

SCHOOL LAUNCH · EXPLORE TRACKS

EXPLORE TRACKS · TRAIL A

Three interest tracks for curious Scouts: Animals (mammals), Dinosaurs and Great Battles of the ancient world. Short, self-paced stops with true stories, great pictures, hands-on projects and games.

First edition

The works of the LORD are great, sought out of all them that have pleasure therein.

Psalm 111:2 (KJV)

COURSE GUIDE

Explore Tracks are for children who want more of what they love. Each track is a trail of short stops. At every stop the child hears a true story, studies a great picture, does something with his or her hands, plays a game and adds a page to a Field Notebook.

Trail A is the first trail of each track at the  Scout level (ages 7-9). The Animals track meets ten mammals. The Dinosaurs track meets ten famous dinosaurs and learns the museum words Triassic, Jurassic and Cretaceous, with a creation-friendly view of the dates on museum signs. The Great Battles track visits eight battles of the ancient world, from Marathon to Alesia, and ends with two victories God gave His people at Jericho and through Gideon.

WHO IT IS FOR

Written for children about ages 7-9 who are read to by a parent, or who read short passages on their own. Older siblings can join in. Nothing earlier is required.

HOW TO USE THIS COURSE

1. **One stop at a time.** A stop takes 15-25 minutes: read the story aloud, look at the picture, do the hands-on part and play the game. Two or three stops a week works well.
2. **Any order.** The tracks are independent. Do one track at a time, or rotate between them.
3. **Field Notebook.** Every stop ends with a page for the notebook. At the end of the trail the pages become a booklet, and the parent signs the Trail A certificate.
4. **Badge quizzes.** Each track has two short, optional oral quizzes. They are for fun, not grades.

SCOPE AND SEQUENCE

Track 1: Animals  **Trail A: Mammals** (Self-paced)

Track 2: Dinosaurs  **Trail A: Meet the Dinosaurs** (Self-paced)

Track 3: Great Battles ✕ **Trail A: The Ancient World** (Self-paced)

MATERIALS

- **Field Notebook (a sketchbook or composition book)** One for the whole trail.
- **Colored pencils, a ruler, scissors and glue** For drawings and maps.
- **Household things** Each hands-on project lists what it needs: blocks, clay, string, toy figures, cups.
- **A Bible (KJV)** For the verse at each stop and the Jericho and Gideon stop.

GRADING

Explore Tracks are not graded. A stop is done when the child has heard the story, done the hands-on part and made a notebook page.

Badges and the Trail A certificate are earned by finishing the stops.

A NOTE TO PARENTS

You do not need to be an expert. Read the story aloud, look at the picture together and ask, “What do you notice?” Each stop has a short *For families* note with background and any facts that scholars still discuss.

Dinosaur dates: museums give ages in millions of years. This trail teaches the period names as museum vocabulary and explains that the dates are interpretations; many Christian families understand the fossils within a young earth and the Flood.

Battles are told for young children: who, where, the plan, what happened and why it mattered, with honor for courage and wisdom and no gory detail.

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- 1.7 Bears
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- 1.9 Kangaroos
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Track 2: Dinosaurs 🦖 Trail A: Meet the Dinosaurs

- 2.1 Tyrannosaurus rex
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Track 3: Great Battles ✂ Trail A: The Ancient World

- 3.1 Marathon (490 B.C.)
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- 3.6 Zama (202 B.C.)
- 3.7 Alesia (52 B.C.)
- 3.8 Jericho and Gideon

Each stop takes 15–25 minutes. Tracks may be done in any order, and a child may do just one track.

ANIMALS TRAIL A: MAMMALS

The first trail of the Animals track visits ten mammals, from the lion and the great whales to the American bison that came back from the edge. Each stop is a short read-aloud story, a picture to study, something to draw or build, two or three quick questions, a game and a verse of Scripture.

This is the  **Scout** level, written for ages 7 to 9. A parent reads the story aloud, or a strong reader reads it alone. Every stop stands by itself, so a child may start with the animal he loves best. The  Ranger and  Expert levels of these same stops will add maps, numbers and primary sources later.

Five stops earn the **Mammal Scout badge, part 1**, and ten stops earn part 2 and the **Trail A certificate**. The badge quizzes are at the end of the trail and are optional.

BEFORE YOU BEGIN

- Listen to a story of about five minutes and tell it back.
- Draw a simple animal shape with a pencil.
- Find Africa, Asia, Australia, North America and the oceans on a globe (a grown-up may help).

MASTERY CHECKLIST

- ☐ I can say what makes an animal a mammal: hair or fur, breathing air, and feeding its babies milk.
- ☐ I can tell one true and surprising fact about each of the ten mammals on this trail.
- ☐ I can point to where each animal lives on a globe or map.
- ☐ I can say one way God's design helps each animal live where it lives.
- ☐ I can keep a Field Notebook page with a drawing, a title, a date and one sentence.

OPTIONAL BOOKS AND RESOURCES

- **Project Gutenberg** (<https://www.gutenberg.org>): Free old nature books to read aloud, such as Thornton W. Burgess's animal stories.
- **Biodiversity Heritage Library** (<https://www.biodiversitylibrary.org>): Old animal drawings and plates (Audubon and others) to copy in the Field Notebook.

1.1 LIONS AND THE LION OF JUDAH

OBJECTIVES

- Tell how lions live together in a family called a pride.
- Name two things that help a lion hunt.
- Explain why the Bible calls Jesus “the Lion of the tribe of Juda.”

Warm-up. Stand up tall and give your loudest roar. Now whisper a roar. Which one would make a zebra run? A lion’s roar can be heard about five miles away. Can you think of a place about five miles from your house?

Video slot. Video coming. Lions in a pride: lionesses hunting and cubs at play, no kills shown. Search approved nature channels (e.g., Homeschool Pop (Alternate), Smithsonian’s National Zoo).

KEY TERMS

mammal

An animal with hair or fur that breathes air and feeds its babies milk.

pride

A family group of lions that live and hunt together.

lioness

A female lion. Lionesses do most of the hunting.

mane

The long, thick hair around a male lion’s head and neck.

CORE IDEAS

The story. The sun is going down over the grassy plains of Africa. Under a flat-topped acacia tree, a big male lion lifts his head. His shaggy golden mane shakes as he opens his mouth and roars: *Aaa-OOOH! Ooh! Ooh!* The sound rolls across the grass for miles. It tells every animal, “This is our land.”

A family called a pride. Most cats live alone, but lions live together. A lion family is called a **pride**. It may have a few grown males, several **lionesses** (mother lions, aunts and sisters) and their cubs. The lionesses do most of the hunting. They creep low through the tall grass, the same color as their fur, and work together like a team. The cubs stay behind and pounce on each other’s tails. That play is practice for when they grow up.

Built for the job. A lion has soft pads on its feet so it can walk without a sound. It has sharp claws that it can pull back in, like a house cat. Its eyes see well in dim light, so it often hunts at dusk or at night. And after a big meal, a lion rests. Lions may sleep or lie still for up to twenty hours a day!

Where lions live. Most wild lions live in Africa, south of the great Sahara Desert. A small group also lives in the Gir Forest of India. Long ago lions lived in the lands of the Bible too, and the Bible mentions them many times. David fought a lion to save his father's sheep. God shut the lions' mouths when Daniel was thrown into their den.

The Lion of Judah. A lion is strong, brave and kingly. That is why, long ago, Jacob called his son Judah "a lion's whelp," a young lion (Genesis 49:9). King David came from Judah's family, and so did Jesus. In the book of Revelation, Jesus is called "the Lion of the tribe of Judah" (Revelation 5:5). The Lion of Judah is the strongest King of all, and He uses His strength to save His people.

PICTURE STUDY



Daniel in the Lions' Den, Peter Paul Rubens, c. 1614–1616 · Oil on canvas · National Gallery of Art, Washington, D.C.

Wikimedia Commons · Public domain

Peter Paul Rubens was a famous painter from Flanders, in what is now Belgium. He studied real lions so that he could paint them life-size. In this painting, Daniel sits on a rock in the den and looks up to God in prayer, while the lions yawn, stretch and lie around him.

Look closely

- Count the lions. How many can you find? Are any of them lionesses?
- Look at Daniel's face and hands. What is he doing?
- Find the light. Where does it come from?

Talk about it

1. Do the lions look hungry, sleepy or angry? Why do you think Rubens painted them that way?

2. What does this painting tell us about how God cared for Daniel (Daniel 6:22)?

HANDS-ON: HOW LONG IS A LION?

A big male lion can be about 9 feet long from his nose to the tip of his tail. Find out how big that is in your own house.

You will need

- A tape measure or yardstick
- Painter's tape or a long piece of string
- Paper and crayons

Steps

1. With a grown-up, measure 9 feet along the floor. (That is 3 yardsticks laid end to end.)
2. Mark the start and the end with tape. This is the lion's nose and the tip of his tail.
3. Lie down beside it. How many of you does it take to make one lion?
4. Draw a lion along a long strip of paper, with a big mane at one end and a tufted tail at the other.

Check your work

- I measured 9 feet.
- I compared the lion to my own size.
- My lion drawing has a mane and a tufted tail.

FIELD NOTEBOOK

1. Draw a lion's head with its mane. Write the title "Lion," the date and one fact you learned.
2. Draw a lion paw print: one big pad and four toe prints. (Cats pull their claws in, so claw marks usually do not show.)

Did you know? A male lion can weigh about 400 pounds, as much as two or three grown men. Lion cubs are born with spots on their fur. The spots fade as they grow up. A lion's tail has a dark tuft of hair at the end, like a paintbrush.

Goes deeper in. Life Science, Grade 2, Unit 1 "Mammals" (coming soon); and Geography, for Africa on the map.

For families. A gentle stop for young children: the video and story show hunting only from a distance, with no kill. If your child asks about Daniel 6, read the chapter together; it is a short and wonderful story of faithfulness.

PRACTICE

1. **EASY** What is a family of lions called?
2. **EASY** Who does most of the hunting in a pride?
3. **MEDIUM** Why does the Bible call Jesus “the Lion of the tribe of Judah”?

Make it a game • Lion, Lion, Cub. Play like Duck, Duck, Goose. The child who is “it” walks around the circle saying “cub, cub, cub...” and then roars “LION!” The lion chases the child who was tapped back to the empty spot.

Scripture. “The wicked flee when no man pursueth: but the righteous are bold as a lion.” (Proverbs 28:1, KJV)

A lion does not run away. God wants us to be brave like a lion when we do what is right.

Practice: answers

1. A pride.
2. The lionesses (the female lions).
3. Jesus came from the family of Judah, and like a lion He is strong and kingly; He uses His strength to save His people (Revelation 5:5).

1.2 ELEPHANTS

OBJECTIVES

- Name three ways an elephant uses its trunk.
- Explain how an elephant family is led by the oldest mother.
- Tell the story of Hansken, the elephant Rembrandt drew.

Warm-up. Try to pick up a pencil using only your nose and your upper lip. It is hard! An elephant's trunk is its nose and upper lip joined together, and it can pick up a single peanut.

Video slot. Video coming. Elephant families: the trunk, ears and the matriarch. Search approved nature channels (Smithsonian's National Zoo, San Diego Zoo Wildlife Alliance, Homeschool Pop (Alternate)).

KEY TERMS

trunk

An elephant's long nose and upper lip joined together.

tusk

A very long front tooth that grows out of an elephant's mouth.

herd

A family group of elephants that travel together.

matriarch

The oldest mother elephant, who leads the herd.

CORE IDEAS

The story. In 1637, a young elephant was shown at the fair in Amsterdam, a busy city in Holland. Her name was Hansken. She had been born on the island of Ceylon, near India, and had come to Holland by ship when she was a baby. Crowds paid to see her, and she had been trained to do tricks for them. One of the people who came to look was the great painter Rembrandt. He took out his chalk and drew her, again and again, so that he could get her wrinkly skin just right.

A nose that is also a hand. An elephant's **trunk** is its nose and upper lip together. It has thousands of muscles and no bones at all. An elephant uses its trunk to smell, to breathe, to pull down branches, to drink and to give itself a dust bath or a shower. It can lift a heavy log, and it can pick up one small peanut.

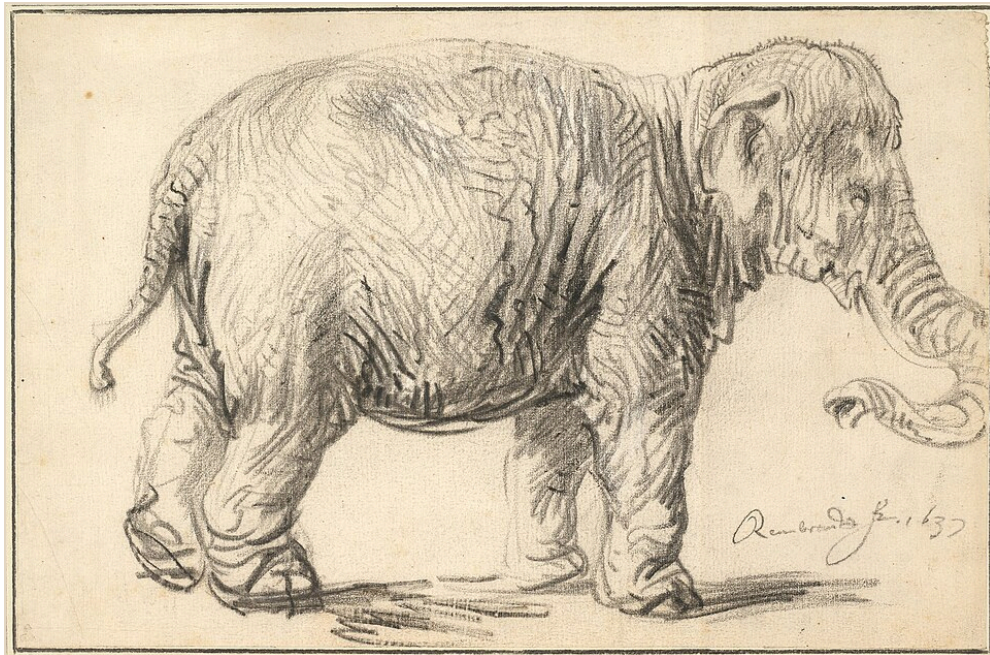
Tusks and ears. An elephant's **tusks** are really two very long front teeth. Elephants use them to dig for water and to strip bark from trees. Their huge ears work like fans. On a hot

day, an elephant flaps its ears, and the blood flowing through them cools down, which cools the whole elephant.

A family led by Grandmother. Elephants live in a family group called a **herd**. The leader is the oldest and wisest mother, the **matriarch**. She remembers where to find water in a dry year and which paths are safe. When danger comes, the big elephants make a circle around the babies. A baby elephant grows inside its mother for about 22 months before it is born, almost two whole years!

The biggest land animal. The African bush elephant is the largest animal that walks on land. A big male can weigh more than six tons, as much as four or five cars. There are also Asian elephants, which are a little smaller and have smaller, rounder ears. Hansken was an Asian elephant.

PICTURE STUDY



Elephant (Hansken), Rembrandt van Rijn, 1637 (signed and dated) · Black chalk on paper · Albertina, Vienna
Wikimedia Commons · Public domain

Rembrandt was one of the greatest artists of the Dutch Golden Age. Few people in Holland had ever seen an elephant, so when Hansken came to Amsterdam, he drew her from life with black chalk. Look how he shows her heavy weight with just a few lines.

Look closely

- Find the wrinkles on Hansken's skin. How did Rembrandt draw them?
- Look at her legs. Do they look like tree trunks?
- Find her trunk. Is it straight or curled?

Talk about it

1. Why do you think Rembrandt drew Hansken more than once?
2. If you could draw a real animal from life, which one would you choose?

HANDS-ON: ELEPHANT FOOT MEASURE

People who study elephants use a clever rule of thumb: the distance around an elephant's front footprint, times two, is about how tall the elephant is at the shoulder.

You will need

- A long piece of string
- Cardboard or a big paper bag
- A yardstick
- Scissors (with a grown-up)

Steps

1. Draw a circle about 18 inches across on the cardboard. This is a grown elephant's footprint. Cut it out.
2. Lay the string around the edge of the footprint and mark how long it is (about 56 inches).
3. Double that length. Measure it up a wall from the floor and put a sticky note there (about 9 feet 4 inches). That is about how tall the elephant would be!
4. Stand under the sticky note. How many of you would fit?

Check your work

- I made an elephant footprint.
- I measured around it with string.
- I doubled the string to find the elephant's height.

FIELD NOTEBOOK

1. Draw an elephant from the side, like Rembrandt did. Label the trunk, tusk, ear and tail.
2. Write: "The leader of an elephant herd is called the ____."

Did you know? An elephant may eat around 300 pounds of plants in a single day. Elephants "talk" with deep rumbles so low that people can hardly hear them, but other elephants far away can. King Solomon had a great throne made of ivory, the material of elephant tusks, and covered it with gold (1 Kings 10:18).

Goes deeper in. Life Science, Grade 6, Lesson 6.3 "Elephants" in the Social Animals unit (coming soon).

For families. Rembrandt signed and dated this drawing 1637 (Albertina, inv. 17558); Hansken was shown at the Amsterdam fair that year. She was born in Ceylon about 1630, reached Holland in 1633 and died in Florence in 1655. Old sources describe several

tricks; the stop just says she did tricks. Hansken's life as a traveling show animal is told simply. If your child is curious about elephants and ivory, explain that wild elephants are now protected so they are not hunted for their tusks.

PRACTICE

1. **EASY** What are an elephant's tusks?
2. **EASY** Name two things an elephant does with its trunk.
3. **MEDIUM** How do big ears help an elephant on a hot day?

Make it a game • Follow the Matriarch. One child is the matriarch and leads the "herd" around the yard. When she says "Danger!", the herd makes a circle around the smallest child or a stuffed-animal "calf."

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)

Job says the animals can teach us. The elephant family teaches us to care for the little ones and to listen to the wise and old.

Practice: answers

1. Two very long front teeth.
2. Any two: smell, breathe, drink, pick up food, pull branches, give itself a shower or dust bath, lift logs.
3. The elephant flaps its ears; the blood in them cools, which cools the whole elephant.

1.3 WHALES, THE “GREAT WHALES” OF GENESIS

OBJECTIVES

- Explain why a whale is a mammal and not a fish.
- Tell how big a blue whale is, compared with things we know.
- Say what Genesis 1:21 tells us about the great whales.

Warm-up. Take a deep breath and hold it as long as you can. How many seconds did you last? A sperm whale can hold its breath for more than an hour while it dives deep for food.

Video slot. Video coming. Blue whales and humpbacks: spouting, breaching and the size of the blue whale. Search NOAA Fisheries, Smithsonian Ocean, Homeschool Pop (Alternate).

KEY TERMS

whale

A very large sea animal that is a mammal: it breathes air and feeds its babies milk.

blowhole

The nostril on top of a whale’s head, used for breathing at the surface.

spout

The cloud of misty air a whale blows out when it breathes.

krill

Tiny shrimp-like animals that some whales eat by the ton.

CORE IDEAS

The story. On the fifth day of creation, God filled the seas with living things. The Bible says, “And God created great whales, and every living creature that moveth” (Genesis 1:21). Of all the creatures in the sea, whales are named first. And they really are great!

A fish? No, a mammal! A whale lives in the sea and swims with its tail, but it is not a fish. A fish breathes water through gills. A whale breathes air, just like you. It comes up to the surface and breathes out through a **blowhole** on top of its head. Whoosh! A cloud of mist shoots up. That is the **spout**. Then the whale takes a big breath and dives. Mother whales give birth to live babies, called calves, and feed them milk. That is why whales are **mammals**.

The biggest animal ever known. The blue whale is the largest animal that has ever lived, as far as anyone knows, bigger even than the largest dinosaurs. It can grow to about 100 feet long. That is longer than two school buses parked end to end. Its heart alone weighs

about 400 pounds, as much as two grown men, and its tongue can weigh as much as a small elephant!

A giant that eats tiny food. You might think such a giant would eat giant food. But the blue whale eats some of the smallest animals in the sea: **krill**, tiny creatures like little shrimp. Instead of teeth, it has long, bristly plates called baleen, like a huge comb. It gulps a mouthful of sea water, pushes the water out through the baleen and keeps the krill. A blue whale may eat about four tons of krill in a day.

Songs in the sea. Humpback whales sing long, rolling songs of moans, squeaks and whoops. The sound travels far through the water. Sailors long ago heard strange noises through the hulls of their ships and did not know what they were. Now we know: the great whales were singing.

PICTURE STUDY



Stranded Whale near Beverwijk, Jan Saenredam, 1602 · Engraving · Rijksmuseum, Amsterdam
Wikimedia Commons · CC0

In December 1601 a sperm whale washed up on the beach near Beverwijk in Holland. People came from miles around to see it, and the Dutch artist Jan Saenredam made this engraving of the crowd. In 1602 there were no photographs, so pictures like this were the only way to show far-away people what a whale looked like.

Look closely

- Find the whale. How does its size compare to the people?
- Look for people measuring or climbing. What are they doing?
- Find the horses and carriages. How did people travel to see the whale?

Talk about it

1. Why do you think so many people came to see the whale?
2. What would you have done if you had been there?

Safety first. Stay out of the street. Measure in a yard, park or quiet driveway with a grown-up.

HANDS-ON: A BLUE WHALE IN THE YARD

See how long a blue whale really is by measuring one outside.

You will need

- A long tape measure, or a string 10 feet long
- Sidewalk chalk or two sticks
- A grown-up helper

Steps

1. Mark a starting line. This is the whale's nose.
2. Measure 10 feet with the string, mark it, and do it again until you have measured ten times. You have measured 100 feet.
3. Mark the end. This is the tip of the whale's tail.
4. Walk from nose to tail and count your steps. Then draw a whale outline with chalk if you can.

Check your work

- I measured about 100 feet.
- I counted my steps from nose to tail.
- I can say about how many school buses long a blue whale is (about two).

FIELD NOTEBOOK

1. Draw a whale at the surface, with its spout. Label the blowhole, tail and flipper.
2. Copy the first words of Genesis 1:21 in your best handwriting: "And God created great whales."

Did you know? Blue whales make some of the loudest sounds of any animal on earth. A humpback whale sometimes leaps almost all the way out of the water and lands with a giant splash. This is called breaching. Whale calves are usually born tail first, and their mothers help them up to the surface for their first breath.

Goes deeper in. Life Science, Grade 1, Lesson 3.1 "Whales" and Grade 6, Lesson 7.1 "Blue whale" (coming soon).

For families. Some children wonder about Jonah. The Bible says “a great fish” (Jonah 1:17), and in the King James Version Jesus says “the whale’s belly” (Matthew 12:40). Stop D10 in the Ocean Life trail looks at Jonah more closely.

PRACTICE

1. **EASY** Do whales breathe water or air?
2. **EASY** What is the largest animal ever known?
3. **MEDIUM** Give two reasons a whale is a mammal and not a fish.

Make it a game • Spout and Dive. When the leader says “Spout!”, everyone jumps up and blows like a whale. When she says “Dive!”, everyone crouches down and holds their breath. Anyone who moves the wrong way becomes the next leader.

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 biggest animal in the world, and He said it was good.

Practice: answers

1. Air. They breathe at the surface through a blowhole.
2. The blue whale.
3. Any two: it breathes air; it has live babies; it feeds its babies milk.

1.4 BATS

OBJECTIVES

- Explain why a bat is the only mammal that can truly fly.
- Tell how many bats find food in the dark by echoes.
- Name one way bats help people.

Warm-up. Stand in a quiet room, close your eyes, and clap once. Can you hear the clap bounce back from the walls? That bounce is an echo. Many bats “see” with echoes.

Video slot. Video coming. How bats fly and find insects by echolocation; the evening flight at a bat cave. Search Bat Conservation International, the National Park Service (Carlsbad Caverns), Smithsonian.

KEY TERMS

bat

A mammal with wings made of skin stretched over long finger bones.

echo

A sound that bounces back off something.

echolocation

Finding things by making sounds and listening to the echoes.

roost

A place where bats or birds rest or sleep.

CORE IDEAS

The story. Every summer evening, near San Antonio, Texas, something amazing happens at Bracken Cave. As the sun sets, a dark cloud begins to pour out of the cave. It twists into the sky like smoke. But it is not smoke. It is millions and millions of bats, flying out for their nightly supper! Bracken Cave is the summer home of one of the largest groups of bats in the world, more than fifteen million Mexican free-tailed bats.

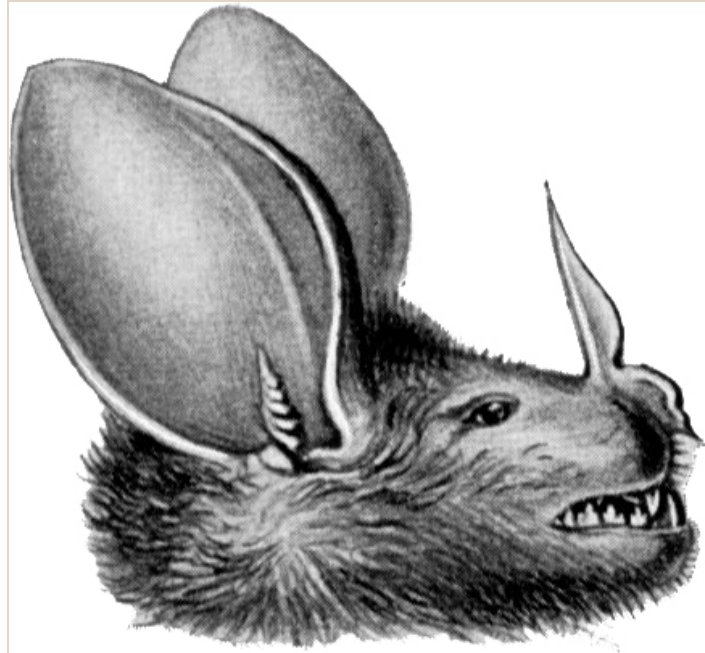
Flying with your hands. Birds fly, and so do bees, but a bat is the only **mammal** that can truly fly. A bat has fur, breathes air and feeds its babies milk. Its wings are really its hands! A bat’s wing is made of thin skin stretched between very long finger bones. The scientific name for bats means “hand-wing.” By moving its fingers, a bat can twist and turn in the air.

Seeing with sound. How does a bat catch a tiny moth in the dark? Many bats make high squeaks, too high for people to hear. The sound bounces off a moth and comes back as an **echo**. By listening, the bat can tell where the moth is and which way it is flying. This is called **echolocation**. Some bats can catch hundreds of insects in one night.

Upside-down sleepers. In the daytime, bats **roost** in caves, hollow trees, barns and under bridges. They hang upside down by their feet. Their toes lock in place, so a bat can hang without using its strength, even while it sleeps.

Good neighbors. Bats help people a great deal. Insect-eating bats eat beetles and moths that would harm farmers' crops. Fruit bats in warm countries carry pollen from flower to flower and drop seeds that grow into new trees. God made even the little bat to do important work.

PICTURE STUDY



A Bat's Face (Chrotopterus), from Plate 67 of Art Forms in Nature, Ernst Haeckel, 1904 · Lithograph · From the book Kunstformen der Natur (Art Forms in Nature)
Wikimedia Commons · Public domain

Ernst Haeckel was a German scientist and artist who drew living things in beautiful patterns. On one page he drew the faces of many kinds of bats; this is one of them, a big-eared bat from South America. Look at its huge ears and its nose shaped like a leaf. These shapes help the bats send out and catch their echoes.

Look closely

- Find the ears. How big are they next to the face?
- Find the leaf-shaped nose.
- Find the teeth. What do you think this bat eats?

Talk about it

1. Why might a bat that uses echoes need big ears?
2. Is this bat scary, funny or beautiful to you? Why?

Safety first. Never touch a bat, alive or dead. A bat on the ground may be sick. Tell a grown-up. Bats are wonderful to watch from a distance.

HANDS-ON: A HAND-WING BAT

Make a bat that shows the finger bones in its wings, then play a game that works like echolocation.

You will need

- Black or brown paper
- A white crayon or chalk
- Scissors and a craft stick
- Tape

Steps

1. Trace your hand on the paper with your fingers spread. Draw long lines from the palm out through each finger. These are the bat's finger bones.
2. Draw the wing skin from fingertip to fingertip, and add a small furry body and ears. Cut it out and tape it to a craft stick.
3. Play the game "Bat and Moth" below.

Check your work

- My paper bat shows long finger bones in the wing.
- I can explain how the game is like echolocation.

FIELD NOTEBOOK

1. Draw a bat hanging upside down. Label the wing, the fingers and the feet.
2. Write one way bats help farmers.

Did you know? There are more than 1,400 kinds of bats. Some are smaller than your thumb, and the biggest fruit bats have wings wider than a grown man is tall. Bats are not blind. Many see quite well, and most fruit bats find their food by sight and smell. In Austin, Texas, about one and a half million bats live under the Congress Avenue Bridge, and people gather on summer evenings to watch them fly out.

Goes deeper in. Life Science, Grade 2, Lesson 1.2 "Bats fly" and Grade 6, Unit 3 "Echolocation" (coming soon).

For families. The safety note matters: in North America bats are a common carrier of rabies, so children should look, not touch. A summer evening bat watch near a pond or a bridge makes a fine family outing.

PRACTICE

1. **EASY** What is a bat's wing made of?
2. **MEDIUM** How does echolocation help a bat catch a moth in the dark?
3. **EASY** True or false: all bats are blind.

Make it a game • Bat and Moth. One blindfolded player is the bat and calls “Bat!” The other players are moths and must answer “Moth!” each time. The bat follows the sound to tag a moth. Play in a clear, safe space.

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 different. The bat, with its hand-wings and echoes, is one of God’s many wise works.

Practice: answers

1. Thin skin stretched over very long finger bones.
2. The bat makes high squeaks; the sound bounces off the moth and comes back as an echo, which tells the bat where the moth is.
3. False. Bats can see; many see well.

1.5 HORSES

OBJECTIVES

- Measure a horse in “hands.”
- Name two ways God designed horses to stay safe.
- Tell how horses have helped people for thousands of years.

Warm-up. Put your hand flat on the table with your fingers together. How wide is it? Horse people measure horses in hands, and one hand is 4 inches.

Video slot. Video coming. Horse gaits and how horses are measured in hands. Search approved channels (e.g., Homeschool Pop (Alternate), the Kentucky Horse Park, Smithsonian).

KEY TERMS

foal

A baby horse.

hand

A unit used to measure a horse’s height: one hand is 4 inches.

hoof

The hard covering on a horse’s foot (plural: hooves).

gait

A way of moving: walk, trot, canter or gallop.

CORE IDEAS

The story. Long ago in Paris, a young painter named Rosa Bonheur wanted to paint the most exciting picture of horses anyone had ever seen. So twice a week, for about a year and a half, she went to the great horse market in Paris. She stood among the stamping, snorting horses with her sketchbook and drew them as they trotted, reared and tossed their manes. Her big painting, *The Horse Fair*, made her famous around the world.

A helper for people. For thousands of years horses have carried people, pulled plows and wagons, and carried messages fast. Before cars and trains, a horse was the fastest way to travel on land. Farmers, soldiers, mail riders and country doctors all needed good horses.

Measured by hands. People measure a horse from the ground to the top of its shoulders, called the withers. They measure it in **hands**, and one hand is 4 inches. A small pony may be about 10 hands. A big draft horse, like a Clydesdale, can be 18 hands tall, which is 6 feet just to its shoulders!

Made to watch and run. A horse's eyes are on the sides of its head, so it can see almost all the way around without turning. Its legs are long and strong, and each foot ends in a hard **hoof**. Horses can even doze standing up, because their legs can lock in place. If danger comes, they are ready to run.

A baby that stands right away. A baby horse is called a **foal**. Within about an hour after it is born, a foal wobbles up onto its long legs. Soon it can walk and run beside its mother. In the book of Job, God asks, "Hast thou given the horse strength?" (Job 39:19). Only God could make such a strong and beautiful animal.

PICTURE STUDY



The Horse Fair, Rosa Bonheur, 1852-1855 · Oil on canvas · The Metropolitan Museum of Art, New York
Wikimedia Commons · Public domain

Rosa Bonheur was a French painter who loved animals and studied them carefully. This painting is more than 16 feet wide. It shows the Paris horse market, where powerful work horses called Percherons were shown to buyers.

Look closely

- Find the white horses. Where is the light shining on them?
- Find a horse rearing up on its back legs.
- Look at the men leading the horses. Do they look calm or busy?

Talk about it

1. What sounds would you hear if you stepped into this painting?
2. Why did Rosa Bonheur go to the horse market so many times?

HANDS-ON: HOW MANY HANDS TALL AM I?

Measure yourself the way people measure horses.

You will need

- A ruler or tape measure
- A pencil and paper
- A door frame and a grown-up

Steps

1. Stand against the door frame and have a grown-up mark your shoulder height.
2. Measure from the floor to the mark in inches.
3. Count by 4s (or divide by 4) to find how many hands tall you are. A grown-up can help with the math.
4. Compare: a pony is about 10 hands; a big draft horse is about 18 hands.

Check your work

- I measured my shoulder height.
- I changed inches into hands (4 inches = 1 hand).
- I compared myself to a pony and a draft horse.

FIELD NOTEBOOK

1. Draw a horse from the side. Label the mane, tail, hoof and withers.
2. Write the four gaits in order from slowest to fastest.

Did you know? A horse's gaits, from slow to fast, are the walk, the trot, the canter and the gallop. You can estimate a horse's age by looking at its teeth. That is where the saying "long in the tooth" comes from. Horses breathe only through their noses, not their mouths.

Goes deeper in. Life Science, Kindergarten, Lesson 1.4 "Horses and Work" (coming soon).

For families. Horse-loving children may enjoy Anna Sewell's *Black Beauty* (1877, public domain) as a read-aloud.

PRACTICE

1. **EASY** How many inches are in one "hand"?
2. **MEDIUM** A horse is 15 hands tall. How many inches is that?
3. **EASY** What is a baby horse called?

Make it a game · Walk, Trot, Canter, Gallop. A caller shouts the four gaits in any order. Everyone moves around the yard at that speed. “Whoa!” means stop.

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

God asks Job this question to show that only He could make a creature so strong and fine.

Practice: answers

1. 4 inches.
2. $15 \times 4 = 60$ inches (5 feet) to the withers.
3. A foal.

1.6 WOLVES AND DOGS

OBJECTIVES

- Tell how a wolf pack lives as a family.
- Explain why dogs and wolves are close relatives.
- Name one way a dog's nose helps people.

Warm-up. Close your eyes. A grown-up holds an orange, a cinnamon stick and a bar of soap near your nose, one at a time. Can you name each one by smell? A dog could find them anywhere in the house.

Video slot. Video coming. Gray wolf packs in Yellowstone, and working dogs (search-and-rescue). Search the National Park Service (Yellowstone), Smithsonian, Homeschool Pop (Alternate).

KEY TERMS

pack

A family group of wolves that live and hunt together.

howl

A long, loud call that wolves use to talk to each other far away.

breed

A kind of dog, like a beagle or a collie, with its own look and skills.

scent

A smell an animal can follow.

CORE IDEAS

The story. Deep in the snowy forest, a gray wolf lifts its nose to the sky and howls: *Owwwooooo!* Far away, another wolf answers. Then another. Soon the whole family is singing together. Wolves **howl** to call their family together, and to tell other wolves, "This place is ours."

A family called a pack. A wolf **pack** is usually a family: a mother, a father and their young. The parents lead the pack. The older brothers and sisters help care for the new pups, bringing them food and watching over them. Wolves hunt together, too, for large animals like deer and elk, and they may travel many miles in one day.

Cousins in the house. The dog lying on your rug is a close relative of the wild wolf. Dogs and wolves have the same number of teeth, and they can even have puppies together. Long, long ago, people began to keep and train dogs, and over many years they bred dogs for different jobs. Now there are hundreds of **breeds**, from the tiny Chihuahua to the giant Great Dane. They all belong to one dog family.

The amazing nose. A dog's nose is far better than ours. A dog can follow the **scent** of one person across fields and through a crowd. Bloodhounds can follow trails that are more than a day old. Dogs help people every day: they find lost hikers, sniff out danger, guide people who cannot see, guard sheep and pull sleds through the snow.

Friends of people. Wolves are wild and should be watched from far away. But dogs have been friends and helpers of people in nearly every land. A good dog is loyal, brave and glad to see you. Those are good things for a person to be, too.

PICTURE STUDY



Dignity and Impudence, Sir Edwin Landseer, 1839 · Oil on canvas · Tate, London
Wikimedia Commons · Public domain

Sir Edwin Landseer was the most famous animal painter in England in the 1800s. Here he painted two dogs side by side in one kennel: a big bloodhound and a small, scruffy white terrier. The title tells you what each dog is like. “Dignity” means calm and noble; “impudence” means cheeky.

Look closely

- Find the big dog and the little dog. Which one is “Dignity”?
- Look at the bloodhound's long ears and droopy face. Bloodhounds are famous trackers.
- Look at the little dog's eyes. What is he thinking?

Talk about it

1. Which dog are you more like today, Dignity or Impudence?
2. If you painted your own pet, what title would you give the painting?

HANDS-ON: SCENT TRAIL

Find out how a tracking dog works by following a scent trail yourself.

You will need

- A cotton ball
- Vanilla or peppermint extract
- A small treat or toy
- A grown-up

Steps

1. A grown-up dabs extract on the cotton ball and touches it to spots along a path in the house or yard, about every 3 feet, ending at the hidden treat.
2. Get on your hands and knees and sniff your way along the trail like a hound.
3. Take turns making trails for each other. Make the next one longer!

Tips

- Use only a little extract so it does not soak in.
- If you have a dog, hide a treat and watch how it finds it with its nose.

Check your work

- I followed the scent trail to the end.
- I can explain how a dog finds a lost person.

FIELD NOTEBOOK

1. Draw a wolf howling at the sky.
2. List three jobs that dogs do to help people.

Did you know? A gray wolf's howl can be heard miles away. Wolf pups are born deaf and blind, in a den dug in the earth. A dog's nose has many millions more smell sensors than a person's nose.

Goes deeper in. Life Science, Kindergarten, Lesson 2.1 "Dogs" and Grade 6, Lesson 6.2 "Wolves" (coming soon).

For families. The stop says plainly that dogs and wolves are one family of animals; the Life Science series treats dog breeds as variety within a created kind. Watching how a family dog uses its nose is a perfect follow-up.

PRACTICE

1. **EASY** What is a family of wolves called?

2. **EASY** Why do wolves howl?
3. **MEDIUM** Name two jobs dogs do for people.

Make it a game · Wolf Pack Howl. One player hides and howls. The pack must find her by listening. Whoever finds her first hides next.

Scripture. “The wolf also shall dwell with the lamb, and the leopard shall lie down with the kid; and the calf and the young lion and the fatling together; and a little child shall lead them.” (Isaiah 11:6, KJV)

Isaiah gives a picture of the peace of Christ’s kingdom, when even the wolf and the lamb are at peace.

Practice: answers

1. A pack.
2. To call their family together and to tell other wolves that this is their land.
3. Any two: find lost people, guide people who cannot see, guard sheep, pull sleds, sniff out danger, guard homes.

1.7 BEARS

OBJECTIVES

- Name the bears of North America.
- Tell what many bears do in winter.
- Tell the true story of how the teddy bear got its name.

Warm-up. Do you have a teddy bear? Hold it up. Do you know whose name is hidden in the word “teddy”? You will find out today.

Video slot. Video coming. Bears in Yellowstone and Alaska: black, brown and polar bears; winter dens. Search the National Park Service (Katmai, Yellowstone), Smithsonian, Homeschool Pop (Alternate).

KEY TERMS

den

A sheltered home, such as a cave or a hollow, where a bear sleeps in winter.

cub

A baby bear.

hibernate

To spend the winter in a long, deep sleep without eating.

omnivore

An animal that eats both plants and meat.

CORE IDEAS

The story. In November 1902, President Theodore Roosevelt went bear hunting in Mississippi. For days he found no bear. Then his guides caught an old black bear and tied it to a tree, so that the President could shoot it. Roosevelt refused. It would not be fair or sporting. A newspaper artist named Clifford Berryman drew a cartoon of the President turning away from the bear. A shopkeeper in New York, Morris Michtom, saw it and made a soft toy bear. He called it “Teddy’s bear,” and the teddy bear was born.

Kinds of bears. There are eight kinds of bears in the world. In North America we have the black bear, the brown bear (often called the grizzly) and the white polar bear of the Arctic. Other bears live in Asia and South America. The giant panda of China is a bear too!

Big and strong. The polar bear is the largest bear, and a big male can weigh more than 1,000 pounds. Under its thick white fur, its skin is black. Brown bears catch salmon in rushing rivers with their paws and mouths. Bears are **omnivores**. They eat berries, nuts, roots, insects, honey, fish and meat.

The long winter sleep. When winter comes and food is scarce, many bears go into a **den**: a cave, a hollow log or a hole dug under a tree. There they **hibernate** for months. A black bear may go more than three months without eating or drinking anything at all! It lives on the fat it stored up in the fall.

Tiny cubs. Mother bears give birth to their **cubs** in the den in the middle of winter. A black bear cub is born tiny, weighing less than a pound, about as much as a can of soup. It drinks its mother's rich milk and grows fast. By spring, when the mother bear walks out of the den, the cubs are ready to tumble along behind her.

PICTURE STUDY



American Black Bear, John James Audubon and John Woodhouse Audubon, 1840s · Hand-colored lithograph ·
From *The Viviparous Quadrupeds of North America*
Wikimedia Commons · CC BY 2.0

John James Audubon is famous for his paintings of birds. Late in his life he and his sons made a second great book, about the furry animals of North America. This plate shows the American black bear.

Look closely

- Look at the bear's claws. What might it use them for?
- Find the details in the fur. How did the artist show that it is thick?
- What is in the background?

Talk about it

1. Does this bear look fierce, curious or calm?
2. Why do you think Audubon wanted to draw the animals of America?

Safety first. If you ever see a real bear outdoors, stay calm, do not run, stand together, back away slowly and tell a grown-up. Never feed a bear.

HANDS-ON: BUILD A BEAR DEN

Make a winter den and find out how a den keeps a bear warm.

You will need

- Blankets, couch cushions or a table
- A flashlight
- A teddy bear
- Two cups of warm water and a kitchen thermometer (optional)

Steps

1. Build a small den under a table with blankets and cushions.
2. Put your teddy bear inside, curled up for winter.
3. Optional: put one cup of warm water inside the den, wrapped in a blanket, and one outside. After 20 minutes, which is warmer? A den holds in warmth.
4. Crawl inside with a flashlight and read a bear story.

Check your work

- I built a den.
- I can explain why a den keeps a bear warm.
- I know whose name is in “teddy bear.”

FIELD NOTEBOOK

1. Draw a bear in its winter den with two tiny cubs.
2. Write the three kinds of North American bears: black, brown (grizzly) and polar.

Did you know? A black bear is not always black. It can be brown, cinnamon-colored or even nearly white. Polar bears are strong swimmers and can swim for many miles in icy water. A bear can run faster than a person, so people in bear country make noise on the trail and never run from a bear.

Goes deeper in. Life Science, Grade 1, Lesson 1.4 “Bears in winter” and Lesson 5.1 “Polar bears” (coming soon).

For families. The teddy bear story is well documented: Berryman’s cartoon ran in the *Washington Post* in November 1902. Families in bear country may want to add the bear-safety rules for hiking and camping.

PRACTICE

1. **EASY** Whose name is in the word “teddy bear”?
2. **EASY** What do many bears do in winter?
3. **MEDIUM** Why did President Roosevelt refuse to shoot the bear tied to a tree?

Make it a game • Bear Wakes Up. One child is the sleeping bear in a “den.” The others creep close, whispering “Is the bear awake?” When the bear jumps up and growls, everyone runs back to base.

Scripture. “The LORD that delivered me out of the paw of the lion, and out of the paw of the bear, he will deliver me out of the hand of this Philistine.” (1 Samuel 17:37, KJV)

Young David had faced a lion and a bear while keeping sheep. He trusted God to help him again against Goliath.

Practice: answers

1. President Theodore (Teddy) Roosevelt.
2. They go into a den and hibernate (sleep for months without eating).
3. It would not be fair or sporting to shoot a bear that was tied up and could not get away.

1.8 CHEETAHS, THE FASTEST RUNNER

OBJECTIVES

- Tell about how fast a cheetah can run, and for how long.
- Name three parts of a cheetah's body made for speed.
- Tell how a cheetah is different from a leopard.

Warm-up. Run as fast as you can across the yard and back. Now try to keep running fast for one whole minute. Could you? A cheetah is the fastest land animal, but it can sprint for only about half a minute.

Video slot. Video coming. A cheetah running in slow motion, showing the spine and tail. Search approved nature channels (Smithsonian's National Zoo, Cincinnati Zoo, Homeschool Pop (Alternate)); no kill footage.

KEY TERMS

sprint

To run very fast for a short time.

spine

The backbone.

tear marks

The black lines that run from a cheetah's eyes down to its mouth.

rosette

A spot shaped like a little rose. Leopards have rosettes; cheetahs have solid round spots.

CORE IDEAS

The story. On the open grassland of Africa, a cheetah crouches low. Its eyes are fixed on a gazelle far away. Slowly, slowly it creeps closer. Then, like a rocket, it bursts forward! In just a few seconds it is racing as fast as a car on the highway, about 60 miles an hour. It is the fastest runner on land.

Built for speed. Everything about the cheetah is made to run. It has long, thin legs and a light body. Its **spine** bends and stretches like a spring, so each stride is very long. Its claws do not pull all the way in like a house cat's; they grip the ground like the cleats on a runner's shoes. And its long tail works like a boat's rudder, helping it turn sharply without falling over.

A short race. A cheetah cannot run fast for long. Its sprint lasts only about 20 or 30 seconds. After that it is hot and out of breath, and it must rest. So a cheetah sneaks up as close as it can before it starts to run.

Not a leopard. People sometimes mix up cheetahs and leopards. A cheetah has solid black spots, while a leopard's spots are **rosettes**, shaped like little roses. A cheetah also has black **tear marks** running from its eyes to its mouth, which may help it see in bright sunshine. And a cheetah does not roar. It purrs, and it makes a high chirp that sounds like a bird!

A royal gift. Long ago, kings and princes in India and Persia tamed cheetahs and took them hunting. In the 1760s, a cheetah was sent from India as a gift to King George III of England. The painter George Stubbs painted it, and you can see that painting today.

PICTURE STUDY



Cheetah and Stag with Two Indians, George Stubbs, c. 1765 · Oil on canvas · Manchester Art Gallery, England

Wikimedia Commons · Public domain

George Stubbs was an English painter who studied the bodies of animals more carefully than almost anyone of his time. The cheetah in this painting was real. It had been sent from India as a gift to King George III, and its Indian keepers came with it to England.

Look closely

- Find the cheetah. Is it running, or waiting?
- Look at the cheetah's spots. Are they solid spots or rosettes?
- Find the stag. Where is it looking?

Talk about it

1. Why do you think the keepers are holding the cheetah back?
2. What do you think will happen next?

HANDS-ON: SPRINT TEST

Find out how long it takes you to run a distance that a cheetah covers in about one second.

You will need

- A stopwatch or phone timer
- A tape measure or a 10-foot string
- Sidewalk chalk or two cones
- A grown-up to time you

Steps

1. Measure 100 feet in a safe, open place and mark the start and the finish.
2. A grown-up says “Go!” and starts the timer. Run as fast as you can to the finish.
3. Write down your time. Try three times and circle your best.
4. A cheetah at top speed runs 100 feet in about one second. How many seconds did you take? How many times faster is the cheetah?

Tips

- Run on soft ground, away from the street.

Check your work

- I measured 100 feet.
- I timed three runs and found my best.
- I compared my time with a cheetah’s (about one second).

FIELD NOTEBOOK

1. Draw a cheetah running. Label the long tail, the spots and the tear marks.
2. Draw one cheetah spot and one leopard rosette side by side.

Did you know? Cheetah cubs have long, fluffy gray fur on their backs that may help them hide in the grass. A running cheetah may cover more than 20 feet in a single stride. Most wild cheetahs live in Africa; a very few still live in Iran, in Asia.

Goes deeper in. Life Science, Grade 6, Animal Design and Behavior (coming soon).

For families. The video note asks for footage without kills. The stop says “about 60 miles an hour,” which matches measured speeds: Sarah at the Cincinnati Zoo was radar-timed at up to 61 mph (2012), and collars on wild cheetahs in Botswana recorded a top speed of 58 mph (Wilson et al., Nature, 2013). Older books often say 70 mph, but that figure was never well measured.

PRACTICE

1. **EASY** What is the fastest land animal?
2. **MEDIUM** How does the cheetah's tail help it run?
3. **EASY** How long can a cheetah sprint at top speed?

Make it a game • Cheetah Tag. The cheetah may run fast only for a count of 10. Then she must walk for a count of 10 to “rest.” Everyone else may jog.

Scripture. “I returned, and saw under the sun, that the race is not to the swift, nor the battle to the strong” (Ecclesiastes 9:11, KJV)

Even the fastest cheetah does not win every race. God rules over all things, not speed or strength.

Practice: answers

1. The cheetah.
2. It works like a rudder, helping the cheetah balance and turn sharply.
3. Only about 20 to 30 seconds.

1.9 KANGAROOS

OBJECTIVES

- Tell what a marsupial is.
- Explain how a joey grows in its mother's pouch.
- Tell how Captain Cook's voyage first showed a kangaroo to England.

Warm-up. Put your feet together and jump as far as you can. Measure your jump with big steps. A red kangaroo can leap about 25 feet in one bound!

Video slot. Video coming. Red kangaroos hopping, and a joey in the pouch. Search approved nature channels (e.g., Australian Museum, San Diego Zoo Wildlife Alliance, Homeschool Pop (Alternate)).

KEY TERMS

marsupial

A mammal whose babies grow in a pouch on the mother's body.

joey

A baby kangaroo.

pouch

The pocket of skin on a mother kangaroo's belly where her baby lives and drinks milk.

mob

A group of kangaroos.

CORE IDEAS

The story. In the summer of 1770, Captain James Cook's ship, the *Endeavour*, struck a coral reef off the coast of Australia. While the sailors mended the ship by the bank of a river, they saw a strange animal. It was gray, about as big as a deer, and it did not run. It hopped on two huge back legs, with its long tail behind it! The people who lived there called it something like "gangurru." The sailors wrote it down as "kangaroo."

A painting from a skin. The ship's naturalist, Joseph Banks, brought a kangaroo skin back to England. Nobody in England had ever seen a kangaroo. Banks asked the painter George Stubbs to paint one. Stubbs had never seen a living kangaroo either, so he painted it from the skin and from what the travelers told him. His painting, *The Kongouro from New Holland*, was the first picture of a kangaroo most English people ever saw.

A baby in a pocket. A kangaroo is a **marsupial**, a mammal whose babies grow in a **pouch**. A newborn kangaroo, called a **joey**, is about the size of a jelly bean. It has no fur, and it cannot see. Yet it crawls up through its mother's fur, all by itself, into her pouch. There it

drinks her milk and grows for months. Later the joey pokes its head out to look at the world, and at last it hops out, though it dives back in when it is scared.

Champion hoppers. The red kangaroo is the largest marsupial. Its back legs are huge and springy, and its long tail helps it balance, like a third leg when it stands still. A red kangaroo can hop at more than 30 miles an hour. Springy tendons in its legs store up energy with each bounce, so a kangaroo can travel a long way without getting tired.

A mob in the outback. Kangaroos live in groups called **mobs**. They graze on grass in the cool morning and evening and rest in the shade during the heat of the day. God made them just right for the dry, hot land of Australia.

PICTURE STUDY



The Kongouro from New Holland, George Stubbs, 1772 · Oil on panel · National Maritime Museum, Greenwich, London

Wikimedia Commons · Public domain

George Stubbs painted this kangaroo in 1772 for Joseph Banks, who had sailed with Captain Cook. Stubbs had only a skin and the travelers' descriptions to work from, yet his painting is a good likeness.

Look closely

- Find the kangaroo's big back legs and its tail. How does it hold itself up?
- Look at its ears and face. What is it looking at?
- What kind of land is behind it?

Talk about it

1. Why was this painting so exciting to people in England in 1772?

2. How would you draw an animal you had never seen?

HANDS-ON: KANGAROO LONG JUMP

Compare your jumps with a kangaroo's.

You will need

- A tape measure
- Sidewalk chalk or a stick
- Paper and pencil

Steps

1. Mark a starting line. Jump forward with both feet together, like a kangaroo.
2. Mark where your heels land. Measure your jump in feet.
3. Jump three times and write down your best jump.
4. Measure out 25 feet. That is about how far a red kangaroo can jump in one bound. How many of your jumps fit in one kangaroo jump?

Check your work

- I measured three jumps.
- I compared my best jump to a kangaroo's 25-foot leap.

FIELD NOTEBOOK

1. Draw a mother kangaroo with a joey peeking out of her pouch.
2. Write: "A kangaroo is a _____. Its baby is called a _____."

Did you know? A kangaroo cannot easily walk backward. Koalas and wombats are marsupials too, and so is the Virginia opossum of North America. Kangaroos "box" with their front paws and kick with their strong back legs when they fight.

Goes deeper in. Life Science, Grade 4, Lesson 5.2 "Marsupials" (coming soon); and Geography, for Australia on the map.

For families. The kangaroo's name is usually traced to the Guugu Yimithirr word *gangurru*, from the people who lived near the Endeavour River in northern Queensland. The Ranger level will add a map of Cook's voyage.

PRACTICE

1. **EASY** What is a baby kangaroo called?
2. **EASY** What is a marsupial?
3. **MEDIUM** How did people in England first see what a kangaroo looked like?

Make it a game • Kangaroo Relay. Teams hop like kangaroos with a stuffed-animal “joey” held in front. If the joey falls, go back to the start and hop again.

Scripture. “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)

God made the kangaroo too, after its kind, and fitted it for its land.

Practice: answers

1. A joey.
2. A mammal whose babies grow in a pouch on the mother.
3. Joseph Banks brought a kangaroo skin back from Captain Cook’s voyage, and George Stubbs painted a kangaroo from it in 1772.

1.10 THE AMERICAN BISON’S COMEBACK

OBJECTIVES

- Tell how many bison once lived on the Great Plains, and how few were left by 1889.
- Name the people who worked to save the bison.
- Explain what it means to take care of God’s creatures.

Warm-up. Look for a picture of the old “buffalo nickel” (1913–1938). It shows an American bison. Why would a country put an animal on its money?

Video slot. Video coming. Bison in Yellowstone and the Wichita Mountains; the story of the bison’s rescue. Search the National Park Service, U.S. Fish and Wildlife Service, Smithsonian.

KEY TERMS

bison

A large, shaggy wild ox of North America, often called a buffalo.

herd

A large group of animals that live and travel together.

Great Plains

The wide grassy middle of North America.

conservation

Wise care and protection of animals, plants and land.

CORE IDEAS

The story. Two hundred years ago, the Great Plains of North America were covered with bison. There were tens of millions of them. Travelers wrote that a single herd could take hours or even days to pass by. The ground shook and the dust rose when they ran. The Plains Indian nations, such as the Lakota and the Comanche, depended on the bison for food, clothing and shelter.

Almost gone. Then everything changed. In the 1870s and 1880s, as railroads crossed the plains, hunters with rifles shot bison by the hundreds of thousands, mostly for their hides. In only about fifteen years, the great herds were gone. In 1889, a scientist named William Hornaday counted fewer than 1,100 bison left in all of North America. In Yellowstone National Park, the only place where wild bison had never disappeared, the herd fell to about two dozen animals.

The rescuers. Some people decided that the bison must not disappear. A few ranchers had saved small herds. William Hornaday and Theodore Roosevelt helped start the American Bison Society in 1905. In 1907, fifteen bison were sent by train from the Bronx Zoo in New

York to the Wichita Mountains in Oklahoma, to start a new wild herd. Bison from ranches were also brought into Yellowstone to make its herd strong again.

Back from the edge. The plan worked! Today there are about half a million bison in North America, on ranches and in parks. In 2016, the bison was named the national mammal of the United States. It is a true story of **conservation**: people taking wise care of God's creatures.

A mighty animal. The bison is the heaviest land animal in North America. A big bull can weigh about 2,000 pounds and stand six feet tall at its hump. Even so, it can run about 35 miles an hour. Visitors to Yellowstone must stay far away from bison, because they can be dangerous.

PICTURE STUDY



Buffalo Bull, Grazing on the Prairie, George Catlin, 1832-1833 · Oil on canvas · Smithsonian American Art Museum, Washington, D.C.

Wikimedia Commons · Public domain

George Catlin traveled up the Missouri River in 1832 to paint the Plains Indians and the animals of the West, when the great bison herds still roamed. He painted this bull grazing on the open prairie.

Look closely

- Find the bison's hump. Where is it?
- Look at the land. Do you see any trees? Any houses?
- Is the bison in the middle of the painting or to one side?

Talk about it

1. How does the prairie in this painting make you feel?

2. Why do you think Catlin wanted to paint the West before it changed?

HANDS-ON: A HERD ON PAPER

See what a big difference there is between tens of millions and about a thousand.

You will need

- A sheet of paper
- A pencil, or a stamp pad and your fingertip

Steps

1. Make 100 small dots on your paper, in 10 rows of 10. Each dot is one bison.
2. Ten pages like yours would show 1,000 bison, about how many were left in 1889.
3. To show the tens of millions of bison of long ago, you would need more than a hundred thousand pages like yours, enough to fill many shelves of books!
4. On a new page, draw one big bison and write: "Saved!"

Check your work

- I made 100 dots in rows of 10.
- I can tell about how many bison were left in 1889 (fewer than 1,100).
- I can name one person who helped save the bison.

FIELD NOTEBOOK

1. Draw a bison. Label the hump, horns, beard and tail.
2. Write the names William Hornaday and Theodore Roosevelt, and one thing they did.

Did you know? The bison's big shoulder hump is made of strong muscle, which helps it swing its head to push snow aside in winter. Bison often face into a winter storm instead of turning away from it. Bison calves are born a reddish orange color and are sometimes called "red dogs."

Goes deeper in. Life Science, Grade 4, Lesson 5.4 "The bison saved" and Grade 8, Lesson 7.3 "Conservation success" (coming soon).

For families. The stop names the hide hunters and the railroads plainly and notes that the Plains nations depended on the bison, without blame-laden language. The Expert level adds Hornaday's 1889 report, *The Extinction of the American Bison*, as a primary source.

PRACTICE

1. **EASY** About how many bison were left in North America in 1889: about 100, about 1,000, or about 1,000,000?

2. **MEDIUM** Name one thing people did to save the bison.
3. **EASY** What is the national mammal of the United States?

Make it a game · Stampede and Storm. Everyone is a bison on the prairie. When the leader shouts “Stampede!”, the herd runs to the far side of the yard. When she shouts “Storm!”, every bison stops and faces the leader, head down, like bison facing into the wind.

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

A good person takes care of animals. The people who saved the bison showed this kind of care.

Practice: answers

1. About 1,000 (Hornaday counted fewer than 1,100).
2. Any one: ranchers kept small herds; the American Bison Society was started in 1905; fifteen bison were sent from the Bronx Zoo to Oklahoma in 1907; Yellowstone’s herd was protected and made stronger.
3. The American bison (named in 2016).

TRACK 1 BADGE QUIZZES

The badge quizzes are optional. Read each question aloud; the child may answer by talking, pointing or drawing. Four right out of five earns the badge. Badges and the certificate are earned by doing the stops, not by scores.

Badge quiz 1 (Stops A1–A5)

1. What is a family of lions called?
2. Who leads an elephant herd?
3. Why is a whale a mammal and not a fish? Give one reason.
4. How does a bat find a moth in the dark?
5. How many inches are in one hand, the unit for measuring horses?

Badge quiz 2 (Stops A6–A10)

6. Name one job a dog does with its nose to help people.
7. Who is the teddy bear named after?
8. What is the fastest land animal?
9. Where does a newborn kangaroo grow?
10. Name one person who helped save the American bison.

TRAIL CERTIFICATE: MY MAMMAL FIELD NOTEBOOK AND TRAIL A CERTIFICATE

Gather the Field Notebook pages from this trail into one booklet with a cover: “My Mammal Field Notebook,” your name and the dates you started and finished. Add a table of contents listing the ten animals.

When the booklet is done, a parent signs the Trail A certificate.

- **Ten stops:** At least one page for each stop, each with a title and a date.
- **Drawings:** Each animal is drawn with care, with at least two labels.
- **Facts:** Each page has at least one true fact in a complete sentence.
- **Cover:** A cover and a table of contents.

Answer key

1. A pride.
2. The matriarch, the oldest mother elephant.
3. It breathes air (or: it has live babies, or: it feeds its babies milk).
4. By echolocation: it makes sounds and listens for the echoes.
5. 4 inches.
6. Finding lost people, tracking, sniffing out danger (any reasonable answer).
7. President Theodore (Teddy) Roosevelt.
8. The cheetah.
9. In its mother’s pouch.

10. William Hornaday or Theodore Roosevelt (or the ranchers who kept small herds).

DINOSAURS TRAIL A: MEET THE DINOSAURS

The first trail of the Dinosaurs track meets ten famous dinosaurs, from *Tyrannosaurus rex* to *Argentinosaurus*, one of the biggest. Each stop tells what the bones show, how the dinosaur got its name and who found it, with a picture, something to make, quick questions, a game and Scripture.

This is the  **Scout** level, for ages 7 to 9. The track is creation-friendly: God made the land animals, dinosaurs among them, on the sixth day (Genesis 1:24–25). The period names museums use, **Triassic**, **Jurassic** and **Cretaceous**, are taught as vocabulary in a “Museum word” box, so a child can read any museum sign and know what it is claiming. Dates on signs are called what they are: interpretations.

Five stops earn the **Dinosaur Scout badge, part 1**; ten earn part 2 and the **Trail A certificate**.

BEFORE YOU BEGIN

- Listen to a short story and tell it back.
- Measure with a ruler or a tape measure (a grown-up may help).
- Know the six days of creation from Genesis 1, or read them together first.

MASTERY CHECKLIST

- ☐ I can name ten dinosaurs and tell one true thing about each.
- ☐ I can say what the name of a dinosaur means for at least five of them.
- ☐ I can tell a plant-eater from a meat-eater by its teeth.
- ☐ I can read the words Triassic, Jurassic and Cretaceous on a museum sign and say what they name.
- ☐ I can say what Genesis tells us about when God made the land animals.

OPTIONAL BOOKS AND RESOURCES

- **Field Museum (Chicago): SUE the T. rex** (<https://www.fieldmuseum.org>): Photos and facts about the most complete T. rex skeleton; a good “virtual visit.”
- **Smithsonian National Museum of Natural History** (<https://naturalhistory.si.edu>): The Hall of Fossils; practice reading museum signs together.

2.1 TYRANNOSAURUS REX

OBJECTIVES

- Tell what the name Tyrannosaurus rex means.
- Describe T. rex's size, teeth and short arms.
- Read the word "Cretaceous" on a museum sign.

Warm-up. Hold up a banana. Some T. rex teeth, counting the part hidden in the jaw, were about as long as a banana, around 12 inches!

Video slot. Video coming. T. rex skeletons in museums: SUE at the Field Museum. Search the Field Museum, Smithsonian; for creation-friendly framing, Answers in Genesis / Creation Museum videos once vetted.

KEY TERMS

dinosaur

A kind of reptile that lived long ago and walked with its legs straight under its body. Dinosaurs are known today from their fossils.

fossil

The remains or traces of a living thing, such as a bone, a tooth or a footprint, preserved in rock.

skeleton

All the bones of a body together.

Cretaceous

The name museums give to the rock layers where T. rex and Triceratops are found (say "kreh-TAY-shus").

CORE IDEAS

The story. In 1902, a fossil hunter named Barnum Brown was digging in the badlands of Montana when he found huge bones sticking out of the rock. They belonged to a giant meat-eating dinosaur no one had ever seen. In 1905, the museum scientist Henry Fairfield Osborn gave it a mighty name: *Tyrannosaurus rex*, which means "tyrant lizard king." Most people just call it **T. rex**.

How big was it? A big T. rex was about 40 feet long from its nose to the tip of its tail, about as long as a school bus. Its hips were about 12 feet off the ground, higher than a basketball hoop. It may have weighed as much as an elephant, or even more. Its head alone was about 5 feet long.

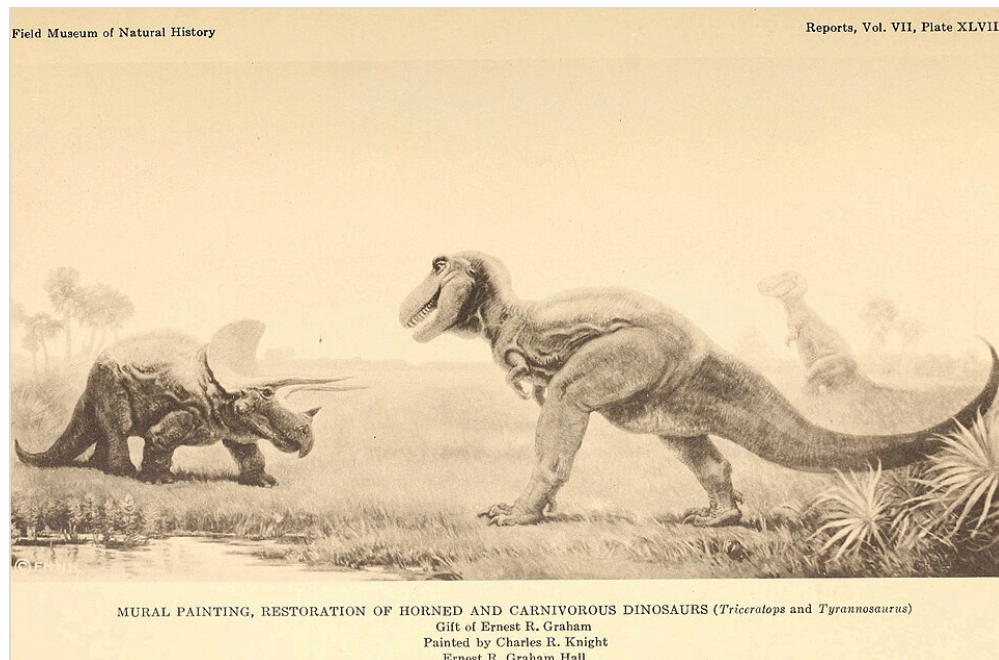
Teeth and jaws. T. rex had about 60 teeth, thick like bananas and jagged on the edges like a steak knife. Scientists think it had one of the strongest bites of any land animal ever. Its

teeth tell us it ate meat. When a tooth broke or fell out, a new one grew in its place.

Those little arms. T. rex had two very short arms, each about 3 feet long, with only two fingers. They look tiny next to its huge body, but they were thick and strong. Nobody knows for sure how T. rex used them. That is one of the mysteries the bones have not told us.

What the Bible tells us. Nobody saw T. rex being made except God. Genesis tells us that on the sixth day God made “the beast of the earth after his kind” (Genesis 1:25), and that means the dinosaurs too. When we look at the bones of T. rex, we are looking at the work of the Creator.

PICTURE STUDY



Tyrannosaurus and Triceratops (mural), Charles R. Knight, 1927 · Oil mural · Field Museum, Chicago
Wikimedia Commons · Public domain

Charles R. Knight was the most famous painter of dinosaurs in his day. He worked closely with scientists and visited the bones in museums before he painted. His big murals hung in the Field Museum in Chicago for many years and taught millions of children what dinosaurs might have looked like.

Look closely

- Find T. rex. How is it standing?
- Find the Triceratops. What are they doing?
- Look at the land and the sky. What kind of place is this?

Talk about it

1. Scientists today think T. rex held its tail out straight behind it, not dragging on the ground. Does Knight's T. rex hold its tail up or down?

2. Why do pictures of dinosaurs change as people find more bones?

HANDS-ON: A LIFE-SIZE T. REX IN CHALK

Find out how big T. rex really was by drawing it full size.

You will need

- A tape measure or a 10-foot string
- Sidewalk chalk
- A driveway, playground or quiet lot, and a grown-up

Steps

1. Mark a starting point for the tip of the nose. Measure 40 feet in a straight line for the tip of the tail.
2. From the nose, measure 5 feet; that is the head. Draw a big head shape there.
3. Draw the body and the long tail along the line, and two strong legs under the hips.
4. Draw two tiny arms, about 3 feet long, near the front of the chest.
5. Lie down along the T. rex. How many of you fit inside it?

Check your work

- My T. rex is 40 feet long.
- The head is about 5 feet long.
- I drew the short two-fingered arms.

FIELD NOTEBOOK

1. Draw a T. rex tooth life-size, about 12 inches long, and label it "T. rex tooth."
2. Write: "Tyrannosaurus rex means tyrant lizard king."

Did you know? The most complete T. rex ever found is named SUE. It was found in South Dakota in 1990 and now stands in the Field Museum in Chicago. T. rex fossils have been found in the western United States and Canada. T. rex had a very good sense of smell; the part of its brain for smelling was large.

Museum word. Museum signs say this dinosaur lived in the **Cretaceous**. That is a name scientists use for a group of rock layers and the fossils found in them. They often add a date such as "68 to 66 million years ago." That number is an interpretation, not something anyone saw. This course reads Genesis as teaching that God made the land animals, dinosaurs included, on the sixth day of creation, only thousands of years ago. The three big names on dinosaur signs are **Triassic**, **Jurassic** and **Cretaceous**, from the lowest rock layers to the highest. Learn them, read the sign, and then you know what it claims.

Goes deeper in. Life Science, Kindergarten, Lesson 7.3 “Fierce Meat-Eaters” and Earth Science, Grade 3, Lesson 6.2 “Sue the T. rex” (coming soon).

For families. Dinosaur names and sizes in this trail follow museum descriptions. Sizes are estimates from bones and vary a little between sources. The “Museum word” box teaches the period names as vocabulary and labels dates as interpretations, as in the Earth Science series.

PRACTICE

1. **EASY** What does Tyrannosaurus rex mean?
2. **EASY** Did T. rex eat plants or meat? How do we know?
3. **MEDIUM** What word do museums use for the rock layers where T. rex is found?

Make it a game • Tyrant King Says. Play like “Simon Says,” but the leader says “T. rex says...” and everyone must keep their arms tucked in like tiny T. rex arms the whole time.

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)

On the sixth day God spoke, and the land animals were made. The biggest meat-eater and the smallest beetle came from His word.

Practice: answers

1. “Tyrant lizard king.”
2. Meat. Its teeth were sharp, thick and jagged like steak knives.
3. Cretaceous.

2.2 TRICERATOPS

OBJECTIVES

- Tell what the name Triceratops means.
- Describe its horns, frill and beak.
- Tell the story of the horns that were first mistaken for a bison's.

Warm-up. Make three horns with your fingers: one finger on your nose and two above your eyes. You are a “three-horned face,” which is what Triceratops means!

Video slot. Video coming. Triceratops skulls and skeletons; horns and frill. Search the Smithsonian (Hatcher the Triceratops), Field Museum; creation channels once vetted.

KEY TERMS

horn

A hard, pointed growth on an animal's head.

frill

The wide bony shield at the back of a Triceratops' head.

beak

A hard, toothless mouth edge, like a parrot's.

herbivore

An animal that eats only plants.

CORE IDEAS

The story. In 1887, a pair of huge pointed horns was found near Denver, Colorado. They were sent to a famous scientist named Othniel Charles Marsh. Marsh looked at them and decided they came from a giant kind of bison! But soon after, a fossil hunter named John Bell Hatcher dug up a whole skull in Wyoming, with the same horns on it. It was not a bison at all. It was a dinosaur with three horns on its face. Marsh named it *Triceratops*, which means “three-horned face.”

Horns and a frill. Triceratops had a short horn on its nose and two long horns above its eyes. The long horns could be about 3 feet long, as long as a baseball bat. Behind its head was a wide bony **frill**, like a big collar or shield. Its skull was one of the biggest of any land animal, about 7 feet long, longer than a tall man.

A beak for plants. Triceratops was a **herbivore**, a plant-eater. The front of its mouth was a hard **beak**, like a giant parrot's, for snipping tough plants. Behind the beak were rows of teeth that sliced plants like scissors. When teeth wore out, new ones grew in to take their place.

Big and heavy. A grown Triceratops was about 26 to 30 feet long and as heavy as an elephant or more. It walked on four strong legs. Triceratops bones are found in the same rock layers as T. rex, and some Triceratops bones even have T. rex tooth marks on them.

Made by God. Why three horns and a frill? Scientists still wonder. The horns may have helped Triceratops defend itself, and the frill may have helped Triceratops know its own kind. However it used them, God designed Triceratops with care.

PICTURE STUDY



Triceratops, Charles R. Knight, 1901 · Watercolor · American Museum of Natural History, New York
Wikimedia Commons · Public domain

Charles R. Knight painted this Triceratops in 1901, early in his long career. He studied the skulls in museums so that he could paint the head correctly.

Look closely

- Count the horns. Where is each one?
- Find the frill. What does it look like to you?
- Look at the legs. How does Knight show that the animal is heavy?

Talk about it

1. What colors did Knight choose for Triceratops? Do we really know what color dinosaurs were?
2. If you met a Triceratops, would you feel safe or scared?

HANDS-ON: TRICERATOPS FRILL MASK

Make a Triceratops mask with three horns and a frill.

You will need

- A paper plate
- Construction paper
- Scissors (with a grown-up), glue or tape
- Crayons or paint
- Yarn or a craft stick

Steps

1. Cut a wide half-circle from the paper plate edge. This is the frill. Decorate its edge with bumps.
2. Roll three paper cones for horns: one short for the nose and two long for over the eyes. Tape them on.
3. Cut eye holes (a grown-up helps) and add a beak at the bottom.
4. Tie on yarn or tape on a craft stick to hold the mask.

Check your work

- My mask has three horns.
- It has a frill and a beak.

FIELD NOTEBOOK

1. Draw a Triceratops skull from the side. Label the nose horn, brow horns, frill and beak.
2. Write: "Triceratops means three-horned face."

Did you know? Triceratops is the state fossil of South Dakota and the state dinosaur of Wyoming. Baby Triceratops had short, stubby horns that grew and curved as they got older. A famous Triceratops skeleton at the Smithsonian is nicknamed "Hatcher," after the fossil hunter John Bell Hatcher, who found many Triceratops bones.

Museum word. Museum signs say this dinosaur lived in the **Cretaceous**. That is a name scientists use for a group of rock layers and the fossils found in them. Many signs give a date such as "68 to 66 million years ago." That number is an interpretation, not something anyone saw. This course reads Genesis as teaching that God made the land animals, dinosaurs included, on the sixth day of creation, only thousands of years ago.

Goes deeper in. Life Science, Grade 2, Lesson 7.3 "Horned dinosaurs" (coming soon).

For families. Marsh's 1887 "bison" (*Bison alticornis*) and his 1889 naming of *Triceratops* are well documented; the story is a gentle way to show that scientists revise their ideas when better evidence comes.

PRACTICE

1. **EASY** What does Triceratops mean?
2. **MEDIUM** What did Othniel Marsh first think the Triceratops horns came from?
3. **EASY** Was Triceratops a plant-eater or a meat-eater?

Make it a game • Horn Ring Toss. Stand a paper-towel tube “horn” in a lump of clay. Toss canning-jar rings or paper rings onto the horn from a few steps away.

Scripture. “Where wast thou when I laid the foundations of the earth? declare, if thou hast understanding.” (Job 38:4, KJV)

God asked Job this question to remind him that God alone was there at the beginning. Scientists like Marsh can make mistakes, but God knows all His works.

Practice: answers

1. “Three-horned face.”
2. A giant kind of bison.
3. A plant-eater (herbivore).

2.3 STEGOSAURUS

OBJECTIVES

- Tell what Stegosaurus means and why it got that name.
- Describe its plates and tail spikes.
- Read the word “Jurassic” on a museum sign.

Warm-up. Lay some playing cards or paper squares on your back, like roof shingles. Now stand them up in a row along your back. Which way do you think Stegosaurus’s plates went?

Video slot. Video coming. Stegosaurus plates and tail spikes. Search the Smithsonian, Denver Museum of Nature & Science, Dinosaur National Monument (NPS).

KEY TERMS

plate

A large, flat, bony piece. Stegosaurus had two rows of tall plates along its back.

spike

A long, sharp, pointed bone. Stegosaurus had four on its tail.

Jurassic

The name museums give to the rock layers where Stegosaurus is found (say “joo-RASS-ick”).

thagomizer

A nickname for the spiky end of a Stegosaurus tail.

CORE IDEAS

The story. In 1877, workers digging for Othniel Marsh in Colorado sent him some strange bones: big, flat, bony plates. Marsh thought the plates lay flat on the animal’s back, like the shingles on a roof. So he named it *Stegosaurus*, which means “roof lizard.” Later, more complete skeletons showed that the plates did not lie flat at all. They stood up in two rows along the dinosaur’s back!

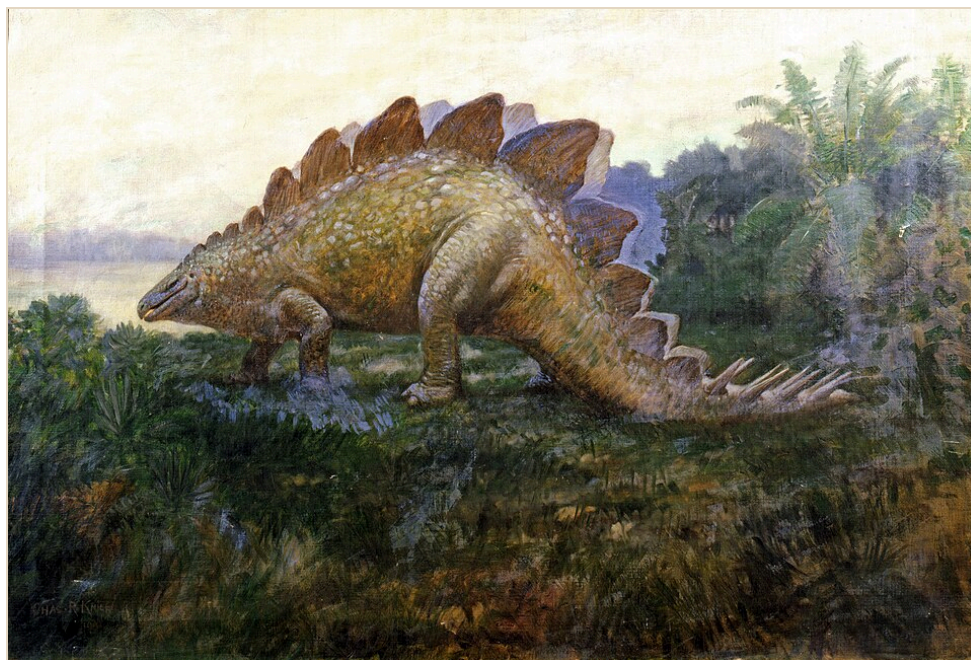
Plates and spikes. A Stegosaurus had about 17 tall plates along its neck, back and tail, set in two staggered rows. The biggest were about 2 feet tall. At the end of its tail were four sharp **spikes**, each 2 or 3 feet long. A Stegosaurus could swing its tail to defend itself. Some fossils of meat-eating dinosaurs even have holes in their bones that fit a Stegosaurus spike.

A tail with a funny name. The spiky tail end has a funny nickname: the **thagomizer**. It comes from a cartoon drawn in 1982 by Gary Larson. In the cartoon, a cave man teacher points to a Stegosaurus tail and calls it a “thagomizer.” Scientists thought the name was so fun that they started using it too!

A plant-eater. Stegosaurus was about 30 feet long and as heavy as a big rhinoceros or more. Its head was small and low to the ground, and it ate low plants. Its back legs were longer than its front legs, so its back was high and its head was low.

A state fossil. Many Stegosaurus bones have been found in Colorado, Wyoming and Utah. In 1982, Colorado made Stegosaurus its state fossil, after schoolchildren asked for it!

PICTURE STUDY



Stegosaurus, Charles R. Knight, 1901 · Watercolor · American Museum of Natural History, New York
Wikimedia Commons · Public domain

Charles R. Knight painted Stegosaurus many times. In 1901 he showed it with its plates standing up, following the newer skeletons and the scientists' ideas of his day.

Look closely

- Find the plates. Are they standing up or lying flat?
- Count the tail spikes.
- Look at the head. Is it big or small compared to the body?

Talk about it

1. If Marsh had been right about the plates lying flat, how would this painting look different?
2. What would you name Stegosaurus, if you could choose?

HANDS-ON: CLAY STEGOSAURUS

Build a small Stegosaurus with plates that stand up in two rows.

You will need

- Modeling clay or salt dough
- Pumpkin seeds, cardboard triangles or crackers for plates
- Four toothpicks (with a grown-up)

Steps

1. Roll a fat body with a long tail and a small head. Add four legs, making the back legs longer than the front legs.
2. Press plates into the back in two rows. Stagger them, so they take turns side to side.
3. Push four toothpick halves into the end of the tail for the thagomizer.
4. Let it dry and give it a name.

Check your work

- My Stegosaurus has two rows of plates.
- It has four tail spikes.
- Its back legs are longer than its front legs.

FIELD NOTEBOOK

1. Draw a Stegosaurus. Label the plates, the spikes (thagomizer) and the small head.
2. Write: “Stegosaurus means roof lizard.”

Did you know? Scientists still argue about what the plates were for. Some think they helped Stegosaurus warm up or cool down; some think they helped others of its kind recognize it. The plates were not solid; they had many small channels in them for blood vessels. Stegosaurus had a small head for such a big body.

Museum word. Museum signs say this dinosaur lived in the **Jurassic**. That is a name scientists use for a group of rock layers and the fossils found in them. Signs often give a date such as “about 150 million years ago.” That number is an interpretation, not something anyone saw. This course reads Genesis as teaching that God made the land animals, dinosaurs included, on the sixth day of creation, only thousands of years ago. Notice that the sign calls Stegosaurus older than T. rex, because its bones are found in lower rock layers.

Goes deeper in. Life Science, Grade 1, Lesson 7.1 “Stegosaurus plates” and Grade 2, Lesson 7.2 “Armored dinosaurs” (coming soon).

For families. The “thagomizer” is a real paleontology nickname that began with Gary Larson’s 1982 *Far Side* cartoon. Colorado named Stegosaurus its state fossil in 1982 after a campaign by elementary students.

PRACTICE

1. **EASY** What does Stegosaurus mean?
2. **MEDIUM** Why did Marsh give it that name?
3. **EASY** What word do museums use for the rock layers where Stegosaurus is found?

Make it a game • Thagomizer Tag. Tuck a scarf in your back pocket as your “thagomizer.” Players try to grab each other’s scarves. If yours is taken, you help guard a teammate.

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)

God made many different creatures, each with its own design: plates, spikes and all.

Practice: answers

1. “Roof lizard.”
2. He thought the plates lay flat on its back like the shingles on a roof.
3. Jurassic.

2.4 BRACHIOSAURUS

OBJECTIVES

- Tell what Brachiosaurus means and why.
- Describe how tall and long it was, compared with things we know.
- Tell why scientists no longer think it lived in lakes.

Warm-up. Stand under a tall tree or the side of a two-story house and look up. A Brachiosaurus could hold its head about 40 feet high, as high as a four-story building!

Video slot. Video coming. Sauropods: Brachiosaurus and Giraffatitan skeletons, the long neck. Search the Field Museum, Museum für Naturkunde Berlin, Smithsonian.

KEY TERMS

sauropod

A huge plant-eating dinosaur with a long neck, a long tail and four thick legs.

vertebra

One of the bones of the backbone (plural: vertebrae).

Jurassic

The museum name for the rock layers where Brachiosaurus is found.

Behemoth

A huge, strong animal God describes in Job 40.

CORE IDEAS

The story. In the summer of 1900, a scientist named Elmer Riggs from the Field Museum in Chicago was digging near Grand Junction, Colorado. He found giant bones: part of a backbone, ribs, and a thigh bone almost 7 feet long. In 1903 he named the animal *Brachiosaurus*, which means “arm lizard,” because its front legs were longer than its back legs, like a giraffe’s.

A living tower. Brachiosaurus was a **sauropod**, one of the long-necked giants. Because its front legs were long, its back sloped up toward its shoulders, and its long neck could lift its head about 40 feet high. From nose to tail it was about 85 feet long, longer than two school buses. It weighed as much as several elephants put together.

A treetop eater. With its head held high, Brachiosaurus could reach leaves at the tops of tall trees, where other animals could not reach. It had chisel-shaped teeth for stripping leaves from branches. It must have eaten a mountain of plants every day.

A wrong idea fixed. Brachiosaurus had bony nose openings high up on its head. Long ago, some scientists thought this meant it lived in deep lakes, with only the top of its head poking

out to breathe, and that its huge body needed water to hold it up. Later scientists studied its strong legs and narrow feet and saw that it was built to walk on land. It probably did not live in the water at all.

Behemoth. In the book of Job, God describes a mighty animal called Behemoth: “he moveth his tail like a cedar” (Job 40:17). Many Christians think Behemoth may have been a great sauropod like Brachiosaurus. Whatever Behemoth was, God says, “Behold now behemoth, which I made with thee.”

PICTURE STUDY



Brontosaurus, Charles R. Knight, 1897 · Watercolor · American Museum of Natural History, New York
Wikimedia Commons · Public domain

Charles R. Knight painted this picture of long-necked sauropods in 1897. In those days scientists thought these giants spent much of their time in swamps and lakes, and Knight painted what they believed.

Look closely

- Find the long necks. How many sauropods can you see?
- Where are they standing: on land, or in the water?
- Look at the plants. What kind of place is this?

Talk about it

1. Scientists now think sauropods lived on land. How would you change this painting to show that?
2. Why is it good for scientists to change their minds when they find better evidence?

HANDS-ON: HOW TALL IS FORTY FEET?

Find something near your home that is about as tall as a Brachiosaurus could reach.

You will need

- A long string or rope, 40 feet
- A tape measure
- A grown-up

Steps

1. Measure 40 feet of string with the tape measure.
2. Lay it on the ground from the bottom of a tree, a house or a flagpole, out across the yard. That is how high the head of a Brachiosaurus could reach.
3. A house is about 10 feet per story. How many stories tall is 40 feet?
4. Now measure out 85 feet, the whole length of Brachiosaurus. Walk it!

Check your work

- I measured 40 feet and 85 feet.
- I found that 40 feet is about 4 stories of a building.

FIELD NOTEBOOK

1. Draw Brachiosaurus next to a giraffe and a house, to show how tall it was.
2. Write: “Brachiosaurus means arm lizard, because its front legs were longer than its back legs.”

Did you know? A close cousin found in Tanzania in Africa, now called Giraffatitan, stands in a museum in Berlin, Germany. It is one of the tallest dinosaur skeletons on display anywhere. Some of a sauropod’s bones were full of air spaces, which made its long neck lighter. A life-size cast of Riggs’s Brachiosaurus first stood in the Field Museum in Chicago in 1993. Today it stands in Terminal 1 of O’Hare Airport in Chicago, where travelers walk right under it!

Museum word. Museum signs say this dinosaur lived in the **Jurassic**. That is a name scientists use for a group of rock layers and the fossils found in them. Signs often give a date such as “about 154 to 150 million years ago.” That number is an interpretation, not something anyone saw. This course reads Genesis as teaching that God made the land animals, dinosaurs included, on the sixth day of creation, only thousands of years ago.

Goes deeper in. Life Science, Grade 1, Lesson 7.2 “Long necks” and Grade 6, Lesson 7.2 “Sauropod necks and hearts” (coming soon).

For families. The identity of Behemoth is presented as a view many Christians hold, not

as settled fact. Trail D (Dinosaurs and the Bible), Stop D2, looks at Job 40 closely.

PRACTICE

1. **EASY** What does Brachiosaurus mean?
2. **MEDIUM** Why did it get that name?
3. **MEDIUM** Why do scientists no longer think Brachiosaurus lived in lakes?

Make it a game • Treetop Reach. Hang paper “leaves” at different heights. Players stretch tall like a Brachiosaurus to pick the highest leaf they can reach without jumping.

Scripture. “Behold now behemoth, which I made with thee; he eateth grass as an ox.” (Job 40:15, KJV)

God made Behemoth, the mightiest of land animals, and He made it to eat plants. Many Christians think Behemoth may have been a sauropod.

Practice: answers

1. “Arm lizard.”
2. Its front legs (arms) were longer than its back legs.
3. Its strong legs and narrow feet were built for walking on land.

2.5 VELOCIRAPTOR, THE REAL SIZE

OBJECTIVES

- Tell how big a real Velociraptor was.
- Describe its sickle claw and its feathers.
- Tell where and when Velociraptor was first found.

Warm-up. Picture a turkey on a farm. Would you be scared of it? A real Velociraptor was about the size of a turkey, with a long tail!

Video slot. Video coming. Velociraptor fossils and the Fighting Dinosaurs fossil from Mongolia. Search the American Museum of Natural History, Smithsonian.

KEY TERMS

raptor

A word that means a robber or seizer; also a name for hunting birds like hawks.

sickle claw

A large curved claw on the second toe of each foot of Velociraptor.

quill knobs

Little bumps on a bone where big feathers were attached.

Gobi Desert

A huge desert in Mongolia and China where many dinosaur fossils are found.

CORE IDEAS

The story. In 1923, a team of explorers led by Roy Chapman Andrews of the American Museum of Natural History drove across the Gobi Desert of Mongolia. At a place of glowing orange rocks called the Flaming Cliffs, a member of the team, Peter Kaisen, found a small skull and a curved claw. In 1924, Henry Fairfield Osborn named the animal *Velociraptor*, which means “swift seizer.”

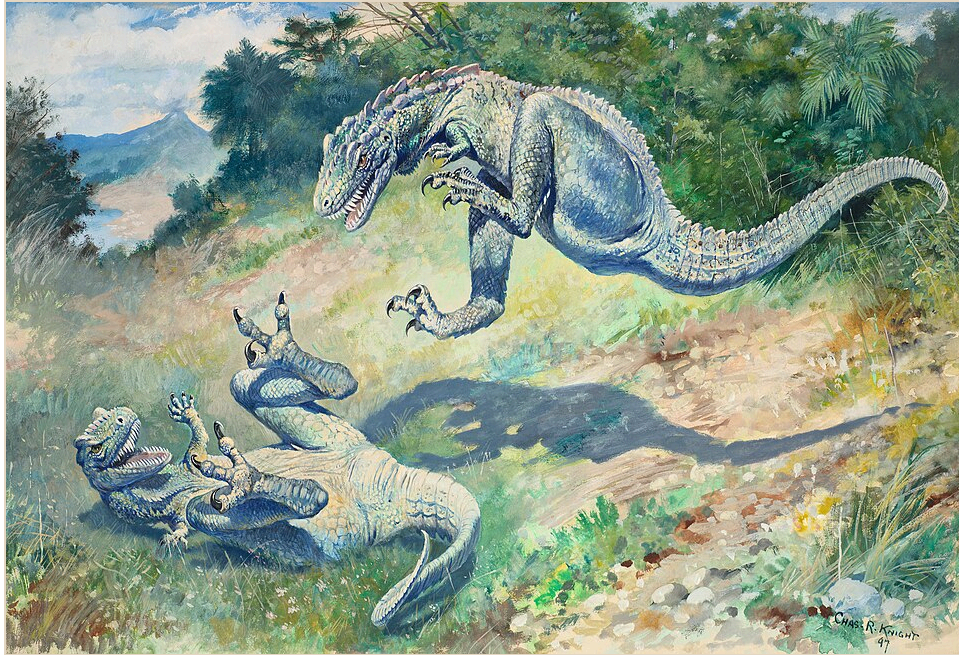
Smaller than the movies. In movies, Velociraptor is often shown as tall as a man. But the real Velociraptor was about the size of a turkey! It was about 6½ feet long, mostly tail, and stood about a foot and a half tall at the hips. It weighed about 30 to 35 pounds, about as much as a medium-sized dog. The big “raptors” in movies are really more like its larger cousins.

The sickle claw. On the second toe of each foot, Velociraptor had a big curved claw, shaped like a farmer’s sickle. It held this claw up off the ground as it walked, so it stayed sharp. It also had sharp teeth and long arms with three clawed fingers.

Feathers! In 2007, scientists looked closely at a Velociraptor arm bone and found a row of little bumps called **quill knobs**. On birds, quill knobs are where big wing feathers attach. This shows that Velociraptor had feathers on its arms. It could not fly, but it was a feathered dinosaur.

The Fighting Dinosaurs. In 1971, explorers in the Gobi found one of the most famous fossils ever: a Velociraptor and a Protoceratops locked together, buried suddenly by sand in the middle of a fight. Neither one ever got away.

PICTURE STUDY



Leaping Laelaps, Charles R. Knight, 1897 · Watercolor · American Museum of Natural History, New York
Wikimedia Commons · Public domain

Charles R. Knight painted *Leaping Laelaps* in 1897. It shows two meat-eating dinosaurs now called *Dryptosaurus*. At a time when most people pictured dinosaurs as slow and clumsy, Knight painted them quick and lively, a little like the way scientists picture raptors today.

Look closely

- Find the dinosaur that is leaping. Where are its claws?
- Find the dinosaur on its back. What is it doing?
- Is this painting calm or full of action?

Talk about it

1. How did Knight show that these dinosaurs were fast?
2. Do these dinosaurs have feathers? Why do you think Knight did not paint any?

HANDS-ON: RAPTOR REAL SIZE

Compare a real Velociraptor with you.

You will need

- A tape measure
- A large sheet of paper or cardboard, or sidewalk chalk
- A bathroom scale (optional)

Steps

1. Measure 6½ feet on the floor or the sidewalk. Draw a Velociraptor along it: a small head, a body and a long, stiff tail.
2. Mark a height of 1½ feet at the hips. Is that as tall as your knee? Your waist?
3. Draw the sickle claw on its foot, held up off the ground, and feathers on its arms.
4. Optional: weigh yourself. A Velociraptor weighed about 30 to 35 pounds. Are you heavier or lighter?

Check your work

- My raptor is 6½ feet long and about 1½ feet tall at the hips.
- I drew the sickle claw and arm feathers.

FIELD NOTEBOOK

1. Draw a Velociraptor foot and its sickle claw.
2. Write: “A real Velociraptor was about the size of a turkey.”

Did you know? Velociraptor’s brain was large for its body size. Velociraptor ran on two legs and used its stiff tail for balance. The Gobi Desert is also where the first nests of dinosaur eggs to be widely known were found, by the same 1923 expedition.

Museum word. Museum signs say this dinosaur lived in the **Cretaceous**. That is a name scientists use for a group of rock layers and the fossils found in them. Signs often give a date such as “about 75 to 71 million years ago.” That number is an interpretation, not something anyone saw. This course reads Genesis as teaching that God made the land animals, dinosaurs included, on the sixth day of creation, only thousands of years ago. Notice that the Fighting Dinosaurs were buried quickly. Sudden burial is how most good fossils form.

Goes deeper in. Earth Science, Grade 1, Lesson 7.4 “Dinosaur eggs (Roy Chapman Andrews, Gobi, 1923)” (coming soon).

For families. Velociraptor’s size and the 2007 quill-knob study (Turner, Makovicky and Norell) are well documented. Whether feathers mean dinosaurs are related to birds is a

question for later levels; at Scout level the feathers are simply described as what the fossil shows.

PRACTICE

1. **EASY** About how big was a real Velociraptor?
2. **MEDIUM** What did scientists find on a Velociraptor arm bone in 2007, and what does it show?
3. **EASY** In what desert was Velociraptor first found?

Make it a game • Raptor Freeze. Play freeze tag where the “raptor” must walk with one toe lifted (the sickle claw) and the frozen players can be freed by a teammate who flaps “feathered arms.”

Scripture. “He that answereth a matter before he heareth it, it is folly and shame unto him.” (Proverbs 18:13, KJV)

Movies can show things that are not true. A wise person listens to all the evidence before deciding, as scientists did when the real bones showed a turkey-sized raptor.

Practice: answers

1. About the size of a turkey (about 6½ feet long with its tail, 30 to 35 pounds).
2. Quill knobs, which show that Velociraptor had feathers on its arms.
3. The Gobi Desert, in Mongolia.

2.6 ANKYLOSAURUS

OBJECTIVES

- Tell what Ankylosaurus means.
- Describe its armor and tail club.
- Name the fossil hunter who named it.

Warm-up. Knock gently on a turtle shell, a helmet or a hard nut. Feel how hard it is. Ankylosaurus was covered with bony armor like that!

Video slot. Video coming. Armored dinosaurs: Ankylosaurus armor and tail club. Search the American Museum of Natural History, Royal Tyrrell Museum, Smithsonian.

KEY TERMS

armor

A hard covering that protects a body.

osteoderm

A bony plate or knob that grows in the skin (say “OSS-tee-oh-derm”).

tail club

A heavy knob of bone at the end of the tail.

fused

Joined together into one piece.

CORE IDEAS

The story. In 1906, the fossil hunter Barnum Brown, the same man who found T. rex, was digging in Montana when he found pieces of a strange, heavy skull and bony plates. In 1908 he named the animal *Ankylosaurus*, which means “fused lizard,” because many of its bones were **fused**, joined together into one solid piece, like a suit of armor.

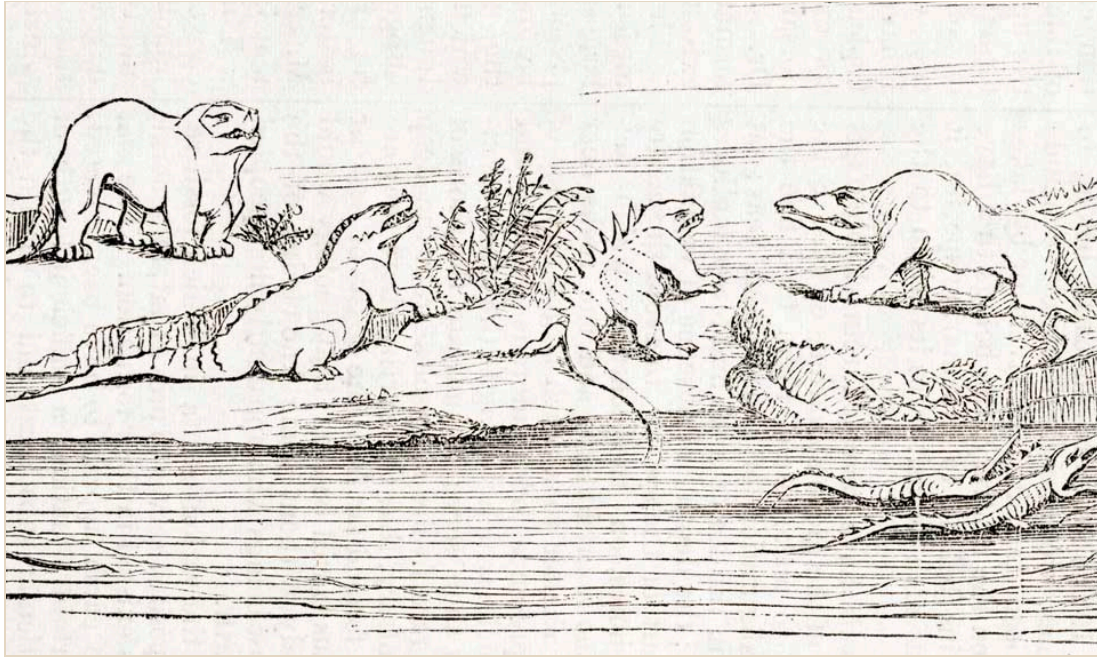
A walking tank. Ankylosaurus was low, wide and heavy, about 20 to 26 feet long. Its back was covered with bony plates and knobs called **osteoderms**, which grew in its skin. Spikes stuck out from its sides and the back of its head. A meat-eater that tried to bite it would get a mouthful of bone!

A club on the tail. At the end of its tail, Ankylosaurus had a big **tail club**, a heavy knob of bone. The back part of its tail was stiff, like a handle. It could swing that club hard from side to side. Scientists think it used the club to defend itself.

A peaceful plant-eater. In spite of all its armor, Ankylosaurus was a plant-eater. It had small, leaf-shaped teeth and a wide beak for cropping low plants. It probably walked slowly, nibbling as it went, like a giant armored cow.

Few fossils. Only a few Ankylosaurus skeletons have ever been found, and none is complete. Much of what we know comes from its cousins, other armored dinosaurs whose fossils are more complete. Scientists put the pieces together like a puzzle.

PICTURE STUDY



Design Drawing for the Crystal Palace Dinosaurs, Benjamin Waterhouse Hawkins, 1854 · Drawing · Crystal Palace Park, London (the statues)
Wikimedia Commons · Public domain

This is the sculptor's plan for his statues. In 1854, Benjamin Waterhouse Hawkins made life-size statues of the first dinosaurs ever named, for a park in London. One of them is *Hylaeosaurus*, an armored dinosaur found in England, a cousin of Ankylosaurus. Only a few bones were known then, so Hawkins had to guess at much of its shape. The statues are still in the park today.

Look closely

- Find a creature with spikes on its back. That is *Hylaeosaurus*.
- Look at the legs. Do these creatures stand tall or lie low, like lizards?
- What do you think Hawkins got right? What might be wrong?

Talk about it

1. How is Hawkins' *Hylaeosaurus* like the Ankylosaurus in our story? How is it different?
2. Why is it hard to make a statue when you have only a few bones?

HANDS-ON: ARMOR TEST

Find out how armor protects a body.

You will need

- Two small balloons (or two eggs, with a grown-up)
- Cardboard and tape
- Bottle caps or pasta shells
- A pillow

Steps

1. Blow up two small balloons. Leave one plain.
2. Make “armor” for the other: tape on cardboard plates and glue bottle caps or pasta shells as osteoderms.
3. Gently poke each balloon with a pencil point (a grown-up helps). Which one is protected?
4. Talk about it: how did Ankylosaurus’s armor protect it?

Tips

- Balloons can pop loudly; be ready! Keep balloon pieces away from little brothers and sisters.

Check your work

- I made bony “armor” for a balloon.
- I tested which balloon was protected.

FIELD NOTEBOOK

1. Draw Ankylosaurus from the top, showing the armor plates and the tail club.
2. Write: “Ankylosaurus means fused lizard.”

Did you know? The Ankylosaurus tail club could be as wide as a big serving platter, about 2 feet across. The armored dinosaurs are called ankylosaurs, after Ankylosaurus. One armored dinosaur from Canada, Borealopelta, was found so well preserved that it looks like a statue, with its armor still in place.

Museum word. Museum signs say this dinosaur lived in the **Cretaceous**. That is a name scientists use for a group of rock layers and the fossils found in them. Signs often give a date such as “68 to 66 million years ago,” the same as T. rex. That number is an interpretation, not something anyone saw. This course reads Genesis as teaching that God made the land animals, dinosaurs included, on the sixth day of creation, only thousands of years ago.

Goes deeper in. Life Science, Grade 2, Lesson 7.2 “Armored dinosaurs” (coming soon).

For families. Ankylosaurus is known from a few partial skeletons; the stop says so plainly. The picture study uses Hawkins’ 1854 Hylaeosaurus, a related armored dinosaur,

because no early fine-art image of Ankylosaurus itself exists.

PRACTICE

1. **EASY** What does Ankylosaurus mean?
2. **EASY** What was at the end of its tail?
3. **MEDIUM** Was Ankylosaurus a plant-eater or a meat-eater? What clue tells us?

Make it a game • Tail Club Bowling. Set up plastic cups as pins. Players swing a sock stuffed with another sock (the tail club) side to side, like Ankylosaurus, to knock them over.

Scripture. “The LORD is my rock, and my fortress, and my deliverer; my God, my strength, in whom I will trust; my buckler, and the horn of my salvation, and my high tower.” (Psalm 18:2, KJV)

Ankylosaurus had armor of bone. God is our armor and fortress, the One who keeps us safe.

Practice: answers

1. “Fused lizard.”
2. A heavy club of bone.
3. A plant-eater; it had small leaf-shaped teeth and a beak for cropping plants.

2.7 SPINOSAURUS

OBJECTIVES

- Describe Spinosaurus's sail, snout and tail.
- Tell how the first Spinosaurus bones were lost.
- Explain how new fossils changed what scientists think.

Warm-up. Hold a paper fan open behind your back. That is a little like the tall “sail” on the back of Spinosaurus. Some of its spines were taller than a grown man!

Video slot. Video coming. Spinosaurus: the sail, the crocodile-like snout and the paddle tail. Search National Geographic Society (vetted per video), Smithsonian.

KEY TERMS

spine

Here, a long rod of bone sticking up from the backbone.

sail

A tall fin of skin held up by long spines along the back.

snout

The nose and jaws of an animal.

paleontologist

A scientist who studies fossils (say “pay-lee-on-TALL-uh-jist”).

CORE IDEAS

The story. In 1912, a fossil collector named Richard Markgraf was digging in the desert of Egypt, near an oasis called Bahariya. He found jaws, teeth and huge spines, some taller than a man. He sent them to a German **paleontologist**, Ernst Stromer, who named the animal in 1915: *Spinosaurus*, “spine lizard.” Stromer kept the bones in a museum in Munich.

Lost in the war. Then came World War II. In 1944, the museum in Munich was destroyed by bombs, and the Spinosaurus bones were destroyed with it. All that was left were Stromer's careful drawings, photographs and notes. For many years, no one knew much more about Spinosaurus.

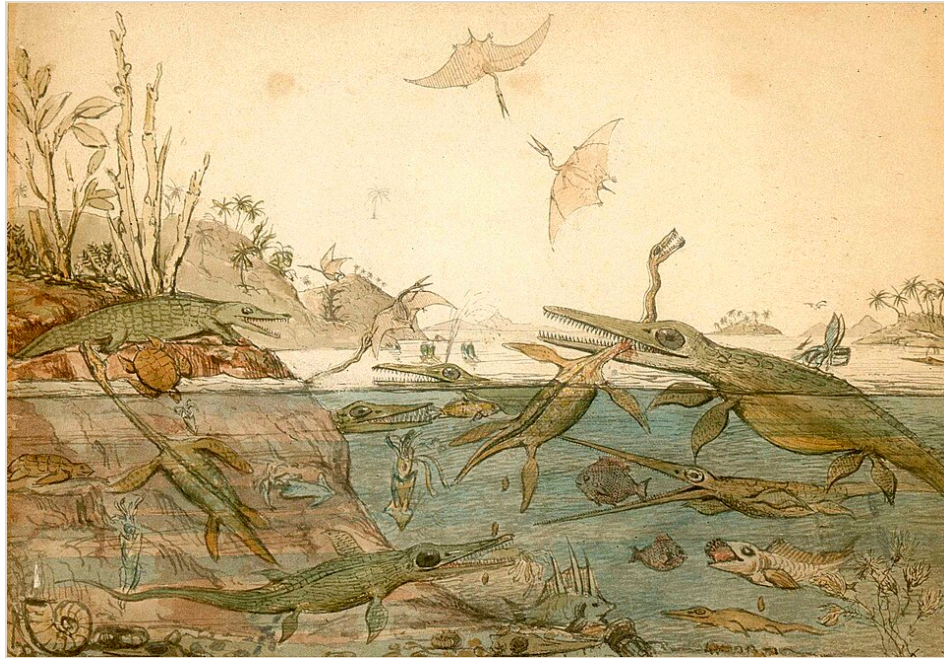
A giant with a sail. From those drawings and from new fossils, we know Spinosaurus was one of the longest meat-eating dinosaurs, perhaps 45 feet long or more, even longer than T. rex. Along its back were tall spines, the longest more than 5 feet high. Skin stretched between them, making a great **sail**.

A fish-eater. Spinosaurus had a long, narrow **snout** like a crocodile's, with cone-shaped teeth good for gripping slippery fish. Its nostrils were set far back on its snout. It lived near

rivers, and it seems to have spent a lot of time in or near the water, catching big fish.

New bones, new ideas. In the 2010s, a paleontologist named Nizar Ibrahim and his team dug up new Spinosaurus bones in Morocco, including a tail. The tail bones had tall spines on top and bottom, making a flat tail like a paddle. Scientists still argue about how well Spinosaurus swam. Each new bone helps us understand it a little better.

PICTURE STUDY



Duria Antiquior (A More Ancient Dorset), Henry De la Beche, 1830 · Watercolor · National Museum Wales, Cardiff (the original); widely printed as a lithograph
Wikimedia Commons · Public domain

Henry De la Beche was an English geologist. In 1830 he painted this scene of ancient sea creatures, based on the fossils that Mary Anning had found on the coast of Dorset. Prints of it were sold to help Mary Anning, who was poor. It is one of the very first pictures ever made of a scene from the world of fossils.

Look closely

- Find a long-necked creature. Find a creature that looks like a fish or a dolphin.
- Look up. What is flying in the sky?
- Is this scene calm or busy?

Talk about it

1. Spinosaurus caught fish in rivers. Which creatures in this painting also hunt fish?
2. Why do you think people in 1830 were amazed by pictures like this?

HANDS-ON: MAKE A SAIL BACK

Build a Spinosaurus sail and see how spines hold up skin.

You will need

- Six drinking straws or wooden skewers (with a grown-up)
- Tissue paper or a paper bag
- Tape and glue
- Clay or a piece of foam

Steps

1. Cut the straws into different lengths: short at the ends, tallest in the middle.
2. Stand them up in a row in a strip of clay. These are the spines.
3. Glue tissue paper across the spines to make the sail.
4. Add a clay body with a long, narrow, crocodile-like snout and a paddle-shaped tail.

Check your work

- My spines are tallest in the middle.
- Skin (paper) stretches between the spines.
- My Spinosaurus has a long narrow snout.

FIELD NOTEBOOK

1. Draw Spinosaurus catching a fish in a river.
2. Write two sentences about how the first Spinosaurus bones were lost and how new ones were found.

Did you know? Ernst Stromer's detailed notes and drawings were so good that scientists still use them today, more than a hundred years later. Spinosaurus had heavy, dense bones, a little like a hippo's or a penguin's, which may have helped it stay under water. Spinosaurus fossils have been found in North Africa, in Egypt and Morocco.

Museum word. Museum signs say this dinosaur lived in the **Cretaceous**. That is a name scientists use for a group of rock layers and the fossils found in them. Signs often give a date such as "about 95 million years ago." That number is an interpretation, not something anyone saw. This course reads Genesis as teaching that God made the land animals, dinosaurs included, on the sixth day of creation, only thousands of years ago.

Goes deeper in. Earth Science, Grade 3, Unit 6 "Dinosaur Digs" (coming soon).

For families. The loss of Stromer's fossils is stated simply. Spinosaurus is an active research topic; the stop presents the 2014 and 2020 finds and notes that scientists still disagree about its swimming.

PRACTICE

1. **EASY** What was on Spinosaurus's back?
2. **MEDIUM** What happened to the first Spinosaurus bones?
3. **MEDIUM** What did Spinosaurus eat? What clue tells us?

Make it a game • Fish Snatch. Scatter paper fish on the floor (the river). Players use kitchen tongs (a long, narrow “snout”) to catch as many fish as they can in 30 seconds.

Scripture. “Or speak to the earth, and it shall teach thee: and the fishes of the sea shall declare unto thee.” (Job 12:8, KJV)

The earth and even its fossils can teach us about the God who made all things.

Practice: answers

1. A tall sail of skin held up by long spines.
2. They were destroyed in 1944, during World War II, when the museum in Munich was bombed.
3. Fish, mostly. Its long narrow snout and cone-shaped teeth were good for gripping slippery fish.

2.8 PARASAUROLOPHUS AND ITS CREST

OBJECTIVES

- Describe the hollow crest of Parasaurolophus.
- Explain how scientists tested the sound the crest could make.
- Tell what a “duck-billed” dinosaur is.

Warm-up. Blow across the top of an empty bottle until it hums. Now try a bigger bottle. Does it make a higher or lower sound? Parasaurolophus had a crest that may have worked like that.

Video slot. Video coming. Parasaurolophus crest and the sound it may have made. Search the Royal Ontario Museum, Smithsonian, New Mexico Museum of Natural History and Science.

KEY TERMS

crest

A bony part sticking up from the top or back of an animal’s head.

hadrosaur

A “duck-billed” dinosaur, with a wide, flat beak.

hollow

Empty inside, like a tube.

CT scan

A machine that uses X-rays to see inside something, slice by slice, without breaking it.

CORE IDEAS

The story. In 1920, a skull with a long, curved crest was found in Alberta, Canada. Two years later, a scientist named William Parks named the dinosaur *Parasaurolophus*, which means “near crested lizard.” Its crest swept back from its head like a long, curved horn.

A trumpet on its head. The crest was not solid bone. Inside were long **hollow** tubes that ran from the nose up into the crest and back down again. What were they for? Many scientists thought the crest might work like a horn or a trombone, making a deep, booming call.

Testing the sound. In the 1990s, scientists in New Mexico took a Parasaurolophus skull and put it through a **CT scan**, which let them see the tubes inside without breaking anything. With a computer, they built a model of the tubes and let air “blow” through them. Out came a deep, low, rumbling sound, like a foghorn or a tuba! No one knows exactly what a real Parasaurolophus sounded like, but the model gives us a good idea.

A duck-billed dinosaur. Parasaurolophus was a **hadrosaur**, a “duck-billed” dinosaur, with a wide, flat beak. Behind its beak were hundreds of small teeth packed together, which ground up tough plants. It was about 30 feet long and could walk on two legs or on all four.

Why a crest? The crest may have helped Parasaurolophus call to its herd, warn of danger, or know others of its own kind. God gave many creatures ways to talk to each other: songs, howls, chirps, and maybe even a dinosaur trumpet.

PICTURE STUDY



Hadrosaurus foulkii, the First Mounted Dinosaur Skeleton, Benjamin Waterhouse Hawkins (mount);
photographer unknown, 1868 · Photograph · Academy of Natural Sciences, Philadelphia
Wikimedia Commons · Public domain

In 1868, in Philadelphia, Benjamin Waterhouse Hawkins put together the bones of *Hadrosaurus*, a duck-billed dinosaur from New Jersey, and stood them up. It was the first dinosaur skeleton ever mounted for people to see. Crowds lined up at the museum. Missing bones were made from plaster.

Look closely

- Find the metal rods holding up the skeleton.
- How is the skeleton standing: on two legs, or four?
- Find the people or objects near it. How big is it?

Talk about it

1. Today scientists think hadrosaurs held their backs more level. How would you stand this skeleton?
2. Why do you think people lined up to see it?

HANDS-ON: BOTTLE CREST ORCHESTRA

Make deep and high sounds with tubes, like a *Parasaurolophus* crest.

You will need

- Three or four empty bottles of different sizes, or paper-towel and wrapping-paper tubes
- Water

Steps

1. Blow across the top of each empty bottle. Which one makes the lowest note?
2. Add water to one bottle. Does the note go up or down?
3. Hum into a short tube and then a long tube. Which sounds deeper?
4. Talk about it: a long, hollow crest could make a deep, low call.

Check your work

- I made notes with bottles or tubes.
- I found that longer air spaces make lower sounds.

FIELD NOTEBOOK

1. Draw *Parasaurolophus* with its crest. Draw dotted lines inside the crest to show the hollow tubes.
2. Write: "Its crest may have worked like a ____." (a horn or trombone)

Did you know? Some duck-billed dinosaurs have been found with fossil skin impressions showing small bumpy scales. Hadrosaurs had hundreds of teeth in rows, stacked so that new teeth replaced worn ones. One of the first good dinosaur skeletons ever found in North America was a duck-billed dinosaur, *Hadrosaurus*, dug up in Haddonfield, New Jersey, in 1858.

Museum word. Museum signs say this dinosaur lived in the **Cretaceous**. That is a name scientists use for a group of rock layers and the fossils found in them. Signs often give a date such as "about 76 to 73 million years ago." That number is an interpretation, not something anyone saw. This course reads Genesis as teaching that God made the land animals, dinosaurs included, on the sixth day of creation, only thousands of years ago.

Goes deeper in. Life Science, Grade 1, Lesson 7.3 "Duck-billed dinosaurs" (coming soon).

For families. The sound model is from a 1997 study at Sandia National Laboratories and the New Mexico Museum of Natural History and Science. The stop presents it as a model, not a recording.

PRACTICE

1. **EASY** What was inside Parasaurolophus's crest?
2. **MEDIUM** How did scientists find out what sound the crest might make?
3. **EASY** What kind of beak did Parasaurolophus have?

Make it a game • Herd Call. Each player picks a secret “call” (hum, whistle or hoot). With eyes closed, players must find their partner who has the same call.

Scripture. “Let every thing that hath breath praise the LORD. Praise ye the LORD.”
(Psalm 150:6, KJV)

Every creature that breathes, from the bird to the great dinosaur, was made to praise God.

Practice: answers

1. Long hollow tubes.
2. They scanned a skull (CT scan), made a computer model of the tubes and “blew” air through them; it made a deep, low sound.
3. A wide, flat “duck bill.”

2.9 PACHYCEPHALOSAURUS

OBJECTIVES

- Tell what Pachycephalosaurus means.
- Describe its thick, domed skull.
- Explain why scientists still argue about head-butting.

Warm-up. Knock gently on your own head. Your skull is about a quarter of an inch thick. The dome on top of a Pachycephalosaurus skull could be about 10 inches thick!

Video slot. Video coming. Pachycephalosaurus domes and the head-butting question. Search the Museum of the Rockies, Smithsonian, Royal Tyrrell Museum.

KEY TERMS

dome

A rounded top, like half of a ball.

skull

The bones of the head.

theory

An idea scientists use to explain something, which they test with evidence.

Hell Creek

A rock formation in Montana and the Dakotas where T. rex, Triceratops and Pachycephalosaurus are found.

CORE IDEAS

The story. Imagine finding a fossil that looks like a big, round, bony bowling ball with knobs around the edges. That is what fossil hunters found in the western United States. In 1943, Barnum Brown and Erich Schlaikjer named the animal *Pachycephalosaurus*, which means “thick-headed lizard.”

A bony helmet. The top of a Pachycephalosaurus skull rose into a high **dome** of solid bone, up to about 10 inches thick. Around the back of the dome were rows of bony knobs and short spikes, and more bumps grew on its snout. It looked like it was wearing a knobby helmet.

Mostly heads. Most Pachycephalosaurus fossils are just skulls, or only the thick domes. The thick bone lasted when the rest of the skeleton was lost. So scientists make their best guess about its body from its smaller cousins. It was probably about 15 feet long, walked on two legs and ate plants, with small leaf-shaped teeth.

Did they bump heads? For many years, people pictured these dinosaurs running at each other and crashing heads together, like rams or mountain goats. Other scientists said a

round dome would slip sideways, and that the dinosaurs more likely pushed each other's sides. Then some scientists found healed injuries on some domes, which may come from hard knocks. The argument is not finished. That is a good lesson: some questions take a long time to answer.

A good theory listens. A **theory** is an idea that tries to explain what we find. A good scientist keeps testing a theory against the evidence, and changes it if he must. Pachycephalosaurus reminds us to be humble about what we know.

PICTURE STUDY



The Iguanodon and the Megalosaurus, Édouard Riou, 1863 · Engraving · From Louis Figuier, *The World Before the Deluge*

Wikimedia Commons · Public domain

Édouard Riou was a French artist who also drew pictures for Jules Verne's adventure books. In 1863 he drew this scene for a book by Louis Figuier called *The World Before the Deluge*. Only a few dinosaur bones were known then, so Riou drew them like giant lizards. Today we know the "horn" on the nose of Iguanodon was really a thumb spike!

Look closely

- Find the horn on one dinosaur's nose. Scientists later learned it belonged on the thumb.
- Do these dinosaurs stand tall or crawl like lizards?
- Look at the trees. What kind of forest is this?

Talk about it

1. How did Riou guess what dinosaurs looked like with only a few bones?

2. Pachycephalosaurus is known mostly from its head. What would you have to guess about its body?

HANDS-ON: DOME DROP TEST

Test whether a round dome or a flat top glances off when it bumps.

You will need

- Two paper or plastic cups
- Half a plastic Easter egg or a ball of clay shaped like a dome
- Tape
- A tray

Steps

1. Tape the dome onto the bottom of one cup. Leave the other cup flat.
2. Slide the two flat cups gently into each other bottom-first. Do they meet squarely?
3. Now slide the dome cup into the flat cup a little off-center. Does it meet squarely, or slip to the side?
4. Talk about it: why do some scientists think round domes would slip, and others think they could still butt heads?

Check your work

- I tested a dome and a flat top.
- I can explain both sides of the head-butting question.

FIELD NOTEBOOK

1. Draw a Pachycephalosaurus skull with its dome and knobs.
2. Write one reason scientists think it butted heads, and one reason some think it did not.

Did you know? Pachycephalosaurus is found in the same rocks as T. rex and Triceratops, in Montana, South Dakota and Wyoming. Young Pachycephalosaurus may have had flatter heads, with the dome growing as they got older. Bighorn sheep, which do butt heads, can run at each other at more than 20 miles an hour.

Museum word. Museum signs say this dinosaur lived in the **Cretaceous**. That is a name scientists use for a group of rock layers and the fossils found in them. Signs often give a date such as “68 to 66 million years ago.” That number is an interpretation, not something anyone saw. This course reads Genesis as teaching that God made the land animals, dinosaurs included, on the sixth day of creation, only thousands of years ago.

Goes deeper in. Life Science, Grade 4, Lesson 7.4 “Ornithischians” (coming soon).

For families. The head-butting debate is real and ongoing; the stop presents both views so children learn that some scientific questions are unsettled.

PRACTICE

1. **EASY** What does Pachycephalosaurus mean?
2. **MEDIUM** Why are most Pachycephalosaurus fossils only skulls?
3. **MEDIUM** Did Pachycephalosaurus butt heads? What is the best answer today?

Make it a game · Gentle Dome Push. Two players stand on one foot, hands on each other's shoulders, and gently push. The first to put the other foot down loses. No head-butting!

Scripture. "A soft answer turneth away wrath: but grievous words stir up anger."
(Proverbs 15:1, KJV)

People do not need to "butt heads." A gentle answer can stop a quarrel before it starts.

Practice: answers

1. "Thick-headed lizard."
2. The thick dome of bone lasted when the rest of the skeleton was lost.
3. Scientists are not sure. Some think the domes were for butting heads (some domes have healed injuries); others think round domes would slip, so they pushed sides instead.

2.10 ARGENTINOSAURUS, ONE OF THE BIGGEST

OBJECTIVES

- Tell how Argentinosaurus was discovered.
- Describe how big it may have been.
- Explain why scientists can only estimate its size.

Warm-up. Stand next to a door. A single backbone of Argentinosaurus was about 5 feet tall, maybe as tall as your mother or father!

Video slot. Video coming. Argentinosaurus bones and the size of the biggest sauropods. Search the Museo Carmen Funes (Plaza Huincul), Fernbank Museum, Smithsonian.

KEY TERMS

titanosaur

A group of very large sauropods, the long-necked plant-eaters, found mostly in South America.

estimate

A careful guess based on what we know.

rancher

A person who raises cattle or sheep on a large farm called a ranch.

petrified wood

Wood that has turned to stone.

CORE IDEAS

The story. In 1987, a rancher named Guillermo Heredia was riding on his land in Neuquén Province, in Argentina, when he saw a huge object sticking out of the ground. He thought it was a log of **petrified wood**. But when scientists from the museum came to dig it up, they found it was a giant bone, a piece of a leg bone from the biggest dinosaur they had ever seen.

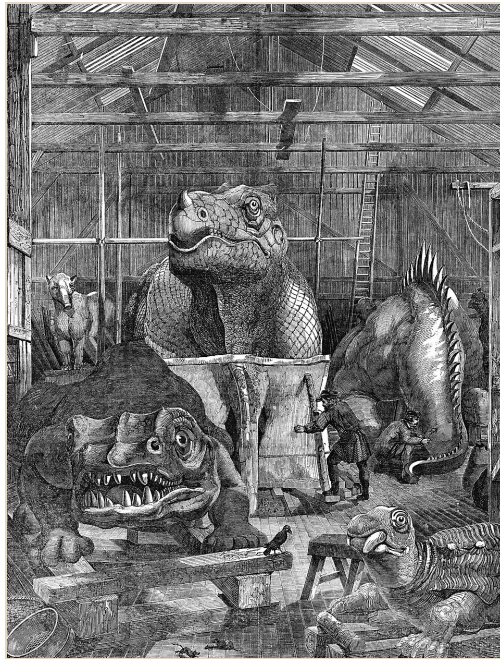
A giant's backbone. As they dug, they found more: pieces of the backbone and ribs. One backbone, called a vertebra, was about 5 feet tall! In 1993, two scientists, José Bonaparte and Rodolfo Coria, named the animal *Argentinosaurus*, "Argentina lizard."

How big? Argentinosaurus was a **titanosaur**, one of the giant long-necked plant-eaters. Scientists **estimate** that it may have been about 100 to 115 feet long, as long as a blue whale, and may have weighed as much as ten elephants or more. It is one of the largest land animals known.

Why only a guess? Only a few bones of Argentinosaurus have ever been found: some backbones, ribs and part of a leg. Scientists compare those bones with the bones of smaller cousins that are more complete, and work out how big the whole animal might have been. That is why the numbers are estimates, and why different books give different sizes.

Great and small. Scientists think giants like Argentinosaurus hatched from eggs only about the size of a grapefruit, like the titanosaur eggs found in Argentina. From that small egg grew one of the biggest creatures God ever made to walk on land. “Great and marvellous are thy works, Lord God Almighty” (Revelation 15:3).

PICTURE STUDY



Mr. Waterhouse Hawkins' Workshop at Sydenham, Unknown engraver for a London newspaper (Commons credits Philip Henry Delamotte), 1853 · Wood engraving · Published in London, 1853
Wikimedia Commons · Public domain

In 1853, the sculptor Benjamin Waterhouse Hawkins built giant dinosaur models in this workshop for Crystal Palace Park in London. On New Year's Eve that year he even held a dinner party for scientists inside the mold of his Iguanodon! Pictures like this show how amazed people were by the size of dinosaurs, even when only a few bones had been found.

Look closely

- Find the workmen. How big are they next to the models?
- Find a model with spikes on its back.
- What tools or ladders can you see?

Talk about it

1. Would you like to eat dinner inside a dinosaur? Why or why not?

2. Argentinosaurus was much bigger than Hawkins' Iguanodon. How many workshops like this might it fill?

HANDS-ON: BIGGEST BACKBONE

Make a life-size Argentinosaurus vertebra out of paper and see how tall it stands.

You will need

- Large cardboard boxes or big sheets of paper taped together
- A tape measure
- Markers
- Tape

Steps

1. Tape paper together until you have a sheet 5 feet tall.
2. Draw one vertebra on it: a round spool at the bottom (the part that held the spinal cord stacked on top) and a tall, wing-shaped spine reaching up.
3. Cut it out with a grown-up and tape it to the wall.
4. Stand beside it and have someone take a picture. Write how tall you are, and how tall the vertebra is.

Check your work

- My vertebra is about 5 feet tall.
- I compared my height to it.

FIELD NOTEBOOK

1. Draw Argentinosaurus next to a blue whale and a school bus.
2. Write: "Scientists estimate its size because only a few bones have been found."

Did you know? Titanosaur nests with many eggs, some with tiny embryos inside, have been found in Argentina at a place called Auca Mahuevo. A life-size cast of Argentinosaurus stands at the Fernbank Museum of Natural History in Atlanta, Georgia. The original Argentinosaurus bones are kept at the Carmen Funes Municipal Museum in Plaza Huincul, Argentina.

Museum word. Museum signs say this dinosaur lived in the **Cretaceous**. That is a name scientists use for a group of rock layers and the fossils found in them. Signs often give a date such as "about 95 million years ago." That number is an interpretation, not something anyone saw. This course reads Genesis as teaching that God made the land animals, dinosaurs included, on the sixth day of creation, only thousands of years ago.

Goes deeper in. Life Science, Grade 6, Lesson 7.3 "How big could a dinosaur get?"

(coming soon).

For families. Size estimates for Argentinosaurus vary widely because the skeleton is very incomplete; the stop gives a range and explains why. The 1853 Iguanodon dinner is well documented and makes a fun bridge to Trail B (Dinosaur Hunters), Stop B5.

PRACTICE

1. **EASY** What did the rancher first think the Argentinosaurus bone was?
2. **EASY** About how long may Argentinosaurus have been?
3. **MEDIUM** Why do books give different sizes for Argentinosaurus?

Make it a game • Smallest to Biggest. Write ten animals and dinosaurs from this trail and the Animals trail on cards. Race to put them in order from smallest to biggest. (Hint: Velociraptor is small; Argentinosaurus and the blue whale are at the top.)

Scripture. “Thou art worthy, O Lord, to receive glory and honour and power: for thou hast created all things, and for thy pleasure they are and were created.” (Revelation 4:11, KJV)

God created all things, from the smallest egg to the biggest dinosaur, and they bring Him glory.

Practice: answers

1. Petrified wood (wood turned to stone).
2. About 100 to 115 feet (an estimate).
3. Only a few bones have been found, so scientists estimate its size by comparing with more complete cousins.

TRACK 2 BADGE QUIZZES

The badge quizzes are optional. Read each question aloud; the child may answer by talking, pointing or drawing. Four right out of five earns the badge. Badges and the certificate are earned by doing the stops, not by scores.

Badge quiz 1 (Stops A1–A5)

1. What does Tyrannosaurus rex mean?
2. How many horns did Triceratops have?
3. What is the funny nickname for the spiky end of a Stegosaurus tail?
4. Why was Brachiosaurus called “arm lizard”?
5. About how big was a real Velociraptor?

Badge quiz 2 (Stops A6–A10)

6. What did Ankylosaurus have at the end of its tail?
7. What was on Spinosaurus’s back?
8. What may the hollow crest of Parasaurolophus have done?
9. What does Pachycephalosaurus mean?
10. Name the three museum words for dinosaur rock layers.

TRAIL CERTIFICATE: MY DINOSAUR FIELD NOTEBