all night, even when you sleep.

**The big idea.** Your body has big parts you can see. Point to each one: head, trunk (that is your chest and belly), two arms, two legs, two hands, two feet. Your body also has parts hidden inside. Your **heart** pumps. Your **lungs** fill with air when you breathe in and squeeze it out when you breathe out. Your brain, inside your head, thinks and tells every other part what to do. Your stomach turns your lunch into fuel. Your skin covers it all like a soft, stretchy coat. Every part has a job, and all the parts work together.

**God's handiwork.** The Bible says God made people in His own image, male and female (Genesis 1:27). God made boys and God made girls, and He made each one on purpose. You are not a copy of anyone. Your fingerprints, your voice and your face are yours alone. When you look in the mirror, you can say with David, "I will praise thee; for I am fearfully and wonderfully made."



*The big parts of the body. The heart beats inside the chest, a little to the left.*

## PICTURE STUDY



*Children Playing on the Beach*, Mary Cassatt, 1884 · Oil on canvas · National Gallery of Art, Washington, D.C.

Mary Cassatt was an American painter who lived in France. She loved to paint children doing ordinary things. Here two little girls sit on the sand. One scoops with a shovel, the other holds a bucket. Cassatt watched real children very closely, so their hands and feet and chubby arms look just right.

### Look closely

- Find the hands. What is each hand doing?
- Point to a foot. Point to an arm. Point to a head.
- Which girl is looking down? What is she looking at?
- What colors do you see on the water? Are the boats near or far away?

### Talk about it

1. Name three parts of your body that you would use to dig in the sand.
2. The girls look alike, but they are not the same. How can you tell them apart?

## MAKE AND DO: MY HANDPRINTS AND FINGERPRINTS

You will make a print of your whole hand and then look at the tiny lines on one finger. Then you will see that your parent's prints are different from yours.

### You will need

- Washable paint and a paper plate, or a stamp pad
- Two sheets of plain paper

- A soft pencil, clear tape and a white index card
- A magnifying glass if you have one
- Soap, water and a towel

### Steps

1. Spread a thin layer of paint on the plate. Press your whole hand into it and then press it on the paper. Lift straight up. Count the fingers on your print.
2. Ask your parent to make a handprint next to yours. Whose hand is bigger? Lay your hand on top of the big print and see.
3. Wash your hands. Now rub the soft pencil back and forth on the index card until there is a dark gray patch.
4. Rub your pointer finger in the gray patch. Press a piece of clear tape on your gray fingertip, peel it off slowly and stick it on the white paper. There is your fingerprint!
5. Look at it with the magnifying glass. Do the lines make loops, swirls or little hills?
6. Have your parent make a fingerprint the same way. Put the two prints side by side. Are they the same?
7. Glue both handprints and both fingerprints in your notebook. Your parent writes: Made by God. No two alike.

### Tips

- Press the tape on gently and peel it slowly, or the lines smudge.
- If the print is too dark, wipe your finger a little before you press the tape.

### Check your work

- I can count the fingers on my handprint.
- I can tell whose hand is bigger, mine or my parent's.
- I can say that my fingerprint is different from everybody else's.

## NATURE NOTEBOOK

1. Draw a picture of yourself from head to toe. Your parent labels head, arms, legs, hands and feet as you point to each one.
2. Draw a big heart shape inside a chest. Next to it draw your fist. Your parent writes: My heart is about as big as my fist.
3. Draw a face in a mirror and put your own eye color and hair color on it. Write your name with help.

**From history.** In 1880 a Scottish doctor named Henry Faulds, who was working in Tokyo, Japan, wrote a letter to a science magazine saying that fingerprints could be used to tell people apart. He had noticed finger marks left on old clay pots and then studied the fingers of his students. Years later, police in England began keeping fingerprint cards, and they still do.

## WORKED EXAMPLES

**Example 1.** How many fingers do you have on both hands? How many toes on both feet? How many fingers and toes all together?

1. Hold up one hand and count: 1, 2, 3, 4, 5. Hold up the other hand: 6, 7, 8, 9, 10. That is 10 fingers.
2. Take off your socks and count your toes the same way: 10 toes.
3. Put them together: 10 fingers and 10 toes. Count by tens: 10, 20.

**Answer:** 10 fingers, 10 toes, 20 fingers and toes all together.

## PRACTICE

1. **EASY** Your parent says a body part: head, arm, leg, hand, foot, chest, belly. Touch it as fast as you can.
2. **EASY** Which part pumps blood through your body: your heart or your stomach?
3. **MEDIUM** Take a big breath in. What part of your body fills up with air? Point to where it is.
4. **MEDIUM** Count on your fingers: a person has 2 eyes, 2 ears and 1 nose. How many is that all together?
5. **HARD** Tell your parent in your own words why no two people have the same fingerprints, and who made it that way.

## COMMON MISTAKES

- Thinking “fearfully made” means God’s work is scary. It means made with awe and wonder, so carefully that we marvel.
- Thinking the heart is on the far left side of the chest. It is in the middle of the chest, just a little to the left.
- Thinking the heart rests when you sleep. The heart keeps beating all night long, just a little more slowly.

**Make it a game · Simon Says, Body Parts.** Your parent is Simon. “Simon says touch your head.” “Simon says wiggle your fingers.” “Simon says put your hand on your heart.” If Simon does not say “Simon says,” stay still! Then switch and you be Simon. Try to use every part you learned: head, trunk, arms, legs, hands, feet, heart and lungs (take a big breath).

**Scripture.** “I will praise thee; for I am fearfully and wonderfully made: marvellous are thy works; and that my soul knoweth right well.” (Psalm 139:14, KJV)

David looked at his own body and praised God for making it so well. When you feel your heart beat or look at your fingerprint, you can praise God too.

### Practice answers

1. The child touches the right part each time. Head is on top, the trunk is the chest and belly, arms end in hands, legs end in feet.
2. The heart. The stomach turns food into fuel.
3. The lungs. They are inside the chest, one on each side.
4. 5. Two and two make four, and one more makes five.
5. God made each person one of a kind. The lines on every person's fingers make a different pattern, even in twins, because God made each of us on purpose and in His image.

## 6.2 BONES

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### OBJECTIVES

- Tell that bones hold the body up and protect the soft parts inside.
- Point to and name the skull, the ribs, the backbone and the long bones of the arms and legs.
- Show how a joint bends and tell that bones grow and mend because they are alive.

**Warm-up.** Feel the top of your head. Hard, isn't it? Now press on your belly. Soft! Feel your elbow, your knee and the bumps down the middle of your back. Everywhere you feel something hard under your skin, that is a bone. Count how many hard places you can find in one minute.

**Video.** Coming soon. Bones and the skeleton for kindergarten: the skull, ribs, backbone, how joints bend, the first X-ray. Try SciShow Kids, Homeschool Pop (Alternate), Smithsonian, Science Max, and simple skeleton songs for young children.

### KEY TERMS

#### **bone**

A hard, strong part inside your body. Bones hold you up like the poles of a tent.

#### **skeleton**

All your bones together. A grown-up's skeleton has 206 bones.

#### **skull**

The hard round bone of your head. It keeps your brain safe like a helmet.

#### **joint**

A place where two bones meet so you can bend, like your elbow or your knee.

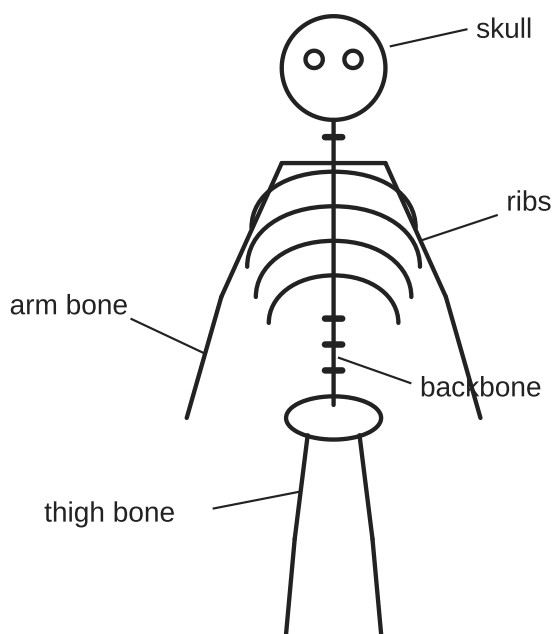
### CORE IDEAS

**The story.** Feel your arm. Under the skin there is something hard and long. That is a bone. Nobody could see a bone inside a living person until one November evening in 1895. In the town of Würzburg, Germany, a scientist named Wilhelm Röntgen found a strange new kind of ray that could pass right through skin. He asked his wife, Anna Bertha, to lay her hand on a photo plate. When the picture came out, there were the bones of her fingers, and even her ring! People called it an X-ray, and doctors still use X-rays to look at bones today.

**How they figured it out.** Long before X-rays, doctors learned about bones by looking at skeletons. A grown-up has 206 bones. A baby has even more little bones, and some of them join together as the child grows. The biggest bone is the thigh bone, the long bone between your hip and your knee. The smallest bone is deep inside your ear, no bigger than a grain of rice. Feel the bumps down the middle of your back. That is your **backbone**, and it is not one bone but a stack of many small bones, like a tower of blocks that can bend.

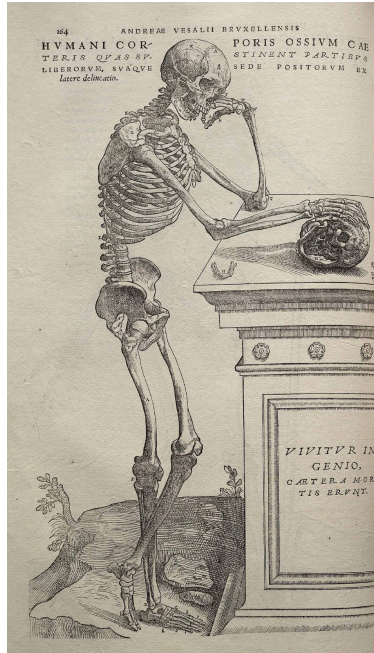
**The big idea.** Bones do three big jobs. First, they hold you up. Without bones you would flop like a jellyfish. Second, they protect the soft parts inside. Your **skull** is a hard helmet around your brain. Your ribs make a cage around your heart and lungs. Press your sides and feel the ribs. Third, bones help you move. Where two bones meet there is a **joint**. Bend your elbow. Bend your knee. Wiggle your fingers. Muscles pull on the bones at the joints, and that is how you run and jump and clap.

**God's handiwork.** Bones look like dry sticks, but they are alive. They grow longer as you grow taller. If a bone breaks, the doctor puts on a cast and the bone slowly knits itself back together. Inside your big bones, new blood is being made right now. Milk, cheese and green vegetables help bones grow strong. Job said to God, "Thou hast clothed me with skin and flesh, and hast fenced me with bones and sinews" (Job 10:11). A fence keeps things safe. Your bones are God's fence around your heart and brain.



*The skeleton. The skull protects the brain, the ribs protect the heart and lungs, and the backbone is a stack of small bones.*

## PICTURE STUDY



*A Skeleton, from De humani corporis fabrica, Andreas Vesalius (woodcut, possibly by an artist of Titian's workshop), 1543 · Woodcut print in a book · Printed in Basel; copies in many libraries, including the National Library of Medicine, Bethesda, Maryland*

Andreas Vesalius was a young doctor who taught in Padua, Italy. He wanted students to see exactly how God built the human body, so he made a big book full of careful pictures. In this famous print, a skeleton stands in a field as if it were alive and thinking. Every bone is drawn in its right place.

### Look closely

- Find the skull. Point to where the eyes would be.
- Count the ribs on one side. Use your finger and count slowly.
- Find the backbone. Is it one bone or many small ones?
- Find the longest bone. Where is it on the body? Point to the same bone on yourself.

### Talk about it

1. Why do you think Vesalius drew the skeleton standing up instead of lying down?
2. Look at the skeleton's hands. How many bones can you see in one finger?

**Safety first.** If you use a cooked chicken bone, make sure it is fully cooked and cleaned, and wash hands after handling it. Never handle raw chicken. Cotton swabs are not for ears.

## **MAKE AND DO: A COTTON-SWAB SKELETON**

You will build a skeleton out of cotton swabs and see where each bone goes. Then you will bend your own joints and find them on your model.

### **You will need**

- A sheet of black or dark blue paper
- About 15 cotton swabs and a pair of child scissors
- White glue
- A white crayon or a small circle of white paper for the skull
- A cooked, cleaned chicken leg bone, if you have one from dinner

### **Steps**

1. Draw or glue a white circle near the top of the paper. That is the skull. Add two dots for eyes.
2. Glue one long swab straight down from the skull. That is the backbone. Lay your finger down your own back and feel the bumps.
3. Cut four swabs in half. Glue the halves across the backbone, four on each side, curving down. Those are the ribs. Press your own ribs.
4. Glue two swabs for the arms. Make a bend at the elbow by using two short pieces. Bend your own elbow and see.
5. Glue two long swabs for the thigh bones and two more below for the lower legs. Leave a tiny gap at the knee. That gap is a joint.
6. Add little pieces for hands and feet.
7. If you have a chicken bone, hold it. Is it hard or soft? Tap it on the table. Your parent can tell you it is a leg bone, like your thigh bone, only smaller.
8. Point to each part of your skeleton and say its name: skull, backbone, ribs, arm, leg.

### **Tips**

- A dot of glue at each end of a swab is enough. Too much glue makes the swabs slide.
- If swabs are too long, snip them. A real skeleton has long leg bones and shorter arm bones.

### **Check your work**

- I can point to the skull, ribs and backbone on my model.
- I can show where a joint is and bend the same joint on my own body.
- I can name one job that bones do.

## **NATURE NOTEBOOK**

1. Draw your hand big on the page. Inside each finger draw the little bones: 3 in each finger and 2 in the thumb.

2. Draw a skull like a helmet with a brain inside. Your parent writes: The skull keeps the brain safe.
3. Draw a picture of Röntgen's X-ray: a hand with bones showing and a ring on one finger.

**From history.** Wilhelm Röntgen found X-rays on November 8, 1895, in Würzburg, Germany, while testing a glass tube in a dark room. A few weeks later he took the famous picture of his wife's hand with its bones and ring. Within months doctors around the world were using X-rays to find broken bones. In 1901 Röntgen was given the very first Nobel Prize in Physics.

## WORKED EXAMPLES

**Example 1.** Each of your four fingers has 3 bones, and your thumb has 2. How many bones are in the fingers and thumb of one hand?

1. Bend one finger. Feel the bends: 1, 2. Two bends means 3 little bones in that finger.
2. Count 3 for each of the four fingers: 3, 6, 9, 12.
3. The thumb has only 2 bones. Count on: 13, 14.

**Answer:** 14 bones in the fingers and thumb of one hand.

## PRACTICE

1. **EASY** Touch your skull. Touch your backbone. Touch your ribs. Tell what each one protects.
2. **EASY** Which bone is bigger, the thigh bone or a finger bone?
3. **MEDIUM** Name two joints on your body and bend each one.
4. **MEDIUM** Count the bones in this list on your fingers: 2 arm bones, 2 leg bones, 1 skull. How many bones is that?
5. **HARD** A boy breaks his arm and the doctor puts on a cast. Tell your parent what happens to the bone inside the cast and why.

## COMMON MISTAKES

- Thinking bones are dead and dry like the ones in a museum. Living bones are wet, alive, grow longer and mend when they break.
- Thinking the backbone is one long bone. It is a stack of many small bones, which is why you can bend and twist.
- Thinking bones move by themselves. Muscles pull on bones at the joints to make them move.

**Make it a game • Freeze Like a Skeleton.** Play music or clap a beat. Dance and bend every joint you can: elbows, knees, wrists, ankles, neck. When your parent calls "Freeze!" stop and hold still like the skeleton in the picture. Your parent names a bone, such as

skull, ribs, backbone, arm bone or thigh bone, and you touch it without moving anything else. Last one to wobble wins the round.

**Scripture.** “Thou hast clothed me with skin and flesh, and hast fenced me with bones and sinews.” (Job 10:11, KJV)

Job tells God that his bones are like a fence. A fence keeps what is inside safe. Your skull and ribs are God’s fence around your brain, heart and lungs.

#### Practice answers

1. The skull protects the brain. The backbone protects a cord of nerves that runs down the back and holds the body up. The ribs protect the heart and lungs.
2. The thigh bone. It is the biggest bone in the body.
3. Any two of: elbow, knee, shoulder, hip, wrist, ankle, finger joints, jaw.
4. 5. Two and two make four, and one more makes five.
5. The bone slowly grows back together and mends, because bones are alive. The cast holds the bone still so it heals straight.

## 6.3 MY FIVE SENSES

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### OBJECTIVES

- Name the five senses and point to the body part that does each one.
- Use each sense to find out something about an orange.
- Tell that messages from the senses go to the brain, which figures out what they mean.

**Warm-up.** Your parent hides an orange behind their back. Close your eyes. Sniff. Can you guess what it is by smell alone? Now keep your eyes closed and feel it. Bumpy or smooth? Now open your eyes. Were you right? Tell how you knew.

**Video.** Coming soon. The five senses for kindergarten: seeing, hearing, smelling, tasting, touching, and how the brain gets the messages. Try SciShow Kids, Homeschool Pop (Alternate), Smithsonian, Moody Science classics, and simple five-senses songs for young children.

### KEY TERMS

#### sense

A way your body finds out about the world. God gave you five: seeing, hearing, smelling, tasting and touching.

#### eyes

The two round parts in your face that see light, colors and shapes.

#### ears

The parts on the sides of your head that catch sounds.

#### brain

The part inside your skull that gets the messages from your senses and tells you what they mean.

### CORE IDEAS

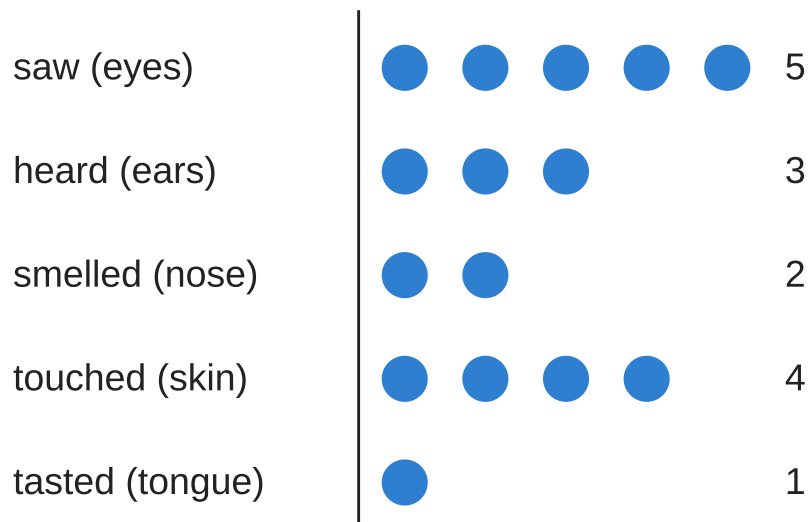
**The story.** Hold an orange. Look at it. What color is it? Now sniff it. Scratch the peel with your fingernail and sniff again. Stronger! Feel it. Is it bumpy? Shake it by your ear. Does it make a sound? Now have your parent peel it and give you a piece. Taste it. You just used all five of your senses on one orange. Your eyes saw it, your nose smelled it, your skin felt it, your ears listened, and your tongue tasted it.

**How they figured it out.** Long ago a Greek teacher named Aristotle counted the senses and found five. People still count them that way. Each sense has its own body part. **Eyes** see. **Ears** hear. The nose smells. The tongue tastes. The skin all over your body feels hot, cold, soft, rough and sharp. But none of these parts understands anything by itself. Each one sends a message, quick as a flash, up to your **brain**. Your brain gets the messages and says, “That is an orange!” Your eyes are like windows. Your brain is the one who looks out of them.

**The big idea.** Senses keep you safe and help you learn. Your nose smells smoke before you see fire. Your ears hear a car before you step into the street. Your tongue tells you when milk has gone sour. Your fingers tell you the stove is hot before you get burned. Your eyes help you find your mother in a crowd. Some people are missing a sense. A girl named Helen Keller could not see or hear. Her teacher, Anne Sullivan, spelled letters into her hand with her fingers. One day in 1887, at a water pump, Helen felt cold water on one hand and the letters w-a-t-e-r on the other, and she understood. She learned to read with her fingers and went to college.

**God's handiwork.** The Bible says, "The hearing ear, and the seeing eye, the LORD hath made even both of them" (Proverbs 20:12). God made your senses so you could enjoy His world: the smell of rain, the taste of honey, the sound of a song, the soft fur of a cat, the colors of a sunset. Every time you use a sense, you can thank Him for it.

### Things I found on my walk



*A five-senses chart from one short walk. Each dot is one thing found with that sense.*

## PICTURE STUDY



*The Milkmaid*, Johannes Vermeer, about 1658 · Oil on canvas · Rijksmuseum, Amsterdam

Johannes Vermeer painted quiet rooms in his home town of Delft, in Holland. Here a kitchen maid pours milk from a jug into a bowl. Sunlight comes through the window and falls on the bread, the basket and her strong arms. Vermeer painted so carefully that you can almost hear the milk and smell the bread.

### Look closely

- Find the milk. Where is it coming from and where is it going?
- Find the bread on the table. Point to the crust. Does it look crunchy?
- Where is the light coming from? Point to the window.
- What is the maid looking at? What do you think she is listening to?

### Talk about it

1. Name one thing in the picture you could see, one you could hear, one you could smell, one you could taste and one you could touch.
2. If you were in this kitchen, which sense would you use first?

**Safety first.** Taste only foods your parent gives you. Never taste anything you find outside. Keep small objects away from younger brothers and sisters.

## MAKE AND DO: THE MYSTERY BOX OF SENSES

You will be a sense detective. You will use one sense at a time to figure out what is hidden, and then check with your eyes.

## You will need

- A shoebox or paper bag you cannot see into
- Feel things: a cotton ball, a pinecone, a spoon, a sponge, a rock
- Smell jars: a little cinnamon, a slice of lemon, a mint leaf or toothpaste, in small cups with a cloth over each
- Sound things: a bell, two spoons, a jar of rice, crinkly paper
- Taste things on a plate: a bit of apple, a cracker, a raisin, a pickle
- A blindfold or just closed eyes

## Steps

1. Touch: close your eyes. Your parent puts one thing in your hand inside the box. Feel it. Say soft or hard, rough or smooth, then guess what it is. Open your eyes and check.
2. Smell: close your eyes. Sniff each cup. Guess. Check.
3. Hear: close your eyes. Your parent makes a sound with one thing. Guess. Check.
4. Taste: close your eyes. Your parent gives you one bite. Say sweet, salty or sour, then guess. Check.
5. See: now look at all the things together. Your eyes guessed them all at once! Count how many your other senses guessed right.
6. In your notebook draw a face. Your parent helps you draw an arrow from each sense part to one thing it found: eye to apple, ear to bell, nose to lemon, mouth to cracker, hand to cotton ball.

## Tips

- Use one sense at a time. If your eyes peek, the game is over!
- Keep smells far apart or they mix. Sniff a sleeve between cups.

## Check your work

- I can name all five senses and point to the part that does each one.
- I can guess a hidden thing by touch alone.
- I can tell which part of my body figures out what the messages mean.

## NATURE NOTEBOOK

1. Draw a big orange. Around it draw an eye, an ear, a nose, a mouth and a hand. Your parent labels each sense.
2. Draw a face and color the eyes the same color as your own. Draw the ears and nose carefully.
3. Go outside for five minutes and find one thing for each sense. Draw the five things in a row.

**From history.** Helen Keller was born in Tuscumbia, Alabama, in 1880. An illness when she was a baby left her unable to see or hear. In 1887 a young teacher named Anne

Sullivan came to live with the family. At the water pump in the yard, Helen understood that the finger-spelling meant water, and she learned thirty new words that same day. She later wrote books and traveled the world.

## WORKED EXAMPLES

**Example 1.** Look at the five-senses chart from a short walk. Which sense found the most things? Which found the fewest? How many more did the eyes find than the tongue?

*(Use the map or drawing “Count the dots in each row.” shown earlier in this lesson.)*

1. Count the dots in each row: saw 5, heard 3, smelled 2, touched 4, tasted 1.
2. The longest row is saw, with 5. The shortest row is tasted, with 1.
3. Count up from 1 to 5: 2, 3, 4, 5. That is 4 more.

**Answer:** The eyes found the most (5). Tasting found the fewest (1). The eyes found 4 more things than the tongue.

## PRACTICE

1. **EASY** Your parent names a sense. You touch the part that does it: see, hear, smell, taste, touch.
2. **EASY** Which sense tells you a cookie is baking in the oven before you see it?
3. **MEDIUM** Sort these into two groups, things you hear and things you taste: a bell, honey, a barking dog, a lemon, a song, salt.
4. **MEDIUM** You have 2 eyes, 2 ears, 1 nose and 1 tongue. Count on your fingers. How many sense parts is that?
5. **HARD** Tell your parent in your own words how Helen Keller learned the word water without seeing or hearing.

## COMMON MISTAKES

- Thinking the eyes understand what they see. The eyes send a message, and the brain figures out what it is.
- Thinking you taste only with your tongue. Much of what we call taste is really smell. Hold your nose and a bite of apple tastes flat.
- Thinking touch happens only in the hands. Skin covers your whole body, and you can feel with your feet, your cheek and your back.

**Make it a game · Which Sense Am I?** Your parent says a clue: “I smell cookies.” “I hear a bird.” “I see a red truck.” “I taste a sour pickle.” “I feel soft fur.” As fast as you can, touch the body part that does that sense and say its name: nose, ears, eyes, tongue, skin. Then you give the clues and your parent touches the part. Try a tricky one: “The soup is too hot!” (tongue or skin both count).

**Scripture.** “The hearing ear, and the seeing eye, the LORD hath made even both of them.” (Proverbs 20:12, KJV)

Your ears and eyes are gifts God made. Use them to see and hear His world, and to listen to His Word.

#### **Practice answers**

1. See: eyes. Hear: ears. Smell: nose. Taste: tongue (mouth). Touch: skin, so hands or any part of the body.
2. Smell, with the nose.
3. Hear: a bell, a barking dog, a song. Taste: honey, a lemon, salt.
4. 6. Two and two make four, then five, then six.
5. Her teacher spelled the letters into her hand with her fingers while cold water ran over her other hand. Helen used her sense of touch, and her brain put the feeling and the letters together.

## 6.4 WASHING HANDS

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### OBJECTIVES

- Tell that germs are tiny living things too small to see, and that soap and water wash them off.
- Show the steps of washing hands well: wet, soap, scrub, rinse, dry.
- Name times when hands must be washed: before eating, after the bathroom, after touching animals, after coughing.

**Warm-up.** Look at your hands. Do they look clean? Now rub a little lotion on them and sprinkle a pinch of glitter or cinnamon on top. Shake hands with your parent. Look at your parent's hand. The sparkle jumped! Pretend the sparkle is germs. Where else did it go? Touch your nose and see.

**Video.** Coming soon. Washing hands for kindergarten: why we wash, how germs spread, the story of Semmelweis and Pasteur, glitter germ experiment. Try SciShow Kids, Homeschool Pop (Alternate), Science Max, Moody Science classics, and simple handwashing songs for young children.

### KEY TERMS

#### **germ**

A living thing so tiny you cannot see it. Some germs can make you sick.

#### **soap**

What we rub on wet hands to loosen dirt and germs so water can wash them away.

#### **scrub**

To rub hard, front and back, between the fingers and under the nails.

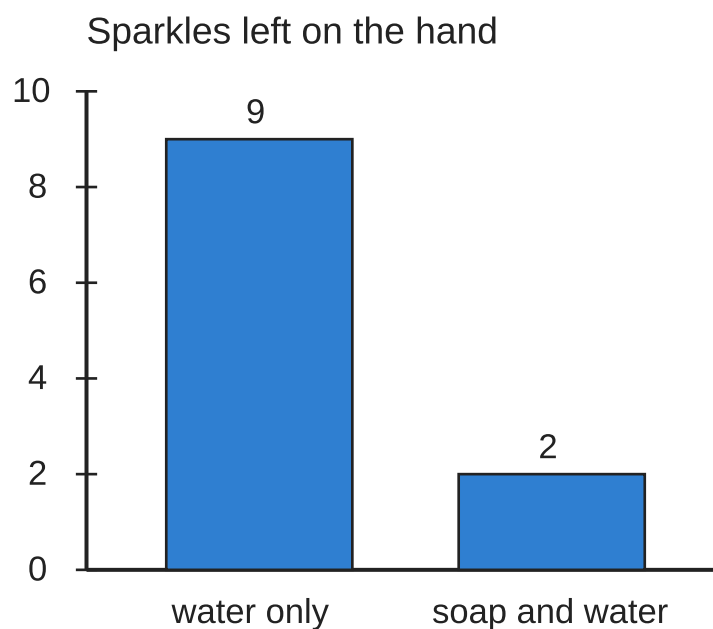
### CORE IDEAS

**The story.** Look at your hands. They look clean. But hands pick up things too small to see. In the city of Vienna, long ago, there was a big hospital where babies were born. A doctor named Ignaz Semmelweis saw that many mothers were getting sick in one part of the hospital. He noticed that the doctors there came straight from studying in another room without washing. In 1847 he made a rule: every doctor must wash his hands in a special wash before touching a mother. Soon far fewer mothers got sick. Clean hands saved lives.

**How they figured it out.** Semmelweis did not know what was on the doctors' hands. Some years later a French scientist named Louis Pasteur looked through a microscope and found the answer: **germs**. Germs are tiny living things. Thousands could fit on the tip of your finger, and you still could not see them. Most germs do no harm. Some can make you sick with a cold, a cough or a tummy ache. Germs ride on hands. You touch a doorknob, then your nose, and the germs get a free ride inside. Washing knocks them off before they can.

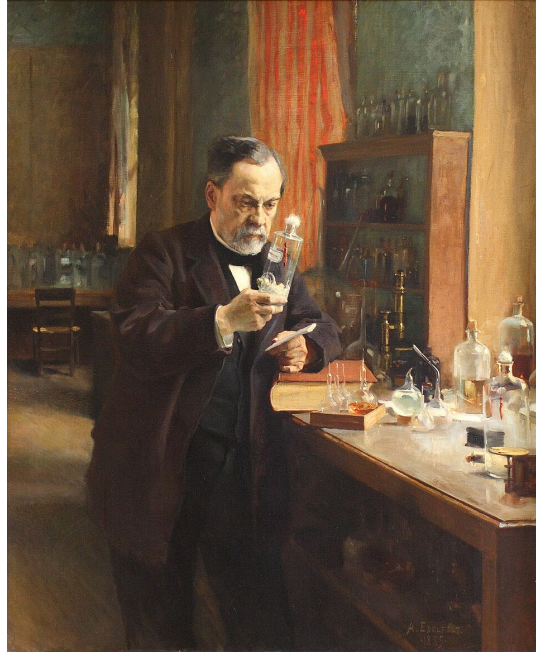
**The big idea.** Water alone slides off. **Soap** is what works. Soap grabs the dirt and oil that germs stick to and lets the water carry it all down the drain. Here are the steps. Wet your hands. Rub on soap. **Scrub** the fronts, the backs, between the fingers and under the nails while you sing a short song all the way through. Rinse. Dry with a clean towel. Wash before you eat, after you use the bathroom, after you touch an animal, after you play outside, and after you cough or sneeze into your hands. When you cough, use your elbow instead of your hand.

**God's handiwork.** God gave you skin that keeps most germs out, and a body that fights the ones that get in. Washing your hands is a way to take care of the body God made and to keep other people safe too. The Bible says the one who comes before God is "he that hath clean hands, and a pure heart" (Psalm 24:4). Clean hands on the outside are a good habit. A clean heart on the inside is God's gift.



*Glitter spots left on a hand. Soap and water took off far more than water alone.*

## PICTURE STUDY



*Louis Pasteur*, Albert Edelfelt, 1885 · Oil on canvas · Musée d'Orsay, Paris

Albert Edelfelt was a painter from Finland who lived in Paris. He painted the famous scientist Louis Pasteur in his own laboratory, holding a glass jar and looking at it very hard. Pasteur showed the world that tiny germs are real and that they can make people and animals sick.

### Look closely

- Find the glass jar in Pasteur's hand. What do you think is inside it?
- Look at Pasteur's face. Is he looking carefully or just glancing?
- Find the books and bottles behind him. What kind of room is this?
- Look at his hands. Are they big or small? Clean or dirty?

### Talk about it

1. Why do you think Pasteur is looking so closely at the jar?
2. Scientists look at things for a long time. What is something you looked at for a long time this week?

**Safety first.** Use warm water, not hot. Keep soap out of eyes. A parent handles any glitter cleanup and makes sure younger children do not put glitter in their mouths.

## MAKE AND DO: GLITTER GERMS: WATER OR SOAP?

You will put pretend germs on your hands and find out whether water alone or soap and water gets them off. Then you will count what is left.

## **You will need**

- Hand lotion
- Glitter, or cinnamon if you have no glitter
- A sink with warm water, a bar or pump of soap, and a towel
- Your nature notebook and crayons

## **Steps**

1. Rub a little lotion on both hands. Sprinkle a pinch of glitter on each hand and rub it in. These are your pretend germs.
2. Rinse your left hand under running water only, for the time it takes to count to ten. No soap. Dry it on the towel. Look closely. Count the sparkles you can still see on that hand.
3. Now wash your right hand with soap. Scrub front, back, between the fingers and under the nails while you sing "Happy Birthday" two times. Rinse and dry. Count the sparkles left.
4. Which hand has fewer sparkles? Tell your parent what made the difference.
5. Draw two hands in your notebook. Put dots on each hand for the sparkles you counted. Your parent writes: water only, and soap and water.
6. Now wash both hands the right way and hang up the towel. You are a hand-washing scientist.

## **Tips**

- Dry your hands all the way. Germs like wet hands.
- For a fun extra, fill a bowl with water, shake pepper on top, then touch the middle with a soapy finger. Watch the pepper rush to the sides. The pepper is not germs, but it shows how soap changes the water.

## **Check your work**

- I can say all five steps: wet, soap, scrub, rinse, dry.
- I can tell which worked better, water only or soap and water.
- I can name three times I must wash my hands.

## **NATURE NOTEBOOK**

1. Draw the five hand-washing steps in a row, like a comic: wet, soap, scrub, rinse, dry. Your parent writes each word under its picture.
2. Draw a doorknob and a hand. Draw tiny dots on both for the germs that ride from one to the other.
3. Draw Pasteur's face looking at his glass jar. Draw tiny dots inside the jar for the germs he found.

**From history.** Ignaz Semmelweis started his hand-washing rule at the Vienna General Hospital in 1847. He had the doctors wash in a bowl of water with chlorinated lime, a strong cleaner, before they went to the mothers. Many doctors laughed at him. Years later Louis Pasteur showed that germs are real, and a surgeon in Scotland named Joseph Lister began cleaning his tools and the wounds he treated. Today every doctor and nurse washes before touching a patient, just as Semmelweis asked.

## WORKED EXAMPLES

**Example 1.** Look at the glitter chart. The hand rinsed with water only has 9 sparkles left. The hand washed with soap and water has 2 sparkles left. How many more sparkles are on the water-only hand?

*(Use the map or drawing “The taller bar means more sparkles were left behind.” shown earlier in this lesson.)*

1. Find the tall bar. It is water only, and it reaches 9.
2. Find the short bar. It is soap and water, and it reaches 2.
3. Count up from 2 to 9: 3, 4, 5, 6, 7, 8, 9. That is 7 more.

**Answer:** The water-only hand has 7 more sparkles. Soap and water washed off more pretend germs.

## PRACTICE

1. **EASY** Show your parent the five hand-washing steps with your hands in the air, and say each one.
2. **EASY** Can you see germs on your hands? Why or why not?
3. **MEDIUM** Your parent names a moment. Say wash or no need: after petting the dog; before eating lunch; after looking at a picture book; after using the bathroom; after sneezing into your hands.
4. **MEDIUM** You washed your hands 3 times before breakfast, lunch and supper, and 2 more times after using the bathroom. Count on your fingers. How many times did you wash today?
5. **HARD** Tell your parent in your own words what Dr. Semmelweis told the doctors to do, and what happened after.

## COMMON MISTAKES

- Thinking hands that look clean are clean. Germs are too small to see, so wash even when hands look fine.
- Thinking a quick splash of water is enough. Soap and scrubbing are what loosen germs, and it takes a whole short song.

- Thinking all germs are bad. Most tiny living things do no harm, and some even help. We wash to get rid of the few that make us sick.

**Make it a game · Germ Tag.** One person is the germ and holds a cotton ball. The germ tags someone by handing over the cotton ball. The tagged person is now the germ. The only safe place is the sink: run to the sink and pretend to scrub while singing one line of a song, and the germ cannot tag you. Play for five minutes, then everyone really washes hands and says the five steps together.

**Scripture.** “Who shall ascend into the hill of the LORD? or who shall stand in his holy place? He that hath clean hands, and a pure heart; who hath not lifted up his soul unto vanity, nor sworn deceitfully.” (Psalm 24:3-4, KJV)

Clean hands on the outside are a good habit that keeps us and others well. A pure heart on the inside is what God wants most, and He gives it to those who ask Him.

#### Practice answers

1. Wet, soap, scrub (front, back, between fingers, under nails), rinse, dry.
2. No. Germs are too small to see without a microscope. Hands that look clean can still have germs.
3. Wash: after petting the dog, before lunch, after the bathroom, after sneezing into your hands.  
No need: after looking at a picture book.
4. 5 times. Three and two make five.
5. He made the doctors wash their hands before touching the mothers. After that, far fewer mothers got sick. Clean hands kept germs from spreading.

## UNIT 6 REVIEW

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Ask each question aloud. The child answers by speaking, pointing, touching or showing. Give full points for a correct answer in the child's own words. The review is worth 20 points.

1. (3 pts) Touch your head, your trunk, one arm, one leg, a hand and a foot. Then put your hand where your heart is.
2. (3 pts) Who made you? Is anyone else exactly like you? Say the words from David's song: "I am ... and ... made."
3. (3 pts) Touch your skull and your ribs. What does each one protect?
4. (3 pts) Bend two joints and name them. Then tell one thing bones do besides bend.
5. (3 pts) Name the five senses and touch the part of your body that does each one.
6. (2 pts) Your eyes see an orange. What part of your body figures out that it is an orange?
7. (3 pts) Show the five hand-washing steps with your hands and say them. Then name two times you must wash.

### UNIT PROJECT: LIFE-SIZE ME

Trace your child's whole body on a long sheet of paper (butcher paper or taped-together grocery bags). With your child, draw the skull, backbone, ribs, arm bones and leg bones inside the outline. Draw a heart in the chest and two lungs beside it. Mark the five senses with arrows from the eyes, ears, nose, mouth and hands to a small picture of something each sense found this unit. Add the painted handprints and fingerprints from Lesson 6.1 and a little comic of the five hand-washing steps near the hands.

When it is done, hang it on a wall and let your child give a tour: pointing to each bone, each sense and each step, and saying Psalm 139:14 at the end.

- **Body parts:** Head, trunk, arms, legs, hands and feet are traced, and the heart and lungs are drawn in the chest.
- **Bones:** The skull, backbone, ribs, arm bones and leg bones are drawn in the right places and the child can name them.
- **Senses and clean hands:** Five arrows link the eyes, ears, nose, mouth and hands to something each sense found, and the hand-washing comic shows all five steps.
- **Narration:** The child gives the tour in his or her own words and says the verse with help.

#### Answer key

1. The child touches each part correctly. The heart is in the middle of the chest, a little to the left.
2. God made me, in His image. No one else is exactly like me; even my fingerprints are mine alone. "I am fearfully and wonderfully made."
3. The skull protects the brain. The ribs protect the heart and lungs.

4. Any two joints, such as elbow and knee. Bones hold the body up, protect the soft parts inside, or help us move with muscles. Bones are alive and grow and mend.
5. See: eyes. Hear: ears. Smell: nose. Taste: tongue. Touch: skin (hands or any part).
6. The brain. The eyes send a message, and the brain understands it.
7. Wet, soap, scrub, rinse, dry. Any two of: before eating, after the bathroom, after touching animals, after playing outside, after coughing or sneezing into hands.

## DINOSAURS

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Dinosaurs are the animals every child wants to meet, and no one alive has ever seen one. All we have are bones, teeth, eggs and footprints turned to stone. In this unit your child will learn to look at those clues the way a real scientist does: count the horns, look at the teeth, measure the length, count the eggs. Along the way the child will meet the people who found the bones, from Richard Owen, who named the dinosaurs, to the explorers who found a nest of eggs in a red desert.

The four lessons move from names to plant-eaters to meat-eaters to eggs and babies. Each one starts with a real find, has a picture to study and a thing to make or do, and ends with a verse that reminds us who made every beast of the earth. Museum words like *Jurassic* are explained plainly as the names museums use, and each lesson has a short box on how Christians think about time and the Flood.

Nothing in this unit needs to be read by the child. A parent reads aloud, the child points, counts, sorts, digs and draws. At the end the child builds a small dinosaur museum on a table and gives the family a tour.

### BEFORE YOU BEGIN

- Can count out loud to ten and point to each thing as it is counted
- Can tell which of two things is bigger or longer
- Has heard that God made the animals (Genesis 1)
- Can hold a crayon and draw a simple animal with a head, body and legs

### MASTERY CHECKLIST

- I can say what the word dinosaur means and count the three horns on a Triceratops.
- I can name a big plant-eating dinosaur and tell what its teeth were for.
- I can name a meat-eating dinosaur and point to the sharp teeth that show it ate meat.
- I can sort pictures of dinosaurs into plant-eaters and meat-eaters.
- I can tell that dinosaurs hatched from eggs and count the eggs in a nest.
- I can say that God made the dinosaurs, each after its kind.

### OPTIONAL BOOKS AND RESOURCES

- **Smithsonian National Museum of Natural History** (<https://naturalhistory.si.edu/>): Free. The museum's website has pictures and short pages about its dinosaur hall, including a Tyrannosaurus rex and a Triceratops. Good for looking at real skeletons together before a museum visit.
- **American Museum of Natural History, New York** (<https://www.amnh.org/>): Free online. The home of Charles R. Knight's paintings, Barnum Brown's Tyrannosaurus rex

and the Flaming Cliffs eggs. Search the site for dinosaurs to find pictures of the fossil halls.

- **Carnegie Museum of Natural History, Pittsburgh** (<https://www.carnegiemnh.org/>): Free online. The home of the real Diplodocus from Lesson 7.2. Also gather a bag of small plastic toy dinosaurs from any toy store; they are used in every lesson for sorting, naming and the egg dig.

## 7.1 DINOSAUR NAMES ★

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### OBJECTIVES

- Say what the word dinosaur means and tell who first gave dinosaurs that name.
- Point to a Triceratops and count its three horns.
- Match three dinosaur names to the body part each name describes.

**Warm-up.** Line up three toy animals or three animal pictures. Give each one a name that tells how it looks, such as Long-Neck, Spotty or Big-Ears. Say why you picked each name. Dinosaur names work the very same way: they tell what the scientist saw.

**Video.** Coming soon. Dinosaur names and what they mean, for young children; look for the Smithsonian National Museum of Natural History, the American Museum of Natural History, SciShow Kids, Homeschool Pop (Alternate) and museum hall footage of a Triceratops skull.

### KEY TERMS

#### **dinosaur**

A kind of land animal we know from its bones turned to stone. The name means terrible lizard.

#### **fossil**

A bone, tooth, egg or footprint that turned to stone in the ground.

#### **Triceratops**

A dinosaur with three horns on its face. Its name means three-horned face.

#### **paleontologist**

A scientist who digs up fossils and studies them.

### CORE IDEAS

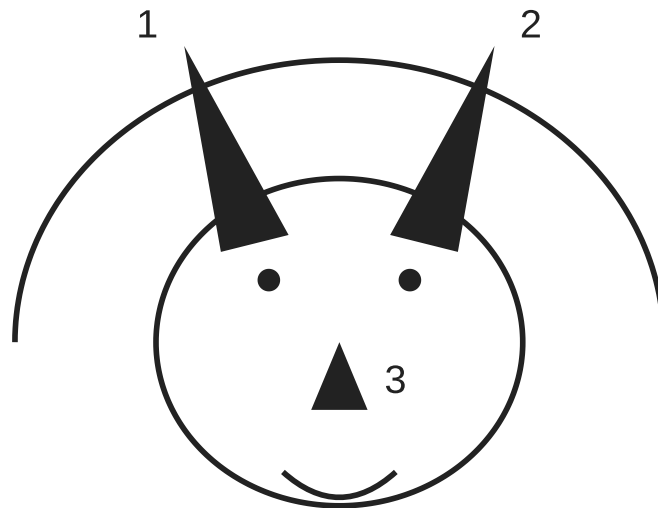
**The story.** In the year 1842, in England, a scientist named Richard Owen was looking at some very big bones. The bones had been dug out of rock. One was a giant jaw with sharp teeth. Some were leg bones as big as a grown-up's leg. Owen knew the bones of many animals, and these bones did not match any of them. They were like a lizard's bones, but huge, and the legs stood straight under the body like an elephant's. So Owen gave this new group of animals a new name: **dinosaurs**. The name means terrible lizards. Owen did not mean they were bad. He meant they were so big and so strong that they filled him with wonder.

**How they figured it out.** Every dinosaur name is a little picture in words. In 1889 a scientist named Othniel Charles Marsh was sent a giant skull from Wyoming. It had a bony collar behind its head and three horns on its face. He named it **Triceratops**. Say it slowly: tri-cera-tops. Tri means three. Cera means horn. The last part, ops, means face. Three-

horned face! Stegosaurus means roof lizard, because of the big plates on its back. Tyrannosaurus rex means tyrant lizard king, because of its giant teeth. When you hear a long dinosaur name, do not be afraid of it. It is just a scientist telling you what he saw.

**The big idea.** Scientists who dig up and study fossils are called **paleontologists**. When they find a new animal, they look at it very carefully before they name it. Then they build the name out of old Greek and Latin words, so that scientists in every country call it the same thing. On a museum sign you will also see words like *Jurassic* and *the age of dinosaurs*. Those are museum words for the rock layers where the bones are found and for a time long ago. We will learn to read them, and we will also think about what the Bible says.

**God's handiwork.** The Bible tells us that God made every beast of the earth after his kind. Dinosaur bones show us some of the wonderful creatures He made. Their horns, plates, long necks and sharp teeth all had a job to do. When you look at a dinosaur, be a little scientist. Look closely, count the horns, and ask, "What does its name tell me?"



tri = three cera = horn tops = face

*Count the horns: 1, 2, 3. Tri means three, cera means horn, and the ending ops means face.*

### **Thinking About Time**

**What the sign says.** Museum signs say dinosaurs lived a very, very long time ago, long before there were any people.

**What we observe.** What we can see today are bones, teeth and eggs turned to stone, buried in layers of hard mud. No one has a photograph of a living dinosaur.

**How Christians read it.** Many Christians read Genesis and believe God made the dinosaurs on the same day He made the other land animals and the first people, and that the great Flood buried many of them in mud.

**Try it.** Press a toy dinosaur into play dough and lift it out. The shape left behind is like a fossil.

*Genesis 1:24*

## PICTURE STUDY



*Triceratops*, Charles R. Knight, 1901 · Painting · Smithsonian Institution, Washington

Charles R. Knight was an American artist who loved animals. He drew lions and elephants at the zoo, and then he worked with scientists to paint dinosaurs the way their bones suggested they looked. No one had ever seen a living Triceratops, so Knight studied the skull and the bones very carefully before he picked up his brush.

This is one of the earliest paintings of a Triceratops. Many later pictures of dinosaurs copied Knight's ideas.

### Look closely

- Count the horns on the dinosaur's face. How many do you see?
- Find the big bony collar behind its head. It is called a frill.
- Look at the legs. Are they under the body like an elephant's, or out to the side like a lizard's?
- What is the dinosaur standing on? Is the land flat or hilly?

### Talk about it

1. Why do you think the scientist named this animal three-horned face?
2. The artist never saw a real Triceratops. What did he look at to help him paint it?
3. If you could give this dinosaur your own name, what would it be?

## MAKE AND DO: DINOSAUR NAME TAGS

Real museums put a name tag by every dinosaur. You will make name tags for your own dinosaurs and then invent a brand-new dinosaur and give it a name that tells how it looks.

### You will need

- Toy dinosaurs, or dinosaur pictures from a library book
- Paper strips or index cards for tags
- Crayons or markers
- Tape or string

### Steps

1. Pick three dinosaurs. A parent says each name slowly, in parts: tri-cera-tops, stego-saurus, tyranno-saurus.
2. For each one, the child points to the part of the body the name is about: the three horns, the roof plates, the giant teeth.
3. The parent writes the name on a tag. The child draws a tiny picture of that body part beside it.
4. Tape or tie each tag to the matching toy or picture.
5. Now invent a new dinosaur. Draw it big. Does it have spikes? A long neck? Five horns?
6. Give it a name made of parts, like Five-Horn-Face or Spike-Tail. The parent writes it on a tag.
7. Set up your dinosaurs with their tags on a table and give a museum tour to the family.

### Tips

- Clap once for each part of the name. Tri (clap), cera (clap), tops (clap).
- If a name is hard to say, the child can use the English meaning: Three-Horn-Face.

### Check your work

- I can say what dinosaur means.
- I can point to the three horns on a Triceratops.
- I can tell what my made-up dinosaur name means.

## NATURE NOTEBOOK

1. Draw a Triceratops head. Count and draw three horns. A parent writes 1, 2, 3 next to them.
2. Draw the body part each name is about: plates for Stegosaurus, big teeth for Tyrannosaurus rex.
3. Draw yourself as a paleontologist with a brush and a hat, digging up a bone.

**From history.** In 1854 the first life-size dinosaur statues in the world were set up in a park in London, at the Crystal Palace. The sculptor was Benjamin Waterhouse Hawkins,

and Richard Owen gave him advice. On New Year's Eve of 1853, before the statues were finished, Hawkins held a dinner party for Richard Owen and about twenty other guests inside the mold of the Iguanodon statue. The statues still stand beside a lake in the park today, and children can see them from the paths.

## WORKED EXAMPLES

**Example 1.** Look at the Triceratops picture. How many horns does it have? What does the name say?

*(Use the map or drawing "Three horns, three-horned face." shown earlier in this lesson.)*

1. Point to each horn and count out loud: one, two, three.
2. Say the name in parts: tri, cera, tops.
3. Tri means three. Cera means horn. The last part, ops, means face.

**Answer:** Three horns. The name Triceratops means three-horned face, and the picture matches the name.

## PRACTICE

1. **EASY** What does the word dinosaur mean?
2. **EASY** Point to a Triceratops picture. Count its horns out loud.
3. **MEDIUM** Stegosaurus means roof lizard. Point to the part of its body the name is about.
4. **MEDIUM** Who gives a dinosaur its name: the dinosaur, the museum guard, or the scientist who studies its bones?
5. **HARD** Tell a grown-up in your own words: how did Richard Owen know the giant bones were not from any animal alive today?

## COMMON MISTAKES

- Thinking dinosaur means dragon or monster. It means terrible lizard, a name a scientist made up for real animals he found in rock.
- Thinking every big animal from long ago was a dinosaur. Mammoths, flying pterosaurs and swimming plesiosaurs are not dinosaurs. Dinosaurs walked on land with their legs straight under them.
- Thinking a dinosaur's name is found on its bones. People choose the names, and they build them from old words that describe what they saw.

**Make it a game · Say My Name, Show My Part.** A parent calls out a dinosaur name in parts: tri-cera-tops, stego-saurus, tyranno-saurus. The child must act out the body part: hold up three fingers on the forehead for three horns, make flat plate hands up the back for roof lizard, or chomp with big teeth for the king. Then switch: the child calls, the parent acts. Play until you have done each name three times.

**Scripture.** “And God said, Let the earth bring forth the living creature after his kind, cattle, and creeping thing, and beast of the earth after his kind: and it was so.” (Genesis 1:24, KJV)

Dinosaurs were beasts of the earth. God made each kind, and people like Richard Owen only found them and gave them names.

#### Practice answers

1. Terrible lizard. Richard Owen gave the name because the bones were so big and strong.
2. One, two, three. Three horns.
3. The big flat plates standing up along its back.
4. The scientist who studies its bones, a paleontologist.
5. He knew the bones of living animals, and these did not match any of them. They were like a lizard's but much bigger, with legs straight under the body, so he gave them a new name.

## 7.2 BIG PLANT-EATERS

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### OBJECTIVES

- Name two big plant-eating dinosaurs and tell what they ate.
- Tell how a plant-eater's teeth and long neck helped it eat leaves.
- Compare the length of a Diplodocus to a car and a school bus.

**Warm-up.** Go to the kitchen. Find three foods that come from plants, such as a carrot, a leaf of lettuce and an apple. Take a bite of one and chew slowly. Feel which teeth you use, the pointy ones in front or the flat ones in back. Big plant-eating dinosaurs ate plants all day long.

**Video.** Coming soon. Long-necked sauropod dinosaurs and plant-eating dinosaurs for young children; look for the Carnegie Museum of Natural History, the Natural History Museum in London (Dippy the Diplodocus), the Smithsonian, SciShow Kids and Homeschool Pop (Alternate).

### KEY TERMS

#### **plant-eater**

An animal that eats leaves, stems, roots or fruit. Cows, elephants and Diplodocus are plant-eaters.

#### **Diplodocus**

A very long dinosaur with a long neck, a tiny head and a long whip tail. It ate plants.

#### **Stegosaurus**

A plant-eating dinosaur with tall plates on its back and spikes on its tail.

#### **skeleton**

All the bones of an animal, fitted together.

### CORE IDEAS

**The story.** In the summer of 1899, in the dry hills of Wyoming, a team of bone diggers found something huge. Bone after bone came out of the rock. There were neck bones as big as a chair, and a tail that went on and on. The bones belonged to a **Diplodocus**. A rich man named Andrew Carnegie, who made steel in Pittsburgh, paid for the digging. The skeleton was carried back to his museum in Pittsburgh and put together. From nose to tail it was about as long as two school buses! Carnegie was so proud that he had copies made and sent one to London. In 1905 the copy was set up in the big museum there, and people called it Dippy.

**How they figured it out.** How do we know Diplodocus ate plants? Look at its teeth. They were thin pegs, like a row of little pencils, and only at the front of its mouth. Teeth like that cannot bite meat. They are good for one thing: raking leaves off a branch, the way you pull

leaves off a stem with your fingers. Its long neck let it reach food high and low without moving its heavy body. **Stegosaurus** had a small head close to the ground and little teeth for low plants. Triceratops had a beak like a parrot for snipping tough plants, and rows of teeth behind it for chopping them up. Flat or peg teeth, beaks and long necks are all clues that say plant-eater.

**The big idea.** Many of the biggest animals God made are plant-eaters. Elephants and cows eat plants, and so did the biggest dinosaurs. Plants are not very filling, so a plant-eater must eat a great deal and needs a big belly to hold it all. That is one reason plant-eaters are often so large. On a museum sign next to Diplodocus you may see the word *Jurassic*. That is the museum's name for the rock layers where Diplodocus bones are found.

**God's handiwork.** In the book of Job, God tells Job to look at a huge animal called behemoth, which "eateth grass as an ox" and has bones like bars of iron. Some Christians think behemoth sounds like a great plant-eating dinosaur. Others think of an elephant or a hippo. Either way, God is telling Job to look closely at a mighty creature and be amazed at who made it. That is what we do with Diplodocus.

Child



about 4 feet

Car



about 15 feet

School bus



about 40 feet

Diplodocus



about 85 feet

1 bus

2 buses

*A picture chart of lengths. A Diplodocus is about as long as two school buses.*



### Thinking About Time

**What the sign says.** The museum sign by Diplodocus says Jurassic. The museum means a time very long ago, long before people.

**What we observe.** We see huge bones buried together in layers of sandstone and mudstone. The bones were buried quickly by mud and water, or they would have rotted away.

**How Christians read it.** Many Christians believe the great Flood in Noah's day buried animals like Diplodocus in thick mud, and that is why we find them in rock today.

**Try it.** Bury a chicken bone in a cup of wet sand and let it dry hard. Now dig it out carefully with a spoon and a paintbrush.

*Genesis 7:11*

## PICTURE STUDY



*Brontosaurus*, Charles R. Knight, 1897 · Painting · American Museum of Natural History, New York

Charles R. Knight painted this long-necked dinosaur for the big museum in New York. *Brontosaurus* means thunder lizard, because scientists thought the ground must have shaken when it walked. In Knight's day many scientists believed such a heavy animal had to stand in water to hold up its weight, so he painted it in a lake.

Today scientists have looked at the leg bones and footprints again. They believe *Brontosaurus* walked on dry land, like an elephant. Knight did his best with what was known. Science keeps looking and keeps learning.

### Look closely

- Find the dinosaur in the water. Find the one on the land.
- Follow the long neck from the body to the tiny head. Now follow the tail. Which is longer?
- What plants do you see? Could the dinosaur reach them with its long neck?
- Look at the legs. Are they thick like tree trunks or thin like a bird's?

### Talk about it

1. Why did the artist put the dinosaur in the water? What do scientists think now?
2. What could a long neck help a plant-eater do?

3. Is it all right for scientists to change their minds when they find new clues?

## **MAKE AND DO: WALK THE LENGTH OF A DIPLODOCUS**

A picture cannot show you how big Diplodocus was. Today you will lay out its real length on the ground and walk it from nose to tail.

### **You will need**

- A ball of yarn or string
- A tape measure (a parent uses it)
- Scissors (a parent uses them)
- A yard, a hallway, a sidewalk or a park lawn
- Sidewalk chalk (optional)

### **Steps**

1. A parent measures and cuts a string 85 feet long. That is about how long the Diplodocus in Pittsburgh is.
2. Lay the string out straight on the ground. One end is the nose. The other end is the tip of the tail.
3. The child walks along the whole string. Count your steps out loud. Say the number at the end.
4. A parent cuts a second string 15 feet long. That is about as long as a family car. Lay it beside the first string.
5. Which string is longer? How many car-strings do you think would fit along the Diplodocus string? Try laying the car-string down end to end along it and count.
6. If you have chalk, draw a tiny head at the nose end and a big body in the middle. Stand at the head and look at the tail. That is one big plant-eater.
7. Finish by finding a tree or bush. Pretend your arm is a long neck. Reach a leaf high up. That is how Diplodocus ate.

### **Tips**

- If you do not have room for the whole string, lay out half of it and say, "The real one is twice this long."
- Do the walk again as a slow, heavy Diplodocus, then again as a fast little lizard. Which takes more steps?

### **Check your work**

- I walked the whole length of a Diplodocus.
- I can say which is longer, a car or a Diplodocus.
- I can name one clue that tells us Diplodocus ate plants.

## NATURE NOTEBOOK

1. Draw a Diplodocus with a very long neck and a very long tail. Draw a leafy tree beside it for the neck to reach.
2. Draw a Stegosaurus. Count the plates you drew along its back and tell a parent the number.
3. Draw three plant-eater foods: a leaf, a branch, a fern.

**From history.** Andrew Carnegie liked his Diplodocus so much that he sent plaster copies to museums in London, Berlin, Paris, Vienna and other cities. Dippy stood in the great front hall of the Natural History Museum in London for many years. In 2017 the museum moved Dippy out of the hall to travel around Britain, and a blue whale skeleton was hung in its place. Today Dippy is still one of the most famous dinosaurs in the world, and it is only a copy of the real bones in Pittsburgh.

## WORKED EXAMPLES

**Example 1.** Look at the picture chart. Which is longer, a school bus or a Diplodocus? About how many school buses long is a Diplodocus?

*(Use the map or drawing “Slide the bus bar along the Diplodocus bar and count.” shown earlier in this lesson.)*

1. Find the school bus bar. Put your finger at its end.
2. Find the Diplodocus bar. It goes much farther.
3. Slide the bus length along the Diplodocus bar. It fits one time, then one more time.
4. Count: one bus, two buses.

**Answer:** The Diplodocus is longer. It is about two school buses long.

## PRACTICE

1. **EASY** Name one big dinosaur that ate plants.
2. **EASY** Point to the picture chart. Which bar is shortest? Which is longest?
3. **MEDIUM** Diplodocus had thin peg teeth only at the front of its mouth. Were they for biting meat or raking leaves?
4. **MEDIUM** Put your toy dinosaurs (or pictures) in a row from shortest to longest. Say which one is in the middle.
5. **HARD** Tell a grown-up: why are so many plant-eaters, like elephants and Diplodocus, so big?

## COMMON MISTAKES

- Thinking all dinosaurs were huge. Some plant-eating dinosaurs were no bigger than a turkey.

- Thinking plant-eaters were weak. Triceratops had three strong horns and Stegosaurus had sharp tail spikes to keep it safe.
- Thinking Brontosaurus lived in water because old paintings show it there. Its leg bones and footprints show it walked on land.

**Make it a game · Long-Neck Lunch.** A parent holds paper leaves at different heights: low by the knees, middle at the waist, and high overhead. The child is a Diplodocus. Call out “low leaf,” “middle leaf” or “high leaf,” and the child stretches a long neck (arm) to grab the right one without moving the feet. Count how many leaves the Diplodocus eats before the parent calls “Stegosaurus!” Then everyone drops to the ground to munch low plants. Play three rounds.

**Scripture.** “Behold now behemoth, which I made with thee; he eateth grass as an ox.” (Job 40:15, KJV)

God points Job to a huge plant-eating animal and says, “I made it.” Every big plant-eater, from a cow to a Diplodocus, was made by God.

#### Practice answers

1. Diplodocus, Stegosaurus, Brontosaurus or Triceratops.
2. The child is shortest. The Diplodocus is longest.
3. Raking leaves off branches. Peg teeth cannot bite meat.
4. Any correct order from shortest to longest; the child names the middle one.
5. Plants are not very filling, so a plant-eater must eat a lot and needs a big belly to hold it all. A big body also helps it reach food and stay safe.

## 7.3 FIERCE MEAT-EATERS

### OBJECTIVES

- Name *Tyrannosaurus rex* and tell what its name means.
- Tell how sharp, pointed teeth show that a dinosaur ate meat.
- Sort pictures of teeth into meat-eater teeth and plant-eater teeth.

**Warm-up.** Look at a pet cat or dog, or at a picture of a lion. Look at its teeth. Are they pointed or flat? Now look at a picture of a cow or a horse. Which animal eats meat? Teeth are a clue. Today we will use that clue on dinosaurs.

**Video.** Coming soon. *Tyrannosaurus rex* and meat-eating dinosaurs for young children, with a look at the teeth; look for the American Museum of Natural History, the Field Museum in Chicago (Sue the T. rex), the Smithsonian, SciShow Kids and Homeschool Pop (Alternate).

### KEY TERMS

#### **meat-eater**

An animal that eats other animals. Lions, sharks and *Tyrannosaurus rex* are meat-eaters.

#### **Tyrannosaurus rex**

A giant meat-eating dinosaur with huge teeth and tiny arms. Its name means tyrant lizard king.

#### **claw**

A sharp, curved nail on a foot or hand, for gripping.

#### **Velociraptor**

A small, quick meat-eating dinosaur about the size of a big dog. Its name means swift thief.

### CORE IDEAS

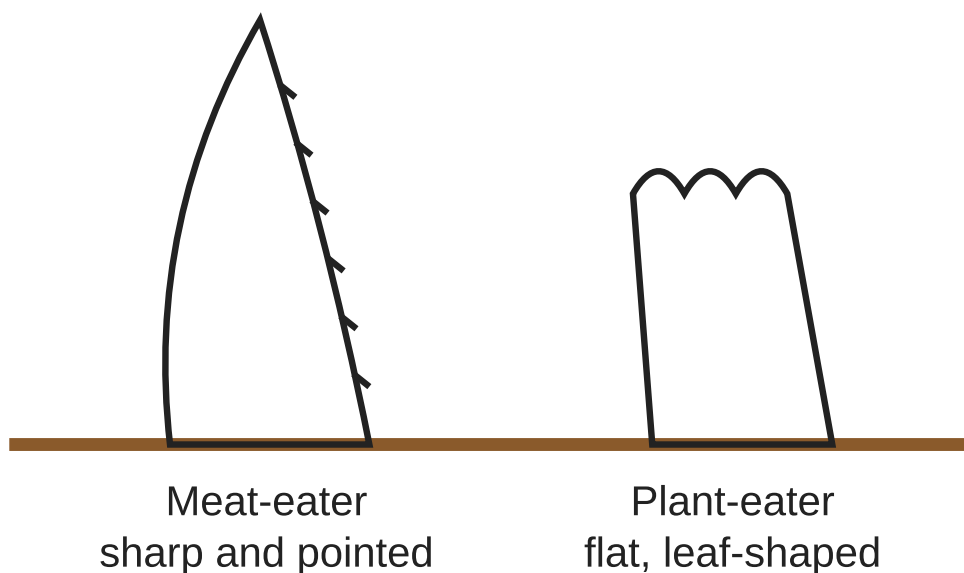
**The story.** In 1902 a bone hunter named Barnum Brown was digging in the badlands of Montana, in a place called Hell Creek. He found huge bones in the rock: a hip, leg bones, pieces of a jaw. The jaw held teeth as long as a banana. Brown packed the bones in plaster and shipped them to the museum in New York. In 1905 a scientist at the museum, Henry Fairfield Osborn, gave the animal its name: ***Tyrannosaurus rex***, the tyrant lizard king. It was the biggest meat-eater anyone had ever found. A few years later Brown found an even better skeleton, and today you can see it standing in the museum.

**How they figured it out.** How do we know *Tyrannosaurus rex* ate meat? Look at the teeth. They are thick, pointed and curved back, like a bunch of bananas with sharp tips. Along each edge are tiny bumps, like the edge of a steak knife. Teeth like that are for cutting meat, not for chewing leaves. Its jaw bones are huge, so its bite was very strong. It walked on two big

back legs, and its eyes faced forward to spot an animal and chase it. Not all meat-eaters were giants. **Velociraptor** was only about as big as a large dog, with a sharp curved claw on each foot. Scientists have even found marks on its arm bones where feathers were attached!

**The big idea.** Teeth tell what an animal ate. Pointed, sharp teeth say meat-eater. Flat, peg or leaf-shaped teeth say plant-eater. Claws, strong jaws and forward eyes are more clues. You can use the same clues on animals alive today. A cat has pointed teeth and claws. A cow has flat teeth and no claws. When you visit a museum, look at the dinosaur's mouth first, and you can guess its dinner.

**God's handiwork.** The Bible says the young lions "seek their meat from God." God made meat-eaters too, and He feeds them. Tyrannosaurus rex was fierce, but it was not a monster. It was an animal with a job in God's world, and every tooth was shaped for that job.



*Meat-eater tooth (left): sharp and pointed. Plant-eater tooth (right): leaf-shaped for mashing plants.*

### Thinking About Time

**What the sign says.** The museum sign by Tyrannosaurus rex says Cretaceous. That is the museum's name for its rock layers and for a time it says was long before people.

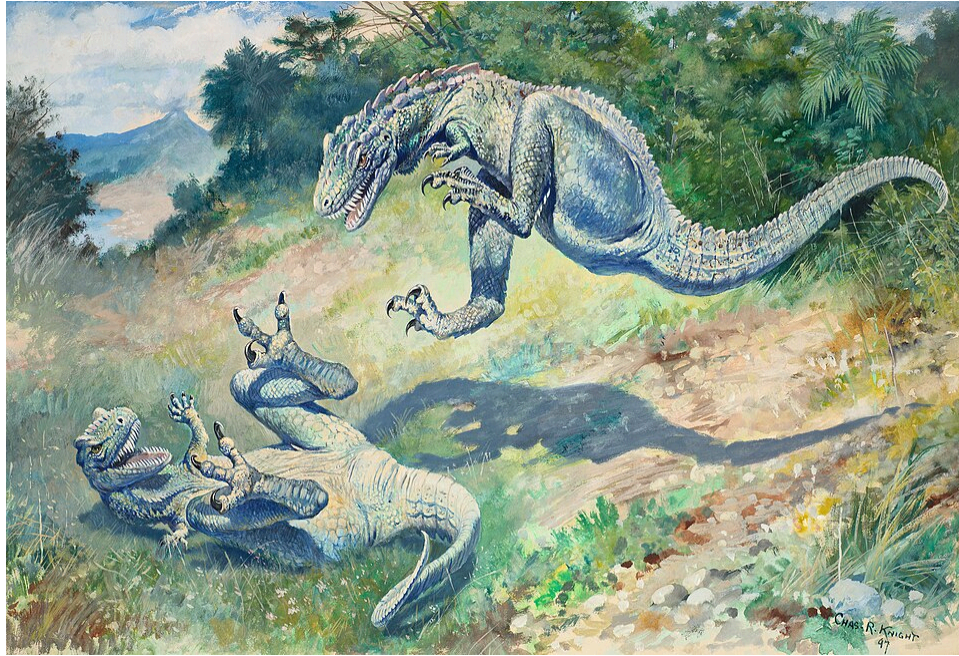
**What we observe.** We see the bones in the rock. Some dinosaur bones still have soft, stretchy bits and blood vessel shapes inside them when scientists look very closely.

**How Christians read it.** Many Christians believe these animals were buried not so very long ago, in the Flood of Noah's day, which is one reason some bones are not completely turned to stone.

**Try it.** Make a bone from play dough and bury it in a cup of mud. Let it dry. Did the mud get hard around it?

*Genesis 7:21*

## PICTURE STUDY



*Leaping Laelaps*, Charles R. Knight, 1897 · Watercolor · American Museum of Natural History, New York

Charles R. Knight painted this picture of two meat-eating dinosaurs fighting. The dinosaur was called *Laelaps* in his day. Today scientists call it *Dryptosaurus*. It walked on two legs and had sharp teeth and claws, like the bigger *Tyrannosaurus rex*. God made both, and they share some of the same features.

This was one of the first pictures to show dinosaurs as quick, active animals that could jump, instead of slow, heavy lizards. Knight had watched real animals move at the zoo, and he put that life into his dinosaurs.

### Look closely

- Find the dinosaur in the air. Which of its feet is highest?
- Find the dinosaur on the ground. Is its mouth open or shut?
- Look for claws on the hands and feet. Are they straight or curved?
- How many legs is each dinosaur standing or jumping on?

### Talk about it

1. What clues in the picture tell you these dinosaurs ate meat?
2. Do these dinosaurs look slow or quick? What makes you say so?
3. Why do you think a meat-eater needs claws as well as teeth?

**Safety first.** Only a parent handles any kitchen knife. The child uses a plastic fork and a spoon. Wash hands before and after handling food.

## **MAKE AND DO: SHARP TEETH, FLAT TEETH**

You will test two kinds of teeth on real food to see what each kind is good for. Then you will make a Tyrannosaurus rex tooth as long as a banana.

### **You will need**

- A banana (keep one for measuring)
- A lettuce leaf or a piece of cooked carrot
- A plastic fork (the pointy teeth) and a spoon (the flat teeth)
- A ruler
- Play dough or modeling clay

### **Steps**

1. Peel the banana and put a piece on a plate. Press the plastic fork into it. The points go in and tear it. Those are meat-eater teeth.
2. Now press the spoon down on another piece. It squashes and mashes. Those are plant-eater teeth.
3. Try both tools on the lettuce leaf. Which tool tears it? Which one only flattens it?
4. Say the rule out loud: pointed teeth tear, flat teeth mash.
5. Hold a whole banana next to the ruler. About how many inches long is it? That is about how long a big Tyrannosaurus rex tooth was, root and all.
6. Roll play dough into a tooth as long as the banana. Make it pointed at one end and curve it a little. Press tiny bumps along the edge with a toothpick.
7. Now roll a tiny tooth the size of your own front tooth. Put the two side by side. Which is bigger? How many of your teeth could line up along the big one?

### **Tips**

- A plant-eater tooth can be made too: a short, flat, leaf-shaped one. Keep both teeth for your museum.
- Eat the banana pieces when you are done. Nothing is wasted.

### **Check your work**

- I can say what pointed teeth are for and what flat teeth are for.
- I made a Tyrannosaurus rex tooth as long as a banana.
- I can name one more clue, besides teeth, that says meat-eater.

## NATURE NOTEBOOK

1. Draw a big Tyrannosaurus rex head with its mouth open. Draw pointed teeth. Count them and tell a parent the number.
2. Draw one sharp tooth and one flat tooth. A parent writes meat-eater and plant-eater under them.
3. Draw a Velociraptor the size of a dog standing next to a dog. Which one did you make bigger?

**From history.** One of the most complete Tyrannosaurus rex skeletons ever found was dug up in 1990 in South Dakota by a fossil hunter named Sue Hendrickson. The dinosaur is called Sue after her. Sue's bones were bought by the Field Museum in Chicago, where they were put together and shown to the public in the year 2000. Sue is about 40 feet long from nose to tail, and children still line up to see her every day.

## WORKED EXAMPLES

**Example 1.** A big Tyrannosaurus rex tooth was about as long as a banana. Measure a banana with a ruler. Is the dinosaur tooth bigger or smaller than your own tooth?

*(Use the map or drawing "Pointed for tearing, flat for mashing." shown earlier in this lesson.)*

1. Lay the banana along the ruler, starting at the zero end.
2. Read the number at the other end. Most bananas reach about 7 inches.
3. Your front tooth is less than 1 inch long.
4. Compare: 7 inches is much more than 1 inch.

**Answer:** A banana is about 7 inches long, so the Tyrannosaurus rex tooth was much bigger than your tooth. Many of your teeth could line up along one of its teeth.

## PRACTICE

1. **EASY** What does Tyrannosaurus rex mean?
2. **EASY** Point to the tooth picture. Which tooth belongs to a meat-eater? How do you know?
3. **MEDIUM** Sort these animals into meat-eaters and plant-eaters: lion, cow, Tyrannosaurus rex, Diplodocus, cat, horse.
4. **MEDIUM** Was Velociraptor as big as a house, or about as big as a large dog?
5. **HARD** Tell a grown-up two clues, besides teeth, that show a dinosaur ate meat.

## COMMON MISTAKES

- Thinking we know what Tyrannosaurus rex sounded like. No one has ever heard one. The roars in movies are made up.

- Thinking every meat-eating dinosaur was a giant. Velociraptor was about the size of a big dog, and some meat-eaters were even smaller.
- Thinking a meat-eater is a bad animal. Lions, hawks and sharks eat meat too. God made them and feeds them.

**Make it a game · T. rex Says.** Play it like Simon Says. The parent is the tyrant lizard king. “T. rex says stomp on two legs.” “T. rex says make tiny arms.” “T. rex says chomp three times.” If the parent leaves out “T. rex says,” the child must freeze like a fossil. Mix in plant-eater moves to trick the player: “T. rex says munch a leaf with flat teeth.” Switch leaders after five commands.

**Scripture.** “The young lions roar after their prey, and seek their meat from God.” (Psalm 104:21, KJV)

Even the fiercest hunters get their food from God’s hand. Meat-eaters are part of His world, and He cares for them.

#### Practice answers

1. Tyrant lizard king.
2. The tall pointed one on the left, because sharp pointed teeth are for cutting meat.
3. Meat-eaters: lion, Tyrannosaurus rex, cat. Plant-eaters: cow, Diplodocus, horse.
4. About as big as a large dog.
5. Any two of: sharp curved claws, big strong jaws, eyes that face forward for chasing, walking fast on two legs.

## 7.4 DINOSAUR EGGS AND BABIES

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### OBJECTIVES

- Tell that dinosaurs hatched from eggs, like birds and turtles.
- Tell the story of the dinosaur eggs found in the desert and the egg thief that was really a parent.
- Count the eggs in a nest and compare a dinosaur egg to a chicken egg.

**Warm-up.** Hold a chicken egg from the refrigerator in your hand. Feel how hard and smooth the shell is. A dinosaur egg had a hard shell too, but it was bumpy and often longer, like a stretched-out loaf. Name three animals you know that hatch from eggs.

**Video.** Coming soon. Dinosaur eggs, nests and baby dinosaurs for young children, including the Flaming Cliffs egg discovery and Oviraptor on its nest; look for the American Museum of Natural History, the Museum of the Rockies, the Smithsonian, SciShow Kids and Homeschool Pop (Alternate).

### KEY TERMS

#### egg

A hard-shelled case with a baby animal growing inside. Birds, turtles and dinosaurs lay eggs.

#### nest

The place where a parent lays its eggs and keeps them safe.

#### hatch

To break out of the egg and be born.

#### Oviraptor

A dinosaur whose name means egg thief. Scientists later found it was sitting on its own nest.

### CORE IDEAS

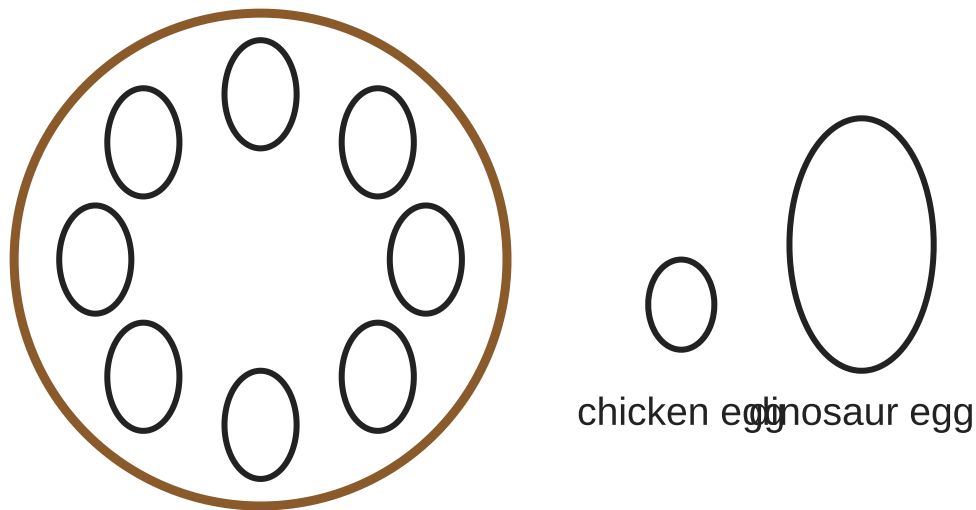
**The story.** In July of 1923 a team of explorers from the museum in New York was crossing the Gobi Desert in Mongolia. Their leader was Roy Chapman Andrews. They camped by some red cliffs that glowed like fire at sunset, so they called them the Flaming Cliffs. One of the men, George Olsen, walked back to camp and said he had found some eggs. The others laughed. Then they went to look. There in the red rock lay a nest of long, bumpy eggs, turned to stone. They were dinosaur eggs! Until then, almost no one had ever seen one. The news went around the world.

**How they figured it out.** Near the eggs the team found bones of a small horned dinosaur called Protoceratops, so they decided the eggs were hers. Lying right on top of one nest were the bones of a different dinosaur, with a beak and no teeth. The scientists thought it

had been caught stealing the eggs, so they named it **Oviraptor**, which means egg thief. Many years later other scientists found an egg of the very same kind in the same desert, and they opened it very carefully. Inside was a tiny baby, and it was not a Protoceratops. It was a baby of the Oviraptor kind! The egg thief had not been stealing at all. It was a parent sitting on its own nest, like a hen. The name was a mistake, but good scientists keep looking and fix mistakes.

**The big idea.** Every dinosaur, even the biggest, began life inside an egg. The shells were hard, like a bird's egg. Many nests were rings of eggs laid in sand. Most dinosaur eggs were about the size of a grapefruit or a cantaloupe. A baby long-necked dinosaur hatched small enough to hold in your arms, and it had to grow and grow. Dinosaurs laid eggs the way birds, turtles and crocodiles do today. Some dinosaurs also sat on their nests like a hen, and some had feathers. God made both dinosaurs and birds, and they share some of the same features.

**God's handiwork.** In the book of Job, God speaks of the ostrich, which "leaveth her eggs in the earth, and warmeth them in dust." Some dinosaurs did the very same thing in the warm sand. God made each creature after its kind. A hen's egg hatches a chick, a turtle's egg hatches a turtle, and a dinosaur's egg hatched a little dinosaur that looked like its parents.



A ring nest. Count the eggs.

*Count the eggs in the ring nest. Compare the chicken egg to the dinosaur egg.*

### **Thinking About Time**

**What the sign says.** The museum sign by the eggs says they are from a time very long ago, long before people.

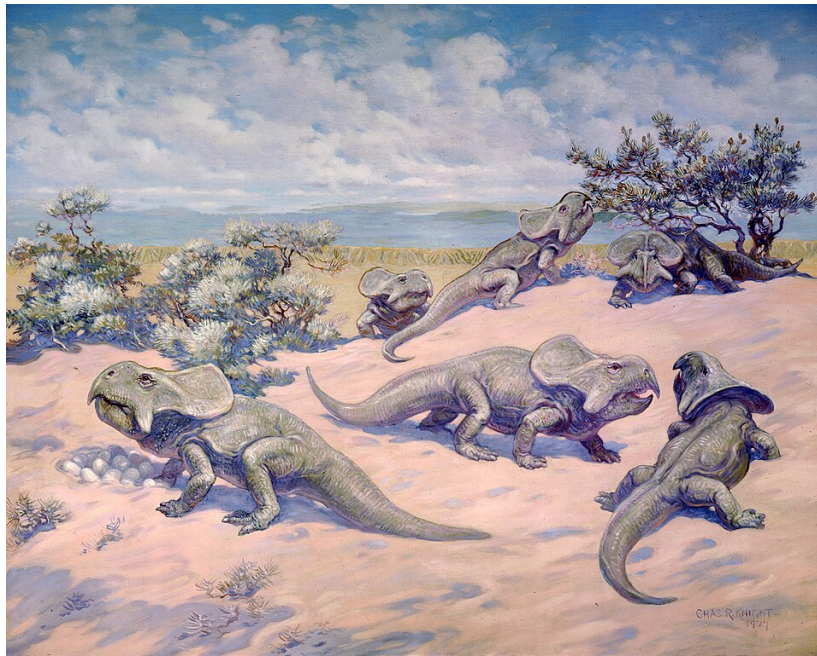
**What we observe.** We see whole nests of eggs still in a ring, turned to stone, some with tiny bones inside. Eggs left out in the open break and rot, so these were covered up fast.

**How Christians read it.** Many Christians believe these nests were buried quickly by sand and water in the great Flood, which is why we find them whole.

**Try it.** Leave a cracked eggshell outside for a day. Does it stay whole? Now think about why stone eggs are still in a ring.

*Genesis 7:19*

## PICTURE STUDY



*Protoceratops and Its Eggs*, Charles R. Knight, 1927 · Oil on canvas (museum mural) · Field Museum, Chicago

A few years after the eggs were found at the Flaming Cliffs, Charles R. Knight painted this picture for the Field Museum in Chicago. He studied the bones of Protoceratops very carefully and painted the little dinosaurs from many sides, standing, walking and lying by a nest of long eggs in the desert sand.

Knight painted what scientists believed at the time: that these were Protoceratops eggs. Later, as you learned in this lesson, scientists found a baby of the Oviraptor kind inside an egg like these. The painting shows us how carefully people looked, and also how good scientists change their minds when they find new clues.

### Look closely

- Count the dinosaurs. How many can you find?
- Find the nest. Are the eggs round like a ball or long like a loaf of bread?
- Find the beaks and the bony frills behind the heads.
- What is the ground like? Is it green and wet, or dry and sandy?

### Talk about it

1. Whose eggs did Knight think these were? Whose eggs were they really?
2. Why is it all right for scientists to fix a mistake?
3. If you could hatch one of these eggs, what would you want to see come out?

**Safety first.** Keep sand and rice away from eyes and mouths. The small toys inside the eggs are not for children who still put things in their mouths. A parent stays with the child during the dig.

### MAKE AND DO: DINOSAUR EGG DIG

You will be a bone hunter at the Flaming Cliffs. A nest of eggs is buried in the sand. Dig gently, brush off each egg, count them, and find out what hatches.

#### You will need

- A plastic tub or sandbox filled with sand, dry rice or dried beans
- Six to ten plastic eggs that open
- A small toy dinosaur or a paper dinosaur to put inside each egg
- A spoon and a clean paintbrush
- A tray or towel to lay the eggs on

#### Steps

1. A parent puts a small dinosaur inside each egg, then buries the eggs in a ring in the sand while the child is not looking.
2. The child digs slowly with the spoon. When an egg appears, stop digging and use the brush, like a real paleontologist.
3. Lift each egg out carefully and lay it on the tray in the same ring shape it was in.
4. Count the eggs out loud. Say the number.
5. Hold a real chicken egg next to a plastic egg. Which is bigger? Which is smoother?
6. Open one egg at a time. What hatched? Is it a baby of the same kind as the others?
7. Put the babies in a line from smallest to biggest. Tell a parent the story of the egg thief who was really a parent.

#### Tips

- Hide one egg with nothing inside. Real scientists find empty or broken eggs too.
- Make the dig harder for an older child: bury the eggs deeper and set a timer.

#### Check your work

- I dug out every egg gently and counted them.
- I can say that dinosaurs hatched from eggs.
- I can tell what happened to the name egg thief.

## NATURE NOTEBOOK

1. Draw a ring nest in the sand with eggs in it. Count them and tell a parent the number.
2. Draw a baby dinosaur cracking out of its egg.
3. Draw a chicken egg and a dinosaur egg side by side. Make the dinosaur egg bigger.

**From history.** In 1978 a bone hunter named Jack Horner found nests of a duck-billed dinosaur in Montana, with eggshells and baby dinosaurs still in the nests. The babies' teeth were worn from eating, so a parent must have brought food to them. Horner named the dinosaur *Maiasaura*, which means good mother lizard. The hill where he found the nests is now called Egg Mountain.

## WORKED EXAMPLES

**Example 1.** Look at the nest picture. How many eggs are in the ring? Then look at the two eggs on the right. Which is bigger, the chicken egg or the dinosaur egg?

*(Use the map or drawing "Count around the ring. Compare the two eggs." shown earlier in this lesson.)*

1. Put your finger on the egg at the top of the ring. Count around the ring one way until you come back to the top: one, two, three, four, five, six, seven, eight.
2. Now look at the two eggs on the right. Compare them side by side.
3. The dinosaur egg is taller and wider.

**Answer:** There are 8 eggs in the nest. The dinosaur egg is bigger than the chicken egg.

## PRACTICE

1. **EASY** Were baby dinosaurs born alive like puppies, or did they hatch from eggs?
2. **EASY** Name two animals alive today that hatch from eggs.
3. **MEDIUM** What does *Oviraptor* mean, and why was the name a mistake?
4. **MEDIUM** Point to the nest picture. Count the eggs. If one egg hatched, how many eggs would be left?
5. **HARD** Tell a grown-up: God made dinosaurs and birds. What features do they share?

## COMMON MISTAKES

- Thinking dinosaur eggs were as big as a car. Most were about the size of a grapefruit or a cantaloupe, and even the biggest were small next to the grown-up.
- Thinking the *Oviraptor* really stole eggs. The name was a mistake. It was a parent on its own nest.
- Thinking baby dinosaurs were born big. They hatched small and had to grow for years, like a chick growing into a hen.

**Make it a game · Hatch Out.** Everyone curls up small on the floor inside a pretend egg. A parent counts slowly: “One, two, three, four, five.” At five, everyone cracks out, first a head, then an arm, then a leg, and stands up as a baby dinosaur. The parent names a kind: “Baby Triceratops!” and everyone shows three fingers for horns. “Baby T. rex!” and everyone chomps. “Baby Diplodocus!” and everyone stretches a long neck. Curl back up and play again, counting to a bigger number each time, up to ten.

**Scripture.** “Which leaveth her eggs in the earth, and warmeth them in dust,” (Job 39:14, KJV)

God describes the ostrich laying her eggs in warm sand. Some dinosaurs laid their eggs in the sand the same way. God made every kind, and every kind brings forth its own babies.

#### Practice answers

1. They hatched from eggs.
2. Any two: chickens, ducks, turtles, crocodiles, snakes, lizards, frogs, fish.
3. It means egg thief. Scientists later found a baby of the Oviraptor kind inside an egg like those, so the dinosaur was sitting on its own nest, not stealing.
4. 8 eggs; if one hatched there would be 7 left.
5. Both lay hard-shelled eggs in nests, some dinosaurs sat on their nests like a hen, and some had feathers. The bones of their legs and hips are alike too.

## UNIT 7 REVIEW

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A parent asks each question aloud and the child answers out loud, by pointing, or by drawing. There are 20 points. Give full points for a clear answer in the child's own words, and half points for an answer with a little help.

1. (3 pts) What does the word dinosaur mean? Who gave dinosaurs that name?
2. (2 pts) Point to a Triceratops picture and count its horns. What does its name mean?
3. (3 pts) Name a big plant-eating dinosaur. How do we know it ate plants?
4. (2 pts) Which is longer, a school bus or a Diplodocus? About how many school buses long is a Diplodocus?
5. (3 pts) What does Tyrannosaurus rex mean? Point to the kind of teeth that show a dinosaur ate meat.
6. (2 pts) Sort these into meat-eaters and plant-eaters: Tyrannosaurus rex, Diplodocus, Velociraptor, Stegosaurus.
7. (3 pts) How were baby dinosaurs born? Tell the story of the egg thief.
8. (2 pts) Who made the dinosaurs? Say the Bible words "after his kind" and tell what they mean.

### UNIT PROJECT: MY DINOSAUR MUSEUM

Set up a small dinosaur museum on a table or shelf. Include at least four dinosaurs, drawn, made of play dough or toys, each with a name tag a parent writes. Sort them into a plant-eater side and a meat-eater side. Add your play dough Tyrannosaurus rex tooth, your Diplodocus string or chalk drawing, and your ring nest of eggs from the dig.

Then give the family a museum tour. For each dinosaur, say its name, what it ate, and one clue from its body that tells you so. Finish the tour by saying who made the dinosaurs.

- **Names:** Each dinosaur has a name tag, and the child can say what at least two of the names mean.
- **Sorting:** Plant-eaters and meat-eaters are on the right sides, and the child points to the teeth or other clue for each.
- **Eggs and size:** The nest of eggs is counted correctly, and the child can say which is longer, a car or a Diplodocus.
- **Tour:** The child gives the tour in his or her own words, with care and wonder, and ends by saying that God made every dinosaur after its kind.

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#### Answer key

1. Terrible lizard. Richard Owen, a scientist in England, gave the name because the bones were so big and strong.
2. Three horns. Triceratops means three-horned face.
3. Diplodocus (or Stegosaurus, Brontosaurus, Triceratops). Its teeth were pegs or flat, or it had a beak, which are good for leaves and not for meat.

4. The Diplodocus is longer. About two school buses.
5. Tyrant lizard king. Sharp, pointed, curved teeth with bumpy edges like a steak knife.
6. Meat-eaters: Tyrannosaurus rex, Velociraptor. Plant-eaters: Diplodocus, Stegosaurus.
7. They hatched from eggs. Scientists named a dinosaur Oviraptor, egg thief, because its bones were on a nest. Later they found a baby of the Oviraptor kind inside an egg like those, so it was a parent on its own nest.
8. God made them. After his kind means each kind of animal has babies of its own kind: a dinosaur egg hatched a dinosaur.

## NOAH'S ARK

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The Bible tells us that God once sent a great flood over the whole earth, and that He saved Noah, his family and the animals in a huge wooden ark (Genesis 6–9). In this unit the story of the ark becomes a way to look closely at the animals God made. The animals came to Noah in pairs, a father and a mother of each kind, so you will find pairs and count by twos. They came in every size, from the elephant to the creeping things, so you will compare big and small and read a picture chart of heights. When the Flood was over, God set His bow in the cloud, so you will make a rainbow with sunlight and water and learn its colors in order.

The last lesson goes back to the beginning, when God brought the animals to Adam “to see what he would call them” (Genesis 2:19). You will sort animals into groups the way Carl Linnaeus did, by fur, feathers, scales and six legs, and give an animal a name of your own. Along the way you will study two famous paintings of the animals entering the ark, one by Edward Hicks and one by Jan Brueghel the Elder, and you will measure things with a cubit, just as Noah did.

### BEFORE YOU BEGIN

- Can count to 20 and is beginning to count by twos
- Can tell which of two things is bigger, taller or smaller
- Can name common animals such as a cat, a cow, a hen, a fish and a snake
- Has heard the story of Noah read aloud at least once

### MASTERY CHECKLIST

- I can tell the story of Noah and the ark in order: God told Noah to build it, the animals came two by two, the LORD shut the door, and the rain came.
- I can find pairs and count them by twos.
- I can measure a table or a bed in cubits.
- I can line up animals from smallest to biggest and read a simple picture chart of heights.
- I can say the colors of the rainbow in order and tell what God promised with His bow in the cloud.
- I can sort animals into groups by fur, feathers, scales and six legs, and give an animal a name from what I see.

### OPTIONAL BOOKS AND RESOURCES

- **The King James Bible (free at Project Gutenberg)**  
(<https://www.gutenberg.org/ebooks/10>): Free. A parent reads aloud Genesis 6–9 for the story of the ark and the rainbow, and Genesis 2:19–20 for Adam naming the animals. Read a few verses at a time and let the child narrate back.

- **J. Paul Getty Museum collection online** (<https://www.getty.edu/>): Free. Search the collection for Jan Brueghel the Elder's "The Entry of the Animals into Noah's Ark" and zoom in on the animals for Lesson 8.2.
- **National Gallery of Art, Washington, collection online** (<https://www.nga.gov/>): Free. Search for Edward Hicks's "Peaceable Kingdom" to zoom in and name every animal in Lesson 8.4. Images from the National Gallery are free to download.

## 8.1 TWO BY TWO ★

### OBJECTIVES

- Tell the story of Noah and the ark in my own words: God told Noah to build it, the animals came two by two, and the LORD shut the door.
- Find pairs of things around the house and count by twos.
- Measure a table or a bed in cubits, the way the ark was measured.

**Warm-up.** Go on a pair hunt. Find things in the house that come in twos: shoes, socks, mittens, your own hands, your own eyes. Line the pairs up on the floor. Touch each pair and count by twos: two, four, six, eight. How many pairs did you find?

**Video.** Coming soon. The story of Noah’s ark for young children, told from Genesis 6–9; nature footage of animals in male and female pairs (lions, ducks, deer, cardinals); counting by twos songs. Search Moody Science classics, Homeschool Pop (Alternate), SciShow Kids and children’s Bible story channels.

### KEY TERMS

#### pair

Two things that go together, like two shoes or a mother duck and a father duck.

#### ark

The very big wooden boat God told Noah to build. It was shaped like a long box with a door in the side.

#### cubit

A measure as long as your arm from the elbow to the tip of the longest finger. The ark was measured in cubits.

#### male and female

A father animal and a mother animal. Every pair on the ark had one of each so there could be babies after the Flood.

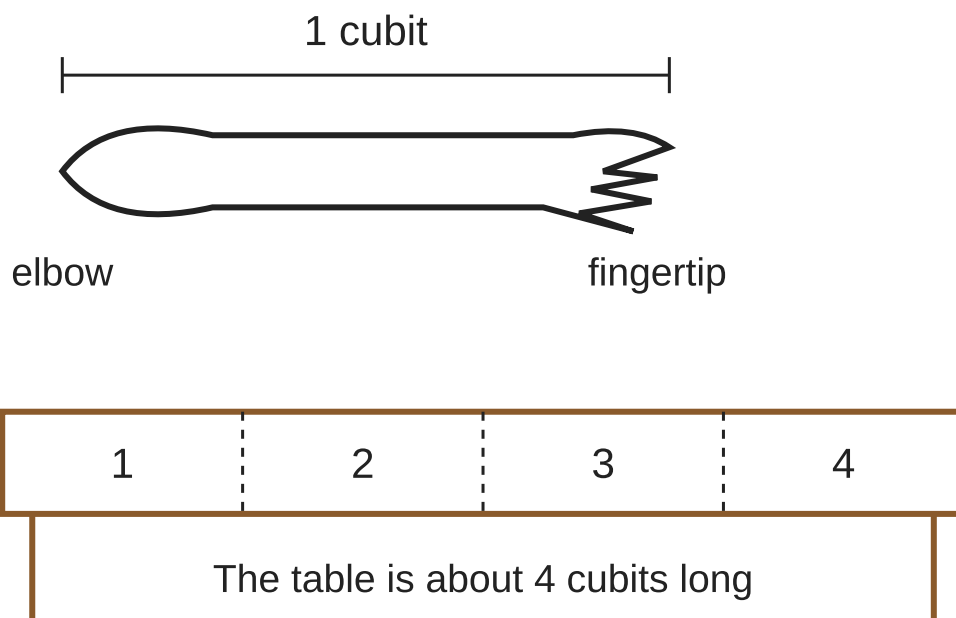
### CORE IDEAS

**The story.** Long ago the earth was full of wicked people, but Noah walked with God. God told Noah that a great flood was coming, and He told him exactly what to build. “Make thee an ark of gopher wood,” God said. It was to be three hundred cubits long, fifty cubits wide and thirty cubits high, with three floors inside, a window near the top and a door in the side. Noah did everything God said. And he did not have to go and catch the animals. “Two of every sort shall come unto thee,” God said. And they came. Birds and beasts and creeping things went in two by two, “the male and the female.” When they were all inside, “the LORD shut him in” (Genesis 7:16).

**How they figured it out.** How did Noah measure such a big boat? He used a **cubit**. A cubit is the length of a grown man's arm from the elbow to the end of the longest finger. Hold your arm out. Put your elbow on the edge of a table and see where your fingers reach. That is *your* cubit. Your cubit is shorter than your father's, so if you both measure the same table, you will count more cubits than he does. People measured with cubits for thousands of years, long before anyone had a ruler.

**The big idea.** Why did the animals come in **pairs**? Because a pair was a father and a mother. After the Flood, each pair could have babies, and the babies would be the same kind as the parents. That is how God filled the earth with animals again. When you count pairs, you count by twos. Two lions. Four, with the two camels. Six, with the two doves. In 1846 a Quaker preacher named Edward Hicks, who painted signs for a living in Newtown, Pennsylvania, painted the animals walking up to the ark in just this way, two by two in a long line under a dark sky.

**Try it and see.** Today you will load your own ark. You will march pairs of toy animals up a ramp and count them by twos. Then you will measure your ark, your table and your bed in cubits, and you will find out whose cubit is longest in your family.



*One cubit is from the elbow to the fingertip. A parent reads the labels while the child measures the table.*

## PICTURE STUDY



*Noah's Ark*, Edward Hicks, 1846 · Oil on canvas · Philadelphia Museum of Art, Philadelphia

Edward Hicks was a Quaker preacher in Pennsylvania who earned his living painting signs and coaches. He loved to paint stories from the Bible. Here he shows the animals coming to Noah, just as God promised. The ark waits on the hill with its door open. The sky is turning dark, because the rain is about to begin.

Look how orderly the animals are. No one is pushing. Each pair walks together, the father and the mother, straight to the door. Hicks shows the animals coming calmly, just as God sent them.

### Look closely

- Find the lions at the front of the line. Are there two? Point to the father lion and the mother lion.
- Follow the line of animals with your finger all the way up to the ark. Count the pairs you can see.
- Find the door in the side of the ark. Find the birds flying toward it.
- Look at the sky. What is the weather about to do?

### Talk about it

1. Why do the animals walk two by two?
2. The animals are not running away or fighting. Who do you think is leading them to the ark?
3. If you were Noah standing at the door, what would you say as each pair came in?

## **MAKE AND DO: LOAD THE ARK TWO BY TWO**

You will make a small ark from a shoebox, march pairs of animals into it, count them by twos, and measure your ark in cubits.

### **You will need**

- A shoebox with its lid, or a cardboard box
- Brown paper or brown crayons
- Toy animals, or animal pictures a parent cuts from an old magazine and tapes to clothespins so they stand up
- A strip of cardboard for a ramp
- Tape and child scissors (a parent cuts the door)

### **Steps**

1. A parent cuts a door in the long side of the box. Color or cover the box brown so it looks like wood. Put the lid on. That is your ark with its door in the side, just like Genesis says.
2. Lean the cardboard strip up to the door for a ramp.
3. Sort your toy animals into pairs. Each pair should be the same kind: two dogs, two horses, two ducks. If you have only one of a kind, draw its partner on paper.
4. March each pair up the ramp and into the door. As each pair goes in, say the number out loud by twos: two, four, six, eight, ten.
5. When all the pairs are in, tell a parent how many animals are inside. Open the lid and count them one by one to check.
6. Now measure. Put your elbow at one end of the box and see where your fingertip reaches. Is the box longer or shorter than one of your cubits? Measure the table and the bed in cubits too.
7. Ask a parent to measure the same table with his or her cubit. Who counted more cubits? Tell why.

### **Tips**

- Say “the LORD shut him in” and close the lid yourself when the last pair is inside.
- If counting by twos is new, hold up two fingers for each pair and count the fingers.

### **Check your work**

- I marched my animals in by pairs and counted by twos.
- I measured my ark and my bed in cubits.
- I can tell the story of the ark with the animals coming two by two.

## **NATURE NOTEBOOK**

1. Draw the ark as the Bible describes it: long like a box, with a door in the side and a window near the top. Draw three floors inside.

2. Draw three pairs of animals walking to the ark. Draw a line under each pair and say the numbers by twos: two, four, six.
3. Lay your arm on the page and let a parent trace it from elbow to fingertip. A parent writes “my cubit” beside it.

**From history.** Edward Hicks did not make up his picture from nothing. He copied the design from a printed picture of Noah’s ark made in 1844 by Nathaniel Currier of New York, whose shop later became the famous Currier and Ives. Hicks lived in Newtown, in Bucks County, Pennsylvania, and painted his most famous picture, the Peaceable Kingdom, more than sixty times. You will see one in Lesson 8.4.

## WORKED EXAMPLES

**Example 1.** How long is the kitchen table in your cubits? Use the picture chart to help.

*(Use the map or drawing “Measure the table by moving your elbow to each mark.” shown earlier in this lesson.)*

1. Put your elbow at one end of the table and stretch your arm along the edge. Where your fingertip ends, put a finger from your other hand to mark the spot. That is 1 cubit.
2. Move your elbow to the mark and stretch again. That is 2 cubits.
3. Keep going to the end of the table: 3 cubits, 4 cubits.
4. If the last stretch does not fit all the way, say “about 4 cubits.”
5. Now a parent measures the same table. A parent’s arm is longer, so the parent counts fewer cubits, maybe 3.

**Answer:** The table is about 4 of my cubits (the exact number depends on your table). A grown-up counts fewer cubits because a grown-up’s cubit is longer.

## PRACTICE

1. **EASY** Point to the pairs on your own body. How many pairs can you find?
2. **EASY** Three pairs of animals walk into the ark. Count by twos. How many animals is that?
3. **MEDIUM** Who shut the door of the ark when all the animals were inside?
4. **MEDIUM** Measure your bed in cubits. Then a parent measures it. Who counted more cubits, and why?
5. **HARD** Tell the story of the ark in three parts, in order: what Noah built, who came to him, and what God did when they were all inside.

## COMMON MISTAKES

- Thinking Noah had to run all over the world catching animals. God said, “Two of every sort shall come unto thee.” The animals came to him.

- Thinking the ark was a little round boat with a pointed front like a storybook picture. The Bible describes a very long box with three floors, a door in the side and a window near the top.
- Thinking every single animal came only by twos. Most did, but God told Noah to take the clean animals by sevens (Genesis 7:2).

**Make it a game • Two by Two Parade.** Spread a blanket on the floor for the ark. A parent calls out an animal: “Elephants!” You and a partner (a brother, a sister or a stuffed animal) walk to the blanket the way that animal moves, side by side as a pair. As each pair steps onto the blanket, everyone says the next number by twos: two, four, six. Keep going until you reach twenty. Then a parent says, “And the LORD shut him in,” and everyone freezes.

**Scripture.** “There went in two and two unto Noah into the ark, the male and the female, as God had commanded Noah.” (Genesis 7:9, KJV)

The animals obeyed God and came in pairs, a father and a mother of each kind, so that after the Flood there could be babies after their kind.

#### Practice answers

1. Two hands, two feet, two eyes, two ears, two arms, two legs: at least 6 pairs.
2. Two, four, six. 6 animals.
3. The LORD shut Noah in (Genesis 7:16). Noah did not shut it himself.
4. The child counts more cubits, because the child’s cubit is shorter, so more of them fit along the bed.
5. Noah built the ark the way God said, long and tall with a door in the side. The animals came to him two by two, male and female. When all were inside, the LORD shut the door, and the rain began.

## 8.2 ANIMALS BIG AND SMALL

### OBJECTIVES

- Sort animals into big and small, and line them up from smallest to biggest.
- Read a simple picture chart of animal heights and tell which is taller.
- Tell that God made animals of every size, each after its kind, and all of them had a place on the ark.

**Warm-up.** Stand in a doorway. Are you taller or shorter than the door? Now hold out one hand. Could a mouse sit on it? Could a cat? Could a horse? Gather five toy animals and line them up on the floor from the smallest to the biggest. Say their names in order.

**Video.** Coming soon. Comparing animal sizes for young children: elephant, giraffe, horse, dog, cat, mouse; the biggest land animal; nature footage of elephants and giraffes beside people. Search SciShow Kids, Homeschool Pop (Alternate), National Geographic Kids, Smithsonian’s National Zoo and Moody Science classics.

### KEY TERMS

#### compare

To look at two things side by side and tell how they are alike and how they are different, like taller and shorter.

#### size

How big something is: how tall, how long or how heavy.

#### kind

A family of animals that are alike and have babies like themselves. God made each animal after its kind.

#### creeping thing

The Bible’s name for small animals that creep along the ground, like lizards, beetles and worms.

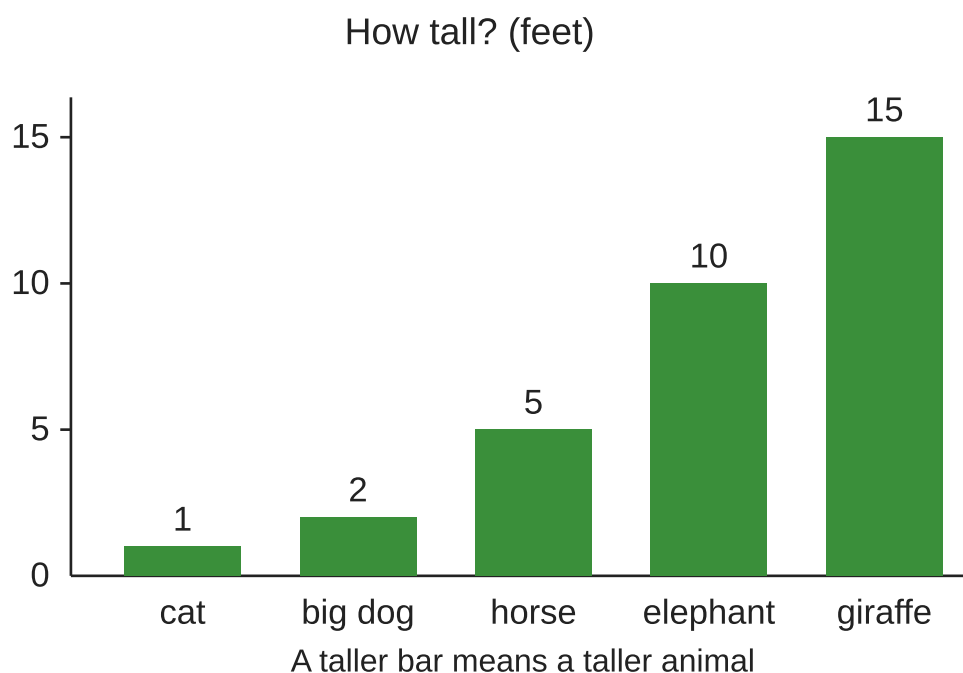
### CORE IDEAS

**The story.** In 1613, in the busy city of Antwerp, a painter named Jan Brueghel the Elder finished a picture of the animals going into Noah’s ark. He had looked at real animals very carefully. The rulers of his country kept lions, leopards, camels, ostriches and parrots in a garden at their palace in Brussels, and Brueghel went to study them. In his painting he put the ark small and far away on a hill, and he filled the front with animals big and small. Big elephants and horses share the ground with tiny guinea pigs, and bats and birds fly across the sky. Brueghel wanted to show what the Bible says: “every beast after his kind, and all the cattle after their kind, and every creeping thing that creepeth upon the earth after his kind, and every fowl after his kind” (Genesis 7:14).

**How they figured it out.** Scientists **compare** animals by putting them side by side. You can do this with your own body. A cat is about as tall as your knee. A big dog comes up to your waist. A horse is taller than your father. An elephant is taller than a door. A giraffe could look in a window on the second floor of a house. The elephant is the biggest animal that walks on land today, and the giraffe is the tallest. At the other end, a mouse fits in your hand and a ladybug sits on your fingertip. A picture chart with bars helps you see all the sizes at once. The taller the bar, the taller the animal.

**The big idea.** God made animals of every **size**, and He gave each one what it needs. The elephant has a long trunk to reach leaves and pull up grass. The mouse has whiskers to feel its way through small holes. Big animals are not better than small ones. "O LORD, how manifold are thy works! in wisdom hast thou made them all," says Psalm 104:24. On the ark, the big animals and the **creeping things** all had a place, because God planned the ark and sent the animals Himself.

**Try it and see.** Today you will make an animal size line on the floor and measure each toy with your hands. Then you will read the picture chart and find out how much taller a horse is than a big dog.



*How tall are they? A parent reads the names while the child points to the tallest and shortest bars. Heights are rounded to whole feet.*

## PICTURE STUDY



*The Entry of the Animals into Noah's Ark*, Jan Brueghel the Elder, 1613 · Oil on panel · J. Paul Getty Museum, Los Angeles

Jan Brueghel the Elder was called “Velvet Brueghel” because his paintings were so smooth and fine. He painted this picture of the animals arriving at the ark in 1613. The ark is tiny in the distance because it is far away. The animals are near us, so they look big.

Brueghel had seen many of these animals alive in the royal gardens in Brussels. He painted the feathers of the birds and the fur of the lions so carefully that you can almost touch them.

### Look closely

- Find the biggest animal in the picture. Find the smallest. Point to each one.
- Find the lions. Find the horses. Find the birds. Which are standing, and which are flying?
- Look far away at the ark. Can you see the little people walking toward it? Why do they look so small?
- Find a pair: two animals of the same kind standing together.

### Talk about it

1. How many different kinds of animals can you name in this picture? Count on your fingers.
2. Would a lion usually stand this close to the animals it hunts? Why are they all calm here?
3. Which animal in the painting would you most like to see for real?

## **MAKE AND DO: ANIMAL SIZE LINE**

You will line up toy animals from smallest to biggest, measure each one with your hands, and make a picture chart of what you find.

### **You will need**

- Five or six toy animals of different sizes (or animal pictures a parent cuts out)
- A strip of masking tape on the floor
- A large sheet of paper and crayons
- Stickers or a crayon for making marks

### **Steps**

1. Stick a long line of tape on the floor. Put the smallest toy animal at one end.
2. Pick up the next animal. Is it bigger or smaller than the first? Put it in its place. Keep going until every animal is in order from smallest to biggest.
3. Measure each animal standing up. How many of your hands tall is it? Lay your hand flat and stack hands from the floor to the top of its head. Say the number.
4. On the paper, a parent draws a box for each animal in order. Draw the animal in its box. Under it, put one sticker or one mark for each hand tall.
5. Look at your chart. Which animal has the most stickers? Which has the fewest? Point and say.
6. Now go to a doorway. A parent marks how tall you are on a strip of tape. Which of your toy animals would be bigger than you if it were real? Which would be smaller?
7. Tell a parent one thing a big animal can do that a small one cannot, and one thing a small animal can do that a big one cannot.

### **Tips**

- Toy animals are not the real sizes. A toy elephant may be smaller than a toy dog. Ask: which would be bigger if they were real?
- If two animals look about the same, stand them back to back and look at the tops of their heads.

### **Check your work**

- I lined up my animals from smallest to biggest.
- I measured each animal in hands and made a chart.
- I can name an animal taller than me and an animal smaller than my hand.

## **NATURE NOTEBOOK**

1. Draw an elephant and a mouse side by side. Make the elephant as big as the page and the mouse tiny in the corner.
2. Draw a giraffe next to a house. Where does its head reach?

3. Draw a creeping thing (a lizard, a beetle or a worm) that could walk right under the elephant's feet.

**From history.** Jan Brueghel the Elder was the son of the famous painter Pieter Bruegel the Elder. He worked for the rulers of the Spanish Netherlands, Archduke Albert and Archduchess Isabella, who kept a menagerie of rare animals at their palace in Brussels. Brueghel was also a close friend of the painter Peter Paul Rubens, and the two often worked on the same picture: Rubens painted the people, and Brueghel painted the animals and flowers.

## WORKED EXAMPLES

**Example 1.** Look at the chart of animal heights. Which animal is the tallest? How much taller is the horse than the big dog?

*(Use the map or drawing "Count up from the shorter bar to the taller one." shown earlier in this lesson.)*

1. Find the tallest bar. It belongs to the giraffe. Its bar reaches 15 feet.
2. Find the horse bar. It reaches 5 feet. Find the big dog bar. It reaches 2 feet.
3. Start at 2 and count up to 5 on your fingers: 3, 4, 5. That is 3 fingers.
4. So the horse is 3 feet taller than the big dog.

**Answer:** The giraffe is tallest. The horse is 3 feet taller than the big dog.

## PRACTICE

1. **EASY** In Brueghel's painting, point to the biggest animal you can find. Point to the smallest. Say their names.
2. **EASY** Sort your toy animals into two piles: big animals and small animals. Count each pile. Which pile has more?
3. **MEDIUM** Look at the chart. How many feet tall is the elephant? Is the giraffe taller or shorter than the elephant?
4. **MEDIUM** Name one animal taller than you and one animal smaller than your hand.
5. **HARD** God made both the elephant and the mouse. Tell one thing each of them has that fits its size, and say why big and small animals both matter.

## COMMON MISTAKES

- Thinking big animals are more important than small ones. The Bible says God made every creeping thing after its kind, and in wisdom He made them all.
- Thinking that in a painting a small animal is really small. In Brueghel's picture the ark looks tiny only because it is far away. Things far off look smaller than they are.
- Thinking the biggest animal is always the tallest. The elephant is the biggest and heaviest land animal, but the giraffe is taller because of its long neck.

**Make it a game · Big Step, Little Step.** A parent calls out an animal. If it is a big animal (elephant, horse, cow, giraffe), take one giant step and stomp. If it is a small animal (mouse, ant, ladybug, frog), take one tiny step on tiptoe. If the parent says “Noah!” everyone freezes. Try to cross the room without a mistake. Then switch, and let the child call the animals.

**Scripture.** “They, and every beast after his kind, and all the cattle after their kind, and every creeping thing that creepeth upon the earth after his kind, and every fowl after his kind, every bird of every sort.” (Genesis 7:14, KJV)

Big beasts, farm cattle, tiny creeping things and birds of every sort all went into the ark. God made every size, and every size had a place.

#### Practice answers

1. Answers vary. The elephants, horses and lions are among the biggest; the small birds, guinea pigs and creeping things are among the smallest.
2. Answers vary. The child should count each pile correctly and say which number is bigger.
3. The elephant is 10 feet. The giraffe is taller (15 feet).
4. Taller: a horse, an elephant, a giraffe, a cow. Smaller than a hand: a mouse, a ladybug, an ant, a beetle.
5. The elephant has a long trunk to reach high leaves and pull grass. The mouse has whiskers to feel its way in small holes. Both matter because God made each one after its kind with what it needs, and He made all of them in wisdom (Psalm 104:24).

## 8.3 THE RAINBOW PROMISE

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### OBJECTIVES

- Tell what the rainbow is a sign of: God’s promise never again to flood the whole earth.
- Name the colors of the rainbow in order, with red on the outside.
- Make a rainbow with water and sunlight, standing with my back to the sun.

**Warm-up.** Look out the window. Is the sun shining? Point to where the sun is in the sky without looking straight at it. Now put a clear glass of water on a sunny windowsill with a sheet of white paper on the floor or table beside it. Watch the paper. Do you see any colors? Move the glass a little and look again.

**Video.** Coming soon. How a rainbow forms for young children: sunlight, raindrops and a prism; the order of the colors; Newton and the prism; nature footage of rainbows over waterfalls and after rain. Search NOAA SciJinks, SciShow Kids, Homeschool Pop (Alternate), Science Max and Moody Science classics.

### KEY TERMS

#### rainbow

A bow of colors in the sky that you see when the sun is behind you and rain is in front of you.

#### promise

Saying you will do something and then doing it. God’s promise is called a covenant, and God always keeps it.

#### sunlight

The light that comes from the sun. It looks white, but all the colors of the rainbow are mixed together inside it.

#### prism

A piece of clear glass that spreads sunlight out into its colors. A raindrop works like a tiny prism.

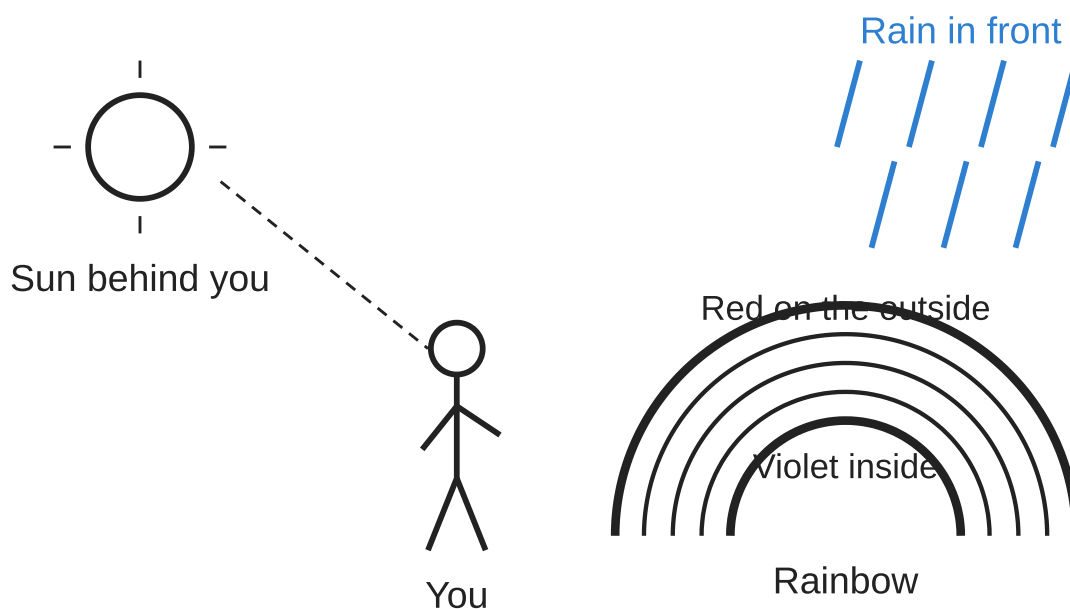
### CORE IDEAS

**The story.** The rain fell for forty days and forty nights, and the water covered the highest hills. But God remembered Noah. The rain stopped, the water went down, and the ark came to rest on the mountains of Ararat. Noah opened the window and sent out a raven, and then a dove. The dove came back with an olive leaf in her mouth, so Noah knew the trees were growing again. At last God said, “Go forth of the ark.” Noah and his family and all the animals came out onto dry ground. Noah built an altar and gave thanks. Then God made a **promise**. He would never again send a flood to cover the whole earth. And He gave a sign: “I do set my bow in the cloud” (Genesis 9:13). Every rainbow you see is that sign.

**How they figured it out.** In 1666 a young Englishman named Isaac Newton made a room dark. He let one thin beam of **sunlight** come through a hole in the shutter and pass through a glass **prism**. On the wall the white light spread into a band of colors. Sunlight is not plain white. All the colors are mixed inside it, and glass can spread them apart. A raindrop does the same thing. When the sun is behind you and rain is falling in front of you, millions of drops spread the light into a great bow. The colors always come in the same order: red on the outside, then orange, yellow, green, blue, indigo and violet on the inside. Newton counted seven.

**The big idea.** A **rainbow** is not painted on the sky. It is made new every time by sunlight and water. You cannot walk to the end of it, because it moves when you move. But it is always the same colors in the same order. That is a good picture of God's promise. The promise does not change, and God does not forget it. When you see a bow in the cloud, you can say, "God keeps His word."

**Try it and see.** On a sunny morning or late afternoon, stand with your back to the sun and have a parent spray a fine mist from a hose or spray bottle in front of you. Look for the bow in the mist. Then draw it with the colors in the right order.



*To see a rainbow: sun behind you, rain in front. A parent reads the labels while the child points.*

## PICTURE STUDY



*Landscape with Noah, Offering a Sacrifice of Gratitude*, Joseph Anton Koch (with Gottlieb Schick), 1803 · Oil on canvas · Städel Museum, Frankfurt

Joseph Anton Koch grew up in the mountains of Tyrol in Austria and loved to paint big, wide landscapes. Here he shows Noah and his family just after they came out of the ark. Noah built an altar and gave an offering to thank God, just as Genesis 8:20 tells us. The land is coming up out of the water again.

Above the land Koch painted the rainbow, God's sign of His promise. For the tall mountain at the side of the picture Koch used a drawing he had made of a great snowy mountain in Switzerland, to stand for the mountains of Ararat.

### Look closely

- Find the rainbow. Trace its curve with your finger.
- Find Noah and his family at the altar. What are they doing?
- Find the smoke rising from the altar. Which way does it go?
- Find the tall mountains. The Bible says the ark came to rest on the mountains of Ararat.

### Talk about it

1. Why do you think Noah built an altar before he did anything else?
2. What does the rainbow in this picture remind us that God promised?
3. If you had just come out of the ark, what is the first thing you would do?

**Safety first.** Never look straight at the sun, even for a moment, and never through a glass or a mirror. A parent runs the hose or spray bottle. Do the spray test outdoors on

grass, not on a slippery floor, and dry off afterward.

## **MAKE AND DO: MAKE A RAINBOW**

You will make your own rainbow with sunlight and water, two different ways, and then draw it with the colors in the right order.

### **You will need**

- A sunny day, early in the morning or late in the afternoon when the sun is low
- A garden hose with a mist setting, or a spray bottle
- A clear glass of water and a sheet of white paper
- Crayons: red, orange, yellow, green, blue, purple (for indigo and violet)
- Paper for drawing

### **Steps**

1. Go outside. A parent finds the sun. Stand so the sun is at your back and your shadow stretches out in front of you.
2. A parent sprays a fine mist into the air in front of you, a little above your shadow. Look into the mist. Do you see a bow of colors? Move a step left or right until it looks brightest.
3. Say the colors you see from the outside of the bow to the inside. Which color is on the outside? (Red.) Which is on the inside? (Violet.)
4. Now turn around and face the sun with the mist in front of you. Can you still see the rainbow? (No. The sun must be behind you.)
5. Inside, set the glass of water on a sunny windowsill with white paper below it. Turn the glass slowly until a band of colors lands on the paper. The glass is working like Newton's prism.
6. Draw a big rainbow. Color the outside arc red, then orange, yellow, green, blue and purple inside. Count the arcs on your fingers.
7. Tell a parent what God said the rainbow is a sign of.

### **Tips**

- If the sun is high at noon, the rainbow will be hard to find. Try again when the sun is low.
- A fine mist works better than a hard stream of water.

### **Check your work**

- I made a rainbow with my back to the sun.
- I can say the colors in order, red on the outside.
- I can tell what the rainbow is a sign of.

## NATURE NOTEBOOK

1. Draw the rainbow with its colors in order and draw the ark resting on a mountain under it.
2. Draw the dove coming back to Noah with an olive leaf in her mouth.
3. Draw yourself with the sun behind you and the mist in front of you, and draw the rainbow where you saw it.

**From history.** Isaac Newton wrote about his prism experiments in a letter to the Royal Society of London in 1672, and later in his book *Opticks*. He chose to name seven colors, red, orange, yellow, green, blue, indigo and violet, partly because there are seven notes in a musical scale, and he liked the match. Today many people simply say six colors, but the seven names are still taught all over the world.

## WORKED EXAMPLES

**Example 1.** Use the picture chart to name the colors of the rainbow in order and count them. Which color is on the outside of the bow?

*(Use the map or drawing “Red is on the outside of the bow, violet on the inside.” shown earlier in this lesson.)*

1. Start at the outside of the bow. The first color is red. Hold up 1 finger.
2. Next come orange, yellow and green. Hold up 2, 3, 4 fingers.
3. Then blue, indigo and violet. Hold up 5, 6, 7 fingers.
4. Count your fingers: 7 colors. Red is on the outside and violet is on the inside.

**Answer:** Red, orange, yellow, green, blue, indigo, violet. That is 7 colors. Red is on the outside.

## PRACTICE

1. **EASY** Point to where the sun is (do not look at it). Now turn so you could see a rainbow. Which way is the sun, in front of you or behind you?
2. **EASY** A parent holds up the crayons. Put them in rainbow order, starting with the outside color.
3. **MEDIUM** A rainbow has 7 colors. You have colored 4 arcs. How many more arcs do you need to color?
4. **MEDIUM** Noah sent two kinds of birds out of the ark. Name them. Which one came back with an olive leaf?
5. **HARD** Tell in your own words what God promised when He set His bow in the cloud, and why we can trust Him to keep it.

## COMMON MISTAKES

- Thinking you can walk to the end of a rainbow. A rainbow is made of light in the drops in front of you, so it moves when you move and you can never reach it.
- Thinking the colors are painted on the sky or the clouds. They come from sunlight spread out by water drops, the same way a glass prism spreads light.
- Mixing up the order of the colors. Red is always on the outside of the main bow and violet on the inside. If you ever see a second, fainter bow above it, its colors are in the opposite order.

**Make it a game · Rainbow Order Race.** Scatter red, orange, yellow, green, blue and purple crayons or blocks across the floor. When a parent says “Bow in the cloud!” run and gather them and lay them out in rainbow order, red first, as fast as you can. A parent checks the order. Then the parent hides one color and you must say which one is missing. Play until you can lay out the order three times in a row without a mistake.

**Scripture.** “I do set my bow in the cloud, and it shall be for a token of a covenant between me and the earth.” (Genesis 9:13, KJV)

A token is a sign. A covenant is a solemn promise. God put the rainbow in the sky as His sign that He will never again flood the whole earth.

### Practice answers

1. Behind you. The sun must be behind you and the rain in front.
2. Red, orange, yellow, green, blue, purple (indigo and violet).
3. Count up from 4 to 7: 5, 6, 7. Three more arcs.
4. A raven and a dove. The dove brought back the olive leaf.
5. God promised never again to flood the whole earth. We can trust Him because God always keeps His word, and every rainbow reminds us of the promise He made.

## 8.4 NAME THE ANIMALS LIKE ADAM

### OBJECTIVES

- Tell that God brought the animals to Adam and Adam gave them their names (Genesis 2:19).
- Sort animals into groups by what covers them: fur, feathers, scales, or a hard body with six legs.
- Look carefully at an animal and give it a name that tells something true about it.

**Warm-up.** A parent holds up a stuffed animal or a toy animal. Say its name. Then say one thing you can see about it: fur, feathers, a long neck, four legs. Do this for five animals. Then make up a brand-new name for one of them that tells what you see, like “Longneck” or “Spots.”

**Video.** Coming soon. Sorting and classifying animals for young children: mammals, birds, fish, reptiles and insects; what covers an animal’s body; Carl Linnaeus and how animals got their names. Search SciShow Kids, Homeschool Pop (Alternate), Smithsonian’s National Zoo, Natural History Museum (London) and Moody Science classics.

### KEY TERMS

#### name

The word we call something by. Adam gave the animals their first names.

#### sort

To put things that are alike together in a group.

#### group

Animals that are alike in some way, such as all the animals with feathers.

#### mammal

An animal with fur or hair whose mother feeds her babies with milk. Dogs, cows, bears and you are mammals.

### CORE IDEAS

**The story.** On the very first days of the world, God gave Adam a job before there was any other work to do. He “brought them unto Adam to see what he would call them,” the beasts of the field and the fowls of the air, “and whatsoever Adam called every living creature, that was the name thereof” (Genesis 2:19). Think of it. The lion walked up, and Adam looked at its mane and its great paws and gave it a name. The dove flew down, and Adam looked at its soft feathers and gave it a name. To **name** something well, you have to look at it carefully. That was the first science ever done.

**How they figured it out.** Thousands of years later, in 1735, a young Swedish doctor named Carl Linnaeus printed a little book in the city of Leiden, in Holland. It was only a few big

pages, but on them he tried to **sort** every living thing into groups. He looked the way Adam looked. Animals with fur and hair, whose mothers feed their babies milk, went in one **group**, which he later named the **mammals**. Animals with feathers went together: the birds. Animals with scales and fins that live in water: the fish. Animals with six legs and a hard body: the insects. Later, in his big book of 1758, Linnaeus gave every animal a name made of two words, like a first name and a last name. The house cat he named *Felis catus*. Scientists all over the world still use his names today.

**The big idea.** Sorting helps us see what God has made. If you know a bat has fur and feeds its babies milk, you know it is a mammal, not a bird, even though it flies. If you know a penguin has feathers, you know it is a bird, even though it cannot fly. God made each animal “after his kind,” and when we sort animals into groups we are noticing the kinds He made. Linnaeus knew this. An old Latin saying linked to his name says that God created and Linnaeus arranged.

**Try it and see.** Today you will be Adam and Linnaeus. You will sort your toy animals into four boxes by looking at what covers them. Then you will look hard at one animal and give it a name that tells the truth about it.

What covers its body?

| Fur  | Feathers | Scales | Six legs |
|------|----------|--------|----------|
| cat  | hen      | fish   | ant      |
| dog  | robin    | snake  | bee      |
| cow  | owl      | lizard | ladybug  |
| bear |          |        |          |

*Four groups to sort by. A parent reads the box names while the child points to where each toy belongs.*

## PICTURE STUDY



*Peaceable Kingdom*, Edward Hicks, about 1834 · Oil on canvas · National Gallery of Art, Washington

Edward Hicks, the Quaker painter who made the Noah's Ark picture in Lesson 8.1, painted this scene more than sixty times. It comes from Isaiah 11:6, where the wolf dwells with the lamb, the leopard lies down with the kid, and "a little child shall lead them." Every animal is calm. The lion does not roar. The lamb is not afraid.

This is a wonderful picture for naming animals, because so many kinds are gathered in one place, close together, just as they must have been when God brought them to Adam.

### Look closely

- Point to each animal and say its name. How many different kinds can you find?
- Find the animals with fur. Is there any animal with feathers? Any with scales?
- Find the biggest animal and the smallest. Find a baby animal.
- Look at the children. Are they afraid? What are they doing?

### Talk about it

1. Which animals here would usually be afraid of each other? Why are they calm in this picture?
2. If you were Adam and the leopard walked up, what name would you give it from what you see?
3. How many of these animals are mammals? Count them on your fingers.

## MAKE AND DO: MY SORTING ZOO

You will sort toy animals or animal pictures into four groups by looking carefully at what covers their bodies, count each group, and then give one animal a name of your own.

### You will need

- Ten or more toy animals, or animal pictures a parent cuts from old magazines
- Four shoeboxes, bowls or sheets of paper for the four groups
- Crayons
- A notebook or a sheet of paper for the count

### Steps

1. A parent draws a picture on each box: a tuft of fur, a feather, a fish scale, and a bug with six legs. Say the name of each box: fur, feathers, scales, six legs.
2. Pick up one animal. Look at it closely. What covers its body? Put it in the right box. Say why: "The hen has feathers, so it goes with the feathers."
3. Keep going until every animal is in a box. If one is hard (a turtle, a frog), talk about it with a parent and choose the closest box.
4. Count the animals in each box. A parent writes the number on the box. Which group has the most? Which has the fewest?
5. Now be Adam. Choose one animal. Look at it for a long time. Give it a new name that tells something true about it, like "Stripes" for a zebra or "Longnose" for an elephant. A parent writes the name on a card and stands it by the animal.
6. Now be Linnaeus. Learn the two-word name of the house cat: *Felis catus*. Say it three times. That is the name scientists everywhere use.
7. Tell a parent one animal that is tricky: a bat flies but has fur, so it is a mammal. A penguin cannot fly but has feathers, so it is a bird.

### Tips

- Look before you sort. The best scientists look twice.
- If you have no toys, draw the animals yourself on small cards.

### Check your work

- I sorted my animals into four groups by looking at what covers them.
- I counted each group and said which had the most.
- I gave an animal a name that tells something true about it.

## NATURE NOTEBOOK

1. Draw Adam with three animals coming to him. A parent writes the names you give them.
2. Draw four boxes and draw one animal in each: one with fur, one with feathers, one with scales and one with six legs.

3. Draw a bat and a bird side by side. Draw fur on the bat and feathers on the bird.

**From history.** Carl Linnaeus was the son of a country pastor in Sweden, and he loved flowers before he could read. The little book he printed in 1735 grew and grew. By its tenth printing in 1758 it named more than four thousand kinds of animals, each with its two-word name. That 1758 book is still the starting point for animal names today, and the house cat is still *Felis catus*, just as Linnaeus wrote it.

## WORKED EXAMPLES

**Example 1.** You have 8 toy animals: a cat, a dog, a hen, a duck, a fish, a snake, an ant and a bee. Sort them with the chart. How many go in each box? How many altogether?

*(Use the map or drawing “Point to the box where each animal belongs.” shown earlier in this lesson.)*

1. Fur: the cat and the dog. That is 2.
2. Feathers: the hen and the duck. That is 2.
3. Scales: the fish and the snake. That is 2.
4. Six legs: the ant and the bee. That is 2.
5. Count all the boxes together: 2, 4, 6, 8. That matches the 8 animals you started with, so nothing is missing.

**Answer:** 2 with fur, 2 with feathers, 2 with scales, 2 with six legs. 8 animals altogether.

## PRACTICE

1. **EASY** In the Peaceable Kingdom painting, point to three animals with fur and say their names.
2. **EASY** A hen: fur, feathers or scales? A goldfish? A puppy?
3. **MEDIUM** Sort six toy animals into the four boxes. Count each box. Which box has the most animals?
4. **MEDIUM** A parent says, “I am thinking of an animal with a long trunk and big floppy ears.” Name it. Then you describe an animal by what you see, and the parent guesses.
5. **HARD** A bat flies in the night sky. Is it a bird? Tell how you know, and say what Adam had to do before he could name an animal.

## COMMON MISTAKES

- Thinking a bat is a bird because it flies. A bat has fur and feeds its babies milk, so it is a mammal.
- Thinking a whale or a dolphin is a fish because it swims in the sea. Whales and dolphins breathe air and feed their babies milk, so they are mammals too.
- Thinking a penguin is not a bird because it cannot fly. It has feathers and lays eggs, so it is a bird.

**Make it a game · Adam's Naming Game.** A parent acts out an animal without a sound: flapping, galloping, slithering, creeping on six legs. You call out its name and its group: "Hen! Feathers!" or "Snake! Scales!" If you are right, you get a point and it is your turn to act. If the parent acts a tricky one, like a bat or a penguin, you must say the group it really belongs to. Play to ten points.

**Scripture.** "And out of the ground the LORD God formed every beast of the field, and every fowl of the air; and brought them unto Adam to see what he would call them: and whatsoever Adam called every living creature, that was the name thereof." (Genesis 2:19, KJV)

God made the animals and brought them to Adam. Adam looked at them and gave them names. Naming and sorting God's creatures is a job He gave people from the very beginning.

#### Practice answers

1. Any three of: lion, leopard, wolf, bear, ox, cow, lamb, kid (goat), calf.
2. A hen has feathers. A goldfish has scales. A puppy has fur.
3. Answers vary. The child should put each animal in the right box, count correctly and name the box with the biggest number.
4. An elephant. Then the child gives two or three true clues (such as: fur, stripes, four legs, says moo) and the parent names the animal.
5. No. A bat has fur and feeds its babies milk, so it is a mammal, even though it flies. Adam had to look carefully at each animal before he named it.

## UNIT 8 REVIEW

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A parent asks each question aloud and the child answers by speaking, pointing, counting on fingers or drawing. No reading or writing is needed. The review is worth 20 points.

1. (3 pts) Tell the story of Noah's ark in three parts: what Noah built, who came to him, and what the LORD did when they were all inside.
2. (3 pts) Four pairs of animals go into the ark. Count by twos. How many animals is that? Then show me one cubit with your arm.
3. (3 pts) Name one animal taller than a door and one animal that fits in your hand. Which is the tallest animal on land?
4. (3 pts) Look at the chart of animal heights. Which bar is tallest? Which is shortest? Is a horse taller or shorter than a big dog?
5. (3 pts) Say the colors of the rainbow in order, starting with the outside color. Where must the sun be for you to see a rainbow?
6. (2 pts) What did God promise when He set His bow in the cloud?
7. (3 pts) I will name an animal and you say its group: a hen, a goldfish, a bear, a bee. Then tell me who gave the animals their first names.

### UNIT PROJECT: MY ARK OF ANIMALS

Make an ark from a shoebox and fill it with pairs of animals, either toys or animals you draw and cut out with a parent's help. Line the pairs up two by two in order from smallest to biggest, and sort them into four groups by fur, feathers, scales and six legs with a drawn label on each group. Paint or draw a big rainbow with its colors in the right order to hang over the ark.

Then show your ark to your family and tell the story: how Noah built it, how the animals came two by two, how God shut the door, and what the rainbow means. Count your animals by twos as you put them in.

- **Pairs:** The animals are in pairs of the same kind, and the child can count them by twos.
- **Sorting:** The animals are lined up from smallest to biggest and sorted correctly into fur, feathers, scales and six legs.
- **Telling:** The child tells the story of the ark in order and says what the rainbow is a sign of.
- **Care:** The ark, the animals and the rainbow are made neatly, and the rainbow colors are in the right order with red on the outside.

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#### Answer key

1. Noah built a very big wooden ark the way God told him, with a door in the side. The animals came to him two by two, male and female. The LORD shut him in, and the rain began.
2. Two, four, six, eight: 8 animals. One cubit is from the elbow to the fingertip.

3. Taller than a door: an elephant or a giraffe. Fits in a hand: a mouse, a ladybug or an ant. The giraffe is the tallest.
4. The giraffe bar is tallest. The cat bar is shortest. A horse is taller than a big dog.
5. Red, orange, yellow, green, blue, indigo, violet. The sun must be behind you, with rain in front of you.
6. He promised never again to flood the whole earth (Genesis 9:13).
7. Hen: feathers (a bird). Goldfish: scales (a fish). Bear: fur (a mammal). Bee: six legs (an insect). Adam gave the animals their first names when God brought them to him (Genesis 2:19).

## BONUS: NATURE LAB

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This bonus unit takes everything you learned about God’s animals and carries it outdoors. There are no new animals to meet here. Instead you will learn the four things every naturalist does: keep a journal, count what lives in one place, go and look at the real animal, and keep a labeled collection. Each lesson is short, playful and mostly outside. You can do them in any season, in a backyard, on a city block or in a park.

You will meet Gilbert White, who watched one English village for his whole life and wrote it all down; Jean-Henri Fabre, who lay on the ground in a stony field in France to count wasps and beetles; the giraffe who walked across France so people could see a real one; and Carl Linnaeus, the boy who had to remember the name of every flower in his father’s garden. By the end you will have your own journal, your own survey chart, your own drawing from a visit and your own egg-carton museum.

### BEFORE YOU BEGIN

- Can count objects to 12 and tell which group has more
- Can sit still and look quietly for one minute
- Can draw a simple shape and name its colors
- Knows a few animals from Units 1 to 8, such as a chicken, a dog, a robin and an ant

### MASTERY CHECKLIST

- I can make a nature journal page with the date, the weather, a drawing and my words.
- I can mark off a patch of ground, count the creatures inside it, and read my picture chart.
- I can say which of two patches had more creatures and why shady, damp spots often have more.
- I can find an animal on a visit, look at it for a whole minute, and tell if it is bigger or smaller than I am.
- I can collect safe specimens, name the things we never take, and sort and count my collection.
- I can give a tour of my egg-carton museum with a label for every specimen.

### OPTIONAL BOOKS AND RESOURCES

- **Seek by iNaturalist (free app)** ([https://www.inaturalist.org/pages/seek\\_app](https://www.inaturalist.org/pages/seek_app)): Free app for a parent’s phone. Point the camera at a bug, leaf or bird and it suggests a name. No account is needed. A fun check after the journal walk and the hoop survey, but let the child look and draw first.
- **Smithsonian’s National Zoo** (<https://nationalzoo.si.edu/>): Free. Live animal cams and animal pages with photos and facts. Use it to choose the three animals for the Lesson 9.3 hunt, or as the visit itself if no zoo is nearby.

- ***The Natural History of Selborne* by Gilbert White (free at Project Gutenberg)**  
(<https://www.gutenberg.org/ebooks/search/?query=natural+history+of+selborne>):  
Free. The book is for grown-ups, but a parent can read aloud a short letter about the swallows or about Timothy the tortoise for Lesson 9.1.

## 9.1 NATURE JOURNAL WALK

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### OBJECTIVES

- Take a slow walk outdoors and find one living thing to look at very closely.
- Make a nature journal page with the date, the weather and a drawing of what I saw. A parent writes the words.
- Tell what I saw in my own words, like a naturalist.

**Warm-up.** Sit on the front step or by an open window for two minutes without talking. Hold up one finger for every living thing you see: a bird, a bug, a leaf moving in the wind, a dog going by. When the time is up, tell your parent each thing you saw. That is what a naturalist does. Look first, then tell.

**Video.** Coming soon. Nature journaling for young children: starting a nature journal, drawing what you see on a walk, looking closely at a leaf or a bug, Gilbert White of Selborne. Try John Muir Laws nature journaling, SciShow Kids, Smithsonian, National Park Service junior ranger videos, and quiet nature-walk footage.

### KEY TERMS

#### **naturalist**

A person who goes outside, looks carefully at living things, and writes or draws what they see.

#### **nature journal**

A notebook where you draw and keep what you saw outdoors, with the day and the weather on each page.

#### **observe**

To look at something slowly and carefully, with your eyes, ears and nose, so you notice things.

#### **weather**

What the sky and air are doing today: sunny, cloudy, windy, rainy, hot or cold.

### CORE IDEAS

**The story.** Long ago in a small village in England called Selborne, a pastor named Gilbert White kept a notebook. Every day he walked out and wrote down what he saw. He wrote the day the swallows came back in spring. He wrote when the first cuckoo sang. He wrote when his pet tortoise, Timothy, woke up from his long winter sleep and came out to eat lettuce. He did this for many, many years. He never traveled far. He just looked very carefully at one little village. Later his notes became a book called *The Natural History of Selborne*, printed in 1789. People still read it today. Gilbert White showed that a great naturalist does not need to go far away. He needs to look closely at what is right here.

**Try it and see.** A nature journal walk is a slow walk. You do not try to get anywhere. You walk until something catches your eye: an ant on the sidewalk, a bird on a wire, a leaf with a hole chewed in it. Then you stop. You look with all your eyes. How many legs? What color? Is it moving or still? Does it make a sound? Your parent writes the date and the weather at the top of the page. You draw what you saw, big, in the middle. Then you tell your parent what it was, and your parent writes your words under the picture. That is one journal page. Tomorrow you will make another.

**The big idea.** Looking carefully is the first job of every scientist. Drawing helps, because when you draw a thing you have to look at it for a long time. You notice the spots on the ladybug and the little hairs on the bee. Your journal is also a record. Months from now you can look back and see what was in your yard on this day. Gilbert White looked back at his notes and found that the swallows came at nearly the same time every spring. You might find that too.

**God's handiwork.** The Bible says, "ask now the beasts, and they shall teach thee; and the fowls of the air, and they shall tell thee" (Job 12:7). God made the animals and birds, and when we watch them closely, they teach us about Him. A nature journal is a way of listening.

|                                                                                                               |                                                                                              |
|---------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| Date: _____                                                                                                   | Weather:  |
| <div style="border: 1px dashed black; height: 150px; margin: 10px auto; width: 80%;"></div> <p>My drawing</p> |                                                                                              |
| I saw: _____                                                                                                  |                                                                                              |
| How many:  = 4             |                                                                                              |

*A nature journal page. Date and weather at the top, a big drawing in the middle, and your words at the bottom.*

## PICTURE STUDY



*Young Hare*, Albrecht Dürer, 1502 · Watercolor and bodycolor on paper · Albertina, Vienna

Albrecht Dürer lived in the city of Nuremberg in Germany. He loved to draw the things God made just as they really are. Here he painted a young hare. Look how still it sits. Dürer painted every hair, the long ones and the short soft ones, with a tiny brush. If you look very closely at the hare's eye, you can even see the shape of a window shining in it. That tells us Dürer was looking at a real hare, sitting inside near a window.

At the bottom Dürer wrote the year, 1502, and his special mark made of an A and a D. He was proud of this picture. It is like the very best nature journal page ever made.

### Look closely

- Point to the hare's ears. Are they up or down? What do you think it is listening for?
- Look at the fur. Find a place where the hair is long and a place where it is short and soft.
- Find the hare's whiskers. How many can you count?
- Look at the hare's eye. Can you see the little light shining in it?

### Talk about it

1. Do you think the hare sat still for a long time, or did Dürer have to look fast and remember? Why?
2. What would you have to do to draw an animal this well?
3. If this hare were on your journal page, what words would you ask your parent to write under it?

**Safety first.** Stay with your parent the whole walk. Wear a hat in the sun and never look at the sun. Look at bugs and animals, but do not pick them up or chase them; wild animals may bite. Do not touch plants with three shiny leaves, which may be poison ivy, and do not pick or taste any berry or mushroom. Stay back from water. Wash hands when you come in, and have a parent check for ticks if you walked in tall grass.

## **MAKE AND DO: MY FIRST JOURNAL PAGE**

You will go on a slow walk, choose one living thing, and make a real nature journal page about it, the way Gilbert White did every day.

### **You will need**

- A notebook with blank pages, or a few sheets of paper on a clipboard
- A pencil and a few crayons
- A magnifying glass if you have one
- A parent to write the words

### **Steps**

1. Before you go out, your parent writes today's date at the top of the page. Look at the sky together and draw a sun, a cloud or raindrops next to the date for the weather.
2. Walk slowly around the yard, the block or a park. Do not talk much. Use your eyes and ears.
3. When something living catches your eye, stop. Crouch down. Look for a whole minute. Count its legs if it has legs. Name its colors. Watch what it does.
4. Draw it big in the middle of the page. Draw what you really see, not what you think it should look like. Color it the colors it really is.
5. Tell your parent in your own words what it was and what it was doing. Your parent writes your words under the drawing.
6. If you found a fallen leaf or a pebble near it, you may tape it to the corner of the page. Never take a living thing or a nest.
7. Go out again on another day and make a new page. Try to find something different.

### **Tips**

- A page with one thing drawn carefully is better than a page with ten things drawn fast.
- If the animal moves away, draw it from memory. Naturalists do that all the time.
- Keep every page, even messy ones. Later you will like to look back at them.

### **Check your work**

- My page has the date and the weather at the top.
- I drew one living thing big in the middle and colored it the real colors.
- I told my parent what I saw and my words are written on the page.

## NATURE NOTEBOOK

1. Draw the same tree or bush from your window on three different days. Your parent writes the date on each one. Did anything change?
2. Draw Timothy the tortoise eating a lettuce leaf. Your parent writes “Timothy” under him.
3. Draw a hare like Dürer’s. Put the ears up tall and draw as many whiskers as you can.

**From history.** Gilbert White’s tortoise Timothy really lived in his garden at Selborne. Timothy slept underground every winter and came out each spring, and Gilbert White wrote down the day it happened. Long after, Timothy’s shell was kept, and it is now in the Natural History Museum in London. Scientists who looked at the shell found a surprise: Timothy was really a girl tortoise.

## WORKED EXAMPLES

**Example 1.** On your walk you found a leaf. You lay it on the page and hold your fingers next to it. The leaf is as long as 3 of your fingers. Your parent’s leaf is as long as 5 of your fingers. Whose leaf is longer? How many fingers longer?

1. Hold up 3 fingers for your leaf. Hold up 5 fingers for your parent’s leaf.
2. 5 is more than 3, so your parent’s leaf is longer.
3. Count up from 3 to 5: 4, 5. That is 2 more fingers.

**Answer:** Your parent’s leaf is longer, by 2 fingers.

## PRACTICE

1. **EASY** What two things does a parent write at the top of every journal page?
2. **EASY** Point to something living that you can see right now. Point to something that is not living.
3. **MEDIUM** Gilbert White found a bug with 6 legs. Then he found a spider with 8 legs. Which one had more legs? Show the numbers on your fingers.
4. **MEDIUM** Look out the window and say what the weather is right now. Draw the sign for it: a sun, a cloud or raindrops.
5. **HARD** Tell your parent why drawing a bug helps you see it better than just glancing at it.

## COMMON MISTAKES

- Thinking you have to go somewhere far away to be a naturalist. Gilbert White watched one village for his whole life and found something new every day.
- Thinking a journal drawing has to be pretty. It has to be honest. Draw what you really see, even if it is lumpy.

- Thinking there is nothing to see in winter or in the city. There are always birds, bugs, bark, buds and tracks if you look slowly.

**Make it a game · Stop and Spot.** Walk slowly with your parent. When your parent says “Stop!” you freeze and look around without moving your feet. Name one living thing you can see from right there. Then it is your turn to call “Stop!” for your parent. Each good spot is a point. Play to ten. On the way home, tell your parent your favorite thing you spotted and draw it in your journal.

**Scripture.** “But ask now the beasts, and they shall teach thee; and the fowls of the air, and they shall tell thee: Or speak to the earth, and it shall teach thee: and the fishes of the sea shall declare unto thee.” (Job 12:7-8, KJV)

God made the animals, and when we watch them carefully they teach us about His wisdom. A nature journal is one way to ask the beasts and listen.

#### Practice answers

1. The date and the weather.
2. Living: a plant, a bird, a bug, a pet, a person. Not living: a rock, a chair, a car, a toy. Any correct choice.
3. The spider. 8 is more than 6.
4. The child names the weather correctly (sunny, cloudy, rainy, windy) and draws the matching sign.
5. When you draw it you have to look at it for a long time, so you notice things you would miss, like how many legs it has, its spots and its colors.

## 9.2 BACKYARD SURVEY

### OBJECTIVES

- Mark off one small patch of ground and count every creature that lives in it.
- Make a picture chart of what I counted and say which kind there was the most of.
- Compare a sunny patch and a shady patch and tell which had more creatures.

**Warm-up.** Lay a hula hoop, or a loop of string, on the carpet. Put a few toys inside it. Now count only the toys inside the loop, not the ones outside. That is a survey: you pick a spot, draw a line around it, and count everything inside. Today we will do it outside with real creatures.

**Video.** Coming soon. Backyard bug hunt and small-animal survey for kids: looking under rocks and logs, counting ants, worms, pill bugs and birds in a square of ground, Jean-Henri Fabre watching insects. Try SciShow Kids, Smithsonian, National Geographic Kids, Homeschool Pop (Alternate), and close-up garden-insect footage.

### KEY TERMS

#### survey

Counting everything of one kind in one place to find out what lives there.

#### habitat

The place where a creature lives and finds its food, like under a log or in the grass.

#### tally mark

A little line a parent makes on paper for each creature you count. Four lines and a slash make five.

#### chart

A picture that shows your counts so you can see which group is biggest.

### CORE IDEAS

**The story.** In the south of France, near a village called Sérignan, there was a stony, weedy piece of ground that nobody wanted. A teacher named Jean-Henri Fabre bought it in 1879. He called it the Harmas, which means a bit of waste ground. To everyone else it was a field of thistles and rocks. To Fabre it was a treasure. It was the thing he had wished for his whole life: a laboratory where every insect was alive and free. Day after day he lay on the ground and watched. He watched wasps dig holes. He watched beetles roll balls of dung. He watched crickets sing. He counted and he wrote it all down in books that children and grown-ups still read. Fabre found that one ordinary patch of ground was full of more creatures than anyone had guessed.

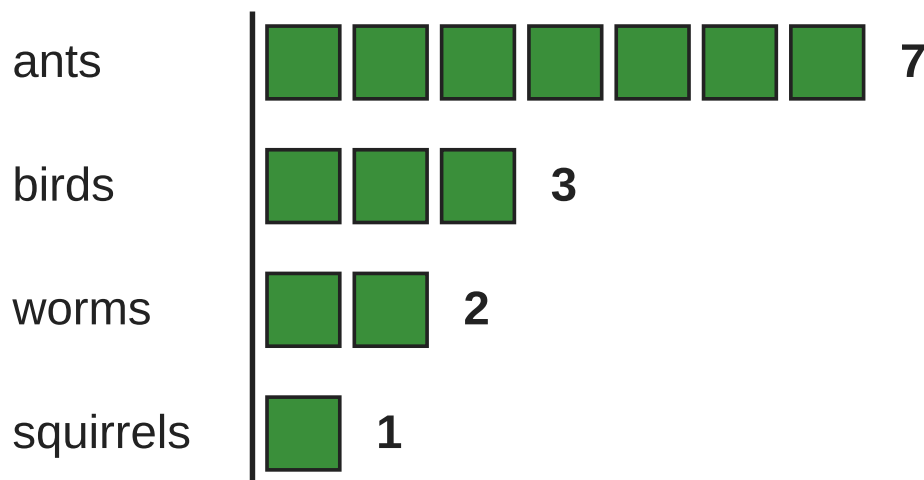
**Try it and see.** You can survey your own patch of ground. Lay a hula hoop or a loop of string on the grass. That is your patch. For five minutes, look at everything inside it and nothing

outside it. Lift leaves. Peek under a rock and put it back gently. Each time you find a creature, say what it is, and your parent makes a tally mark next to its name: ant, worm, pill bug, beetle, spider, bird, squirrel. When time is up, count the tally marks. Then make a picture chart: one square colored in for each creature. The longest row is the creature there was the most of.

**The big idea.** A survey tells you who lives in a place. Scientists do surveys to learn what lives in a forest, a pond or a whole country. The trick is to count only inside your line, so the count is fair. Now try a second patch in a different kind of spot: shade instead of sun, or near a tree instead of open grass. Compare the two charts. Most children find more creatures in the damp shady patch. That is because many small creatures like it cool and wet. Each creature has a **habitat**, the place that suits it best.

**God's handiwork.** God knows every creature in your patch of ground. "I know all the fowls of the mountains: and the wild beasts of the field are mine" (Psalm 50:11). Nothing in your survey is too small for Him to know.

## What lives in my hoop?



one square = one creature

*A picture chart from a backyard survey. One square for each creature counted. Which row is longest?*

## PICTURE STUDY



*Hunters in the Snow*, Pieter Bruegel the Elder, 1565 · Oil on panel · Kunsthistorisches Museum, Vienna

Pieter Bruegel painted in the Low Countries, where the winters can be cold and white. In this picture three hunters are coming home over a hill with their dogs. The hunt did not go well. They carry only one small fox. Below them the whole village is out on the ice, skating and playing. Bare trees stand against the gray sky, and birds sit in the branches.

This is a wonderful picture for a survey. There are many animals hidden in it, and you have to look slowly to find them all, just like looking in your patch of grass.

### Look closely

- Count the dogs walking with the hunters. Keep a tally with your parent.
- Find the birds. Some sit in the trees and one is flying. How many can you count?
- What animal do the hunters carry? Is it big or small?
- Look far away at the ponds. What are the people doing on the ice?

### Talk about it

1. Which were there more of in the picture, dogs or birds?
2. It is winter. Where do you think the bugs and worms are?
3. The hunters look tired and the dogs hang their heads. Why do you think the hunt went badly?

**Safety first.** Stay with a parent. Lift rocks and logs by rolling them toward you so anything underneath runs away from you, and put them back gently. Do not pick up spiders, bees, wasps or any creature that stings or bites; look and count only. Do not

touch plants with three shiny leaves. Wear a hat in the sun, drink water, and wash hands when you come inside. Have a parent check for ticks after kneeling in grass.

## **MAKE AND DO: THE HOOP SURVEY**

You will count every creature in one patch of ground, make a picture chart, and then do it again in a different patch to see which one has more life.

### **You will need**

- A hula hoop, or a piece of string about as long as your parent is tall, tied in a loop
- Your nature journal, a pencil and a green crayon
- A magnifying glass if you have one
- A kitchen timer or a parent's watch

### **Steps**

1. Your parent writes the date and the weather at the top of a journal page, and then writes these names down the side: ant, worm, pill bug, beetle, spider, bird, squirrel, other.
2. Lay the hoop on sunny grass. Set the timer for five minutes.
3. Look at everything inside the hoop. Part the grass with your fingers. Turn over a leaf or a small rock and put it back. Each time you find a creature, say its name and your parent makes a tally mark.
4. When the timer rings, count the marks for each creature. Your parent writes the number.
5. Make a picture chart: color one green square for each creature in a row next to its name. Say which row is longest. That creature had the most.
6. Now move the hoop to a shady, damp spot, maybe under a tree or near a bush. Do the five minutes again on a new page.
7. Put the two charts side by side. Which patch had more creatures in all? Tell your parent why you think so.

### **Tips**

- Be very still for the first minute. Many creatures hide when they feel your feet.
- If a creature leaves the hoop and comes back, count it only once.
- If you do not find much, that is a real answer too. Write it down and try a different patch.

### **Check your work**

- I counted only inside my hoop.
- My chart has one square for each creature and I can point to the longest row.
- I can say which patch, sunny or shady, had more creatures.

## NATURE NOTEBOOK

1. Draw your hoop from above with every creature you found inside it, in the spot where you found it.
2. Draw a sunny patch and a shady patch side by side. Draw a sun over one and a tree over the other. Draw a pill bug in the patch where it likes to live.
3. Draw Fabre lying on the ground in his stony field with his nose close to a beetle.

**From history.** Jean-Henri Fabre's stony field, the Harmas, still exists. His house and garden at Sérignan are kept as a museum by the national natural history museum of France, and part of the garden is still left wild, as he liked it, so wasps and beetles still live there.

## WORKED EXAMPLES

**Example 1.** Look at the picture chart from a backyard survey. Ants have 7 squares, birds have 3, worms have 2 and squirrels have 1. Which creature was there the most of? Which was there the least of? How many creatures were counted in all?

*(Use the map or drawing "Read the chart: the longest row is the most." shown earlier in this lesson.)*

1. Find the longest row. The ant row has 7 squares. That is the most.
2. Find the shortest row. The squirrel row has 1 square. That is the least.
3. Count all the squares together: 7 ants, then 8, 9, 10 for the birds, then 11, 12 for the worms, then 13 for the squirrel.

**Answer:** Most: ants. Least: squirrels. 13 creatures in all.

## PRACTICE

1. **EASY** What is a survey? Show your parent with the hoop.
2. **EASY** Your parent makes these tally marks: four lines and a slash. How many is that?
3. **MEDIUM** In the sunny patch you found 4 creatures. In the shady patch you found 9. Which patch had more? Which patch do pill bugs and worms like best?
4. **MEDIUM** Point to where each creature would be found: an ant, a worm, a bird. Choose from under the dirt, on the ground, in a tree.
5. **HARD** Why do we count only inside the hoop and not everything we can see?

## COMMON MISTAKES

- Thinking a patch of grass is empty because nothing moves at first. Be still, look under things, and the creatures appear.
- Counting the same ant over and over as it runs in and out. Count it once.

- Thinking the sunny patch should have the most because we like sun. Many small creatures like cool, damp, dark places.

**Make it a game · Who Lives Here?.** Your parent names a place: under a rock, in a tree, in the dirt, on a flower, in the grass. You name a creature that lives there and act it out: wiggle like a worm, flap like a bird, curl up like a pill bug. Then you name a place and your parent acts. Each good match is a point. Play to ten. End by naming the one creature you found the most of in your survey.

**Scripture.** “For every beast of the forest is mine, and the cattle upon a thousand hills. I know all the fowls of the mountains: and the wild beasts of the field are mine.” (Psalm 50:10-11, KJV)

Every creature belongs to God and He knows each one. When you count the creatures in your hoop, you are counting His.

#### Practice answers

1. A survey is counting everything inside one spot to find out what lives there. The child lays the hoop down and counts only inside it.
2. 5.
3. The shady patch had more. Pill bugs and worms like the cool, damp, shady patch.
4. Ant: on the ground (or in the dirt). Worm: under the dirt. Bird: in a tree.
5. So the count is fair. If we count everywhere we would never finish, and we could not compare one patch with another patch of the same size.

## 9.3 ZOO, FARM OR MUSEUM VISIT

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### OBJECTIVES

- Visit a zoo, a farm or a natural history museum and find three animals I chose ahead of time.
- Stand still in front of a real animal and tell how it moves, what it eats and how big it is next to me.
- Draw one animal from real life and tell about it at home.

**Warm-up.** Pick a stuffed animal and set it across the room. Walk slowly toward it like you are at the zoo. Stop. Say three things you notice: its color, how many legs, something special like a trunk or a tail. Now hold it up next to you. Is it bigger or smaller than you? Today we will do this with real animals.

**Video.** Coming soon. A visit to the zoo, farm or natural history museum for young children: watching elephants, giraffes, goats and chickens up close, the story of the first giraffe in Paris, zookeepers caring for animals, museum skeletons. Try Smithsonian National Zoo, San Diego Zoo Kids, Smithsonian, SciShow Kids, Homeschool Pop (Alternate), and farm-tour footage.

### KEY TERMS

#### **zoo**

A place where living animals from all over the world are kept and cared for so people can see them.

#### **farm**

A place where people raise animals and grow plants for food and work.

#### **museum**

A building full of real things to look at, like bones, shells and stuffed animals, that stay still so you can look for a long time.

#### **keeper**

A person whose job is to feed and care for the animals at a zoo or farm.

### CORE IDEAS

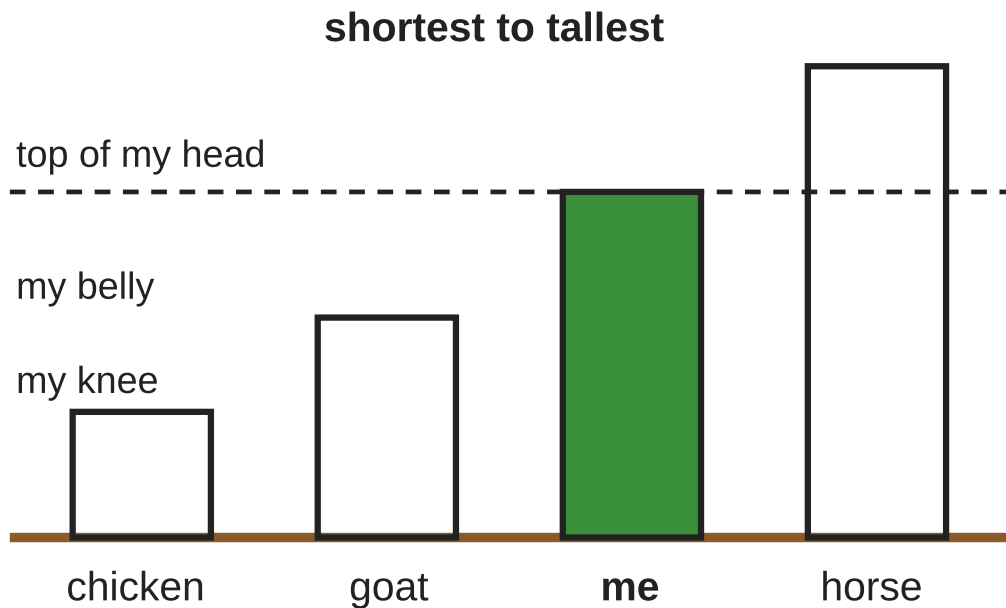
**The story.** In 1826 a young giraffe arrived in France. She was a gift from the ruler of Egypt to the king of France. No one in France had ever seen a living giraffe. The giraffe came by ship to the city of Marseille. But a giraffe is too tall to ride in a wagon, so she walked. In the spring of 1827 she walked for many weeks along the roads to Paris with her keepers beside her, wearing a special raincoat to keep her dry. In every town, people ran out to see her. When she reached Paris, huge crowds came to the Jardin des Plantes, the great garden where she lived. People made hats and dishes and dresses with giraffes on them. They had

seen pictures of giraffes in books. But a picture is not the same as standing next to a real one and looking up, and up, and up.

**Try it and see.** Before your visit, choose three animals you want to find. Your parent draws or prints a little picture of each one on a card. At the zoo, the farm or the museum, hunt for your three animals. When you find one, stop. Do not rush to the next thing. Stand still and look for a whole minute. How does it move? What is it eating? How many legs? Is it taller than you or shorter? Hold your hand up to compare. Then draw it in your journal right there, while you can see it. At a farm you may be allowed to touch a goat or hold a chick. At a museum the animals are bones or stuffed animals, so they stay still and you can look as long as you like.

**The big idea.** Real scientists have always needed to see the real thing. A drawing can be wrong. A story can be wrong. But a real elephant, a real goat or a real skeleton tells you the truth about how big it is, how it smells and how it moves. When you come home, tell someone about your three animals. Say what surprised you. Being surprised is a sign that you learned something a book could not teach you.

**God's handiwork.** A zoo is like a little piece of the whole world's animals in one place. Walking past the elephants, the penguins and the lions, you can say with the psalm, "O LORD, how manifold are thy works! in wisdom hast thou made them all" (Psalm 104:24).



*Measuring animals with your own body. The chicken comes to your knee, the goat to your belly, and the horse's back is above your head.*

## PICTURE STUDY



*Zebra*, George Stubbs, 1763 · Oil on canvas · Yale Center for British Art, New Haven

George Stubbs was an English painter who loved horses and drew them better than anyone. In 1762 a zebra came to England as a gift for the queen. It was the first living zebra most people in England had ever seen, and crowds came to look at it where it was kept near the queen's house in London. Stubbs went too, and he painted the zebra from real life, stripe by stripe.

Look at where Stubbs put the zebra. It is standing in a shady English wood, not on the wide sunny plains of Africa where zebras really live. Stubbs painted the animal he saw and the place he knew.

### Look closely

- Point to the stripes. Do they all go the same way? Look at the legs and the face.
- Is the zebra looking at you? What do you think it is thinking?
- Find the zebra's mane. Is it long and floppy like a horse's, or short and stiff?
- Look at the trees and leaves around the zebra. Does this look like a hot, dry place or a cool, shady place?

### Talk about it

1. Why did Stubbs go to see the real zebra instead of painting one from a story?
2. If you were at the zoo standing next to this zebra, what would you want to look at first?
3. Zebras live in Africa. Why do you think the painter put it in an English wood?

**Safety first.** Stay with your parent and follow every sign and rope. Never put fingers through a fence or cage, and never feed an animal unless a keeper says you may. At a

farm, stay away from the back legs of horses and cows, and move slowly and quietly so animals are not startled. Wash hands with soap right after touching any animal or its pen and before eating; petting-zoo animals can carry germs. Wear a hat and drink water on a hot day.

## **MAKE AND DO: THREE-ANIMAL HUNT**

You will plan a visit like a scientist: choose three animals, find them, look closely, and draw one from real life.

### **You will need**

- Three index cards, each with a picture of one animal you hope to see, drawn or printed with a parent
- Your nature journal, a pencil and crayons in a small bag
- A ticket or a plan to visit a zoo, a farm, a petting zoo or a natural history museum

### **Steps**

1. At home, look at the zoo, farm or museum website with a parent and choose three animals to find. Make a card for each one.
2. On the way, say what you already know about each animal. Your parent remembers your guesses.
3. When you find the first animal, stop and look for one whole minute. Count its legs. Say how it moves. Say what it is eating, if you can see.
4. Hold up your hand or stand next to the fence and compare: is the animal taller than you, or shorter? Is it longer than your parent lying down? Say it out loud.
5. Pick the animal you like best and draw it right there in your journal. Draw the real colors and the real shape, even if it is hard.
6. Ask a keeper or farmer one question, like what the animal eats or how old it is. Your parent writes the answer on your page.
7. At home, tell a grandparent or a friend about all three animals and what surprised you most.

### **Tips**

- Morning is a good time to visit a zoo. Many animals are busy eating and moving before the day gets hot.
- If you cannot visit anywhere this week, find a farm stand, a pet store, a pond with ducks, or a dog park. Any real animal will do.
- Draw first, then look at the sign. Your own eyes come first.

### **Check your work**

- I found my three animals and looked at each one for a whole minute.
- I can say whether each animal is bigger or smaller than I am.

- I drew one animal from real life and told someone about my visit.

## NATURE NOTEBOOK

1. Draw the giraffe walking down a French road with crowds of people waving. Give her a raincoat.
2. Draw yourself standing next to the biggest animal you saw. Make it the right size next to you.
3. Draw the animal from your visit that surprised you most, and your parent writes what surprised you.

**From history.** In 1515 Albrecht Dürer made a famous print of a rhinoceros, but he never saw the animal. He worked from a letter and a quick sketch sent from Portugal. His rhinoceros has armor plates like a knight and a small extra horn on its back, which real rhinos do not have. Even so, the picture was copied in books for a very long time. It is a good reminder of why scientists go and look at the real animal.

## WORKED EXAMPLES

**Example 1.** At the farm you stand next to three animals. The chicken comes up to your knee. The goat comes up to your belly. The horse's back is higher than your head. Put the three animals in order from shortest to tallest. Which one is taller than you?

*(Use the map or drawing "Use your own body as a ruler." shown earlier in this lesson.)*

1. Touch your knee, your belly and the top of your head. Your knee is lowest, then your belly, then your head.
2. The chicken reaches your knee, so it is the shortest. The goat reaches your belly, so it is in the middle. The horse goes past your head, so it is the tallest.
3. Only the horse goes higher than your head, so only the horse is taller than you.

**Answer:** Shortest to tallest: chicken, goat, horse. The horse is taller than you.

## PRACTICE

1. **EASY** Name one animal you would see at a zoo, one at a farm, and one you would see as bones at a museum.
2. **EASY** Who feeds the animals at a zoo? What should you do before you feed any animal?
3. **MEDIUM** You saw 2 elephants, 5 penguins and 3 goats. Which group had the most? Count all the animals.
4. **MEDIUM** Point to a chair. Is a rabbit taller or shorter than the chair? Is a giraffe taller or shorter than your house's door?
5. **HARD** Why did people in France want to see the real giraffe when they already had pictures of giraffes?

## COMMON MISTAKES

- Running from one cage to the next and seeing everything but looking at nothing. One minute of standing still teaches more than a whole fast lap.
- Thinking the animals at a museum are alive. Museum animals are bones or stuffed skins, which is why you can look at them so closely.
- Thinking any animal behind a fence is safe to touch. Only touch what a keeper or farmer says you may, and wash hands after.

**Make it a game · Zoo Charades.** Your parent whispers an animal from your visit in your ear. You act it out without a sound: swing a trunk, hop, waddle, stretch your neck. Your parent guesses. Then switch. Each animal guessed is a point. Play to ten, and at the end tell your parent one true thing you noticed about each animal you acted out.

**Scripture.** “O LORD, how manifold are thy works! in wisdom hast thou made them all: the earth is full of thy riches.” (Psalm 104:24, KJV)

Manifold means many kinds. At a zoo or farm you see many kinds of animals in one place, and every one of them was made by God in wisdom.

### Practice answers

1. Any good answer, such as a lion at a zoo, a cow at a farm, and a dinosaur or whale skeleton at a museum.
2. The keeper feeds them. Ask a keeper or a parent first; never feed an animal unless you are told you may.
3. The penguins had the most. 2 and 5 is 7, and 3 more is 10 animals.
4. A rabbit is shorter than the chair. A giraffe is taller than the door.
5. A picture cannot show how tall a giraffe really is, how it moves, or what it is like to stand next to one. Seeing the real animal tells you things a picture cannot.

## 9.4 SPECIMEN COLLECTION

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### OBJECTIVES

- Collect safe things from nature, like shells, leaves, seeds, pinecones and rocks, and know what must never be collected.
- Sort my specimens into groups and count each group.
- Make a label for each specimen with a parent and show my collection like a little museum.

**Warm-up.** Empty your pockets or a toy bin onto the floor. Sort everything into three piles: things that are round, things that are flat, and things that are long. Count each pile. Which pile is biggest? Sorting and counting is what you will do today with things from outside.

**Video.** Coming soon. Starting a nature collection for kids: collecting shells, leaves, seeds, pinecones and rocks, sorting and labeling specimens, a cabinet of curiosities, how a museum keeps its collections, Carl Linnaeus sorting plants. Try Smithsonian, Natural History Museum London, SciShow Kids, Homeschool Pop (Alternate), and museum behind-the-scenes footage.

### KEY TERMS

#### **specimen**

One real thing from nature that you keep to look at, like one shell or one leaf.

#### **collection**

A group of specimens kept together in one place, sorted and labeled.

#### **sort**

To put things that are alike together in groups.

#### **label**

A little card that says what a specimen is, where you found it and when.

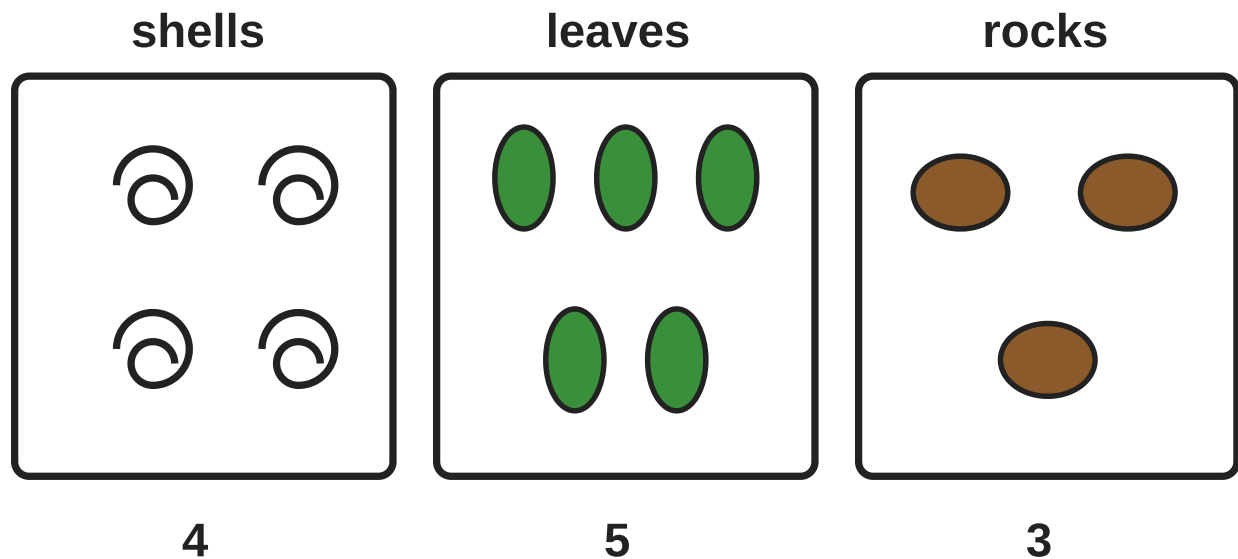
### CORE IDEAS

**The story.** A boy named Carl Linnaeus grew up in the country in Sweden. His father was a pastor who loved his garden. When Carl was small his father gave him a little plot of his own, and Carl filled it with flowers. He asked the names of every plant, and his father told him that he must remember them, or he would stop telling him. So Carl remembered. When he grew up, Linnaeus did a great work. He collected plants and animals from all over the world, sorted them into groups that were alike, and gave each kind a name of two words. Scientists still use his names today. His own collection of dried plants, shells and insects was so precious that after he died it was bought and carried to London, where it is still kept safe.

**Try it and see.** You can start a collection today. Take a bag on your walk and look on the ground. Good specimens are things that are already dead or dropped: shells, fallen leaves, acorns, pinecones, seed pods, smooth rocks, an empty snail shell, the dry skin a cicada leaves on a tree. Some things we never take. We never take a nest or an egg. We never take a live animal home. We leave mushrooms alone. In the United States it is against the law to keep feathers from most wild birds, so draw a feather in your journal and leave it where it lies. At a park or nature preserve, ask first, because collecting is often not allowed there.

**The big idea.** At home, spread everything on a tray and sort it. All the shells together. All the leaves together. All the rocks together. Count each group. Then an egg carton becomes your museum: one specimen in each cup. Your parent writes a label for each one: what it is, where you found it, and the date. A label is what makes a pile of stuff into a scientist's collection. The great museums of the world began exactly this way, with one person keeping shells and bones in a cupboard and writing down what they were.

**God's handiwork.** "It is the glory of God to conceal a thing: but the honour of kings is to search out a matter" (Proverbs 25:2). God hid wonderful things in every leaf and shell. When you collect, sort and look closely, you are searching them out.



$$4 + 5 + 3 = 12 \text{ specimens}$$

*Sort, then count. Which group has the most?*

## PICTURE STUDY



*Museum Wormianum (the frontispiece of Ole Worm's book about his collection), Engraved for Ole Worm's Museum Wormianum, 1655 · Engraving on paper · Printed in the book Museum Wormianum, Leiden, 1655; copies in many libraries*

Ole Worm was a doctor in Copenhagen, in Denmark. He loved to collect things from nature. He filled a whole room with shells, horns, bones, stuffed fish and birds, dried plants and strange rocks. People came from far away to see it. In 1655 a book was printed about his collection, and this picture is on the first page. It shows the room just as it looked. Look at how many things are there! Some hang from the ceiling. Some sit in boxes with labels on the front.

Rooms like this were called cabinets of curiosities. They were the beginning of the natural history museums we visit today.

### Look closely

- Find something hanging from the ceiling. What do you think it is?
- Find the boxes along the wall. Can you see the little labels on them?
- Look for a shell, a horn, a fish and a bird. Point to each one.
- Is there anything in this room that you have in your own collection?

### Talk about it

1. Why do you think Ole Worm put labels on his boxes?
2. If you could pick one thing from this room to hold, what would it be?
3. What would your room look like if you collected for your whole life?

**Safety first.** Collect only with a parent. Pick up only things that are dry and dead: shells, leaves, seeds, pinecones, rocks and empty snail shells. Never pick up mushrooms, dead animals, bones you find, broken glass or anything sharp, and never take a nest, an egg or a living creature. Do not keep wild bird feathers, which is against the law in the United States for most birds; draw them instead. Avoid plants with three shiny leaves. Ask before collecting on someone else's land or in a park, and wash hands with soap when you come home and after handling specimens.

## **MAKE AND DO: MY EGG-CARTON MUSEUM**

You will gather safe specimens, sort them, count them, label them and set up your very own museum in an egg carton.

### **You will need**

- A paper bag for collecting
- An empty egg carton, the twelve-cup kind
- Small slips of paper and a pencil for labels, and a parent to write
- A tray or old towel to spread things out on
- A magnifying glass if you have one

### **Steps**

1. Go outside with your bag. Look on the ground, under trees and along paths. Pick up only safe, dead, dropped things: leaves, acorns, seed pods, pinecones, shells, smooth rocks, an empty snail shell.
2. Stop when the bag has about twelve things. A small collection you can look at is better than a big pile.
3. At home, wash your hands. Spread everything on the tray.
4. Sort into groups: leaves here, seeds and cones here, rocks here, shells here. Count each group and tell your parent the numbers. Which group is biggest?
5. Put one specimen in each cup of the egg carton, with the groups next to each other.
6. For each one, your parent writes a label on a slip of paper: what it is, where you found it, and the date. Tuck the label under the specimen.
7. Close the lid. Your museum is ready. Open it and give a tour to someone in your family, telling about each specimen like a museum guide.

### **Tips**

- Leaves dry flat if you press them between two sheets of paper under a heavy book for a few days.
- A pinecone or shell may have a tiny bug inside. Leave the specimens outside overnight in a bag before bringing them in.
- Keep collecting. When the carton is full, start a second one for a new kind of specimen.

### **Check your work**

- I collected only safe, dead, dropped things and nothing from the never-take list.
- I sorted my specimens into groups and counted each group.
- Every specimen in my carton has a label, and I gave a tour.

## NATURE NOTEBOOK

1. Draw your favorite specimen very big, bigger than your hand. Look at it with the magnifying glass while you draw.
2. Draw a feather you saw on your walk but did not take. Your parent writes where you saw it.
3. Draw Ole Worm's room, but with your own specimens hanging from the ceiling.

**From history.** After Carl Linnaeus died, his collection of pressed plants, shells, insects and books was sold by his family and shipped to England, where a young naturalist named James Edward Smith bought it. He started the Linnean Society of London to care for it, and the collection is still there today. Scientists from all over the world visit to compare their specimens with the very ones Linnaeus named.

## WORKED EXAMPLES

**Example 1.** You spread your collection on the tray and sort it: 4 shells, 5 leaves and 3 rocks. Which group has the most? Which has the fewest? How many specimens do you have in all?

*(Use the map or drawing "Count each group, then count them all." shown earlier in this lesson.)*

1. Look at the three groups. 5 is the biggest number, so the leaves are the most.
2. 3 is the smallest number, so the rocks are the fewest.
3. Count everything together: 4 shells, then 5, 6, 7, 8, 9 for the leaves, then 10, 11, 12 for the rocks.

**Answer:** Most: leaves. Fewest: rocks. 12 specimens in all, one for each cup of the egg carton.

## PRACTICE

1. **EASY** Say yes or no: may we take a bird's nest home? May we take a fallen pinecone?
2. **EASY** What three things does a parent write on a label?
3. **MEDIUM** Here are a shell, an acorn, a pebble, a leaf, another shell and a pinecone. Sort them into shells, seeds and rocks. How many are in each group? (Leaves can be their own group.)
4. **MEDIUM** Your egg carton has 12 cups and you have 9 specimens. Are there enough cups? How many cups are empty?
5. **HARD** Tell your parent what makes a pile of leaves and rocks into a real collection.

## COMMON MISTAKES

- Thinking a collection has to be big. Twelve things you have looked at closely and labeled are worth more than a bucket of things you never sorted.
- Thinking anything on the ground is fine to take. Nests, eggs, living animals, mushrooms and most wild bird feathers are never collected. Look and draw instead.
- Forgetting the label. Without the label you soon forget where a shell came from, and the specimen cannot teach anyone anything.

**Make it a game · Museum Guide.** Set your egg-carton museum on the table. Your parent is the visitor and points to any specimen. You are the guide: say what it is, where you found it and one thing you noticed about it. Three good things earns a point. Then switch and let your parent be the guide while you point. Play until every specimen has been told about. Finish by choosing the one specimen you would show Ole Worm.

**Scripture.** “It is the glory of God to conceal a thing: but the honour of kings is to search out a matter.” (Proverbs 25:2, KJV)

God hid wonders in every shell and leaf. Searching them out, by collecting, sorting and looking closely, is a kingly kind of work.

### Practice answers

1. Nest: no, never. Pinecone: yes.
2. What it is, where you found it, and the date.
3. Shells: 2. Seeds: 2 (the acorn and the pinecone). Rocks: 1 (the pebble). Leaves: 1.
4. Yes, there are enough. 3 cups are empty, because 9 and 3 more make 12.
5. Sorting the things into groups and giving each one a label that says what it is, where it was found and when. Then anyone can learn from it, like at a museum.

## UNIT 9 REVIEW

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Ask these questions aloud. Let the child answer by talking, pointing, drawing or acting it out. No reading or writing is needed. There are 6 questions worth 20 points in all. Give full points for an answer in the child's own words that has the main idea.

1. (3 pts) Show me one page in your nature journal. Point to the date and the weather. Then tell me what you drew and what it was doing.
2. (3 pts) Gilbert White was a naturalist. What did he do every day, and did he have to travel far to do it?
3. (4 pts) Here is a chart: ants 6, worms 2, birds 3. Which creature was there the most of? Which was there the fewest of? Then tell me why we count only inside the hoop.
4. (3 pts) Tell me about one animal you saw on your visit. How did it move? Was it bigger or smaller than you?
5. (4 pts) Name two things that are good to collect and two things we must never take home.
6. (3 pts) Open your egg-carton museum. Sort your specimens into groups and count each group. Which group is biggest? Then pick one specimen and tell me its label.

### UNIT PROJECT: MY NATURE LAB BOX

Put the whole unit in one box or basket to show a grandparent or friend. Inside go: your nature journal with at least three dated pages; your two hoop-survey charts, sunny and shady, with the creature that had the most circled; your drawing from the zoo, farm or museum visit with your parent's note of what surprised you; and your egg-carton museum with a label under every specimen.

Then give a tour. Open each thing in order and tell what you did, like a scientist showing a visitor around the lab.

- **Journal:** At least three pages have the date, the weather, a drawing of a real living thing and the child's own words written by a parent.
- **Survey:** Both charts are complete, and the child can point to the longest row and say which patch had more creatures.
- **Visit and Collection:** The visit drawing shows a real animal seen in person, and every specimen in the carton is safe to collect and has a label with what, where and when.
- **Telling:** The child gives the tour in order, in complete thoughts, and can name one person from the unit (Gilbert White, Fabre or Linnaeus) and what that person did.

#### Answer key

1. The child points to the date and the weather sign at the top and tells about the drawing in their own words.
2. He walked out, looked carefully at the animals and birds around his village, and wrote down what he saw. He did not travel far; he watched one village.

3. Most: ants. Fewest: worms. We count only inside the hoop so the count is fair and we can compare one patch with another.
4. The child names a real animal from the visit, tells how it moved (walked, hopped, swam, flew) and says correctly whether it was bigger or smaller than the child.
5. Good: shells, fallen leaves, acorns, pinecones, seed pods, rocks, empty snail shells (any two).  
Never: nests, eggs, live animals, mushrooms, wild bird feathers (any two).
6. The child sorts, counts each group correctly, names the biggest group, and tells what one specimen is, where it was found and when.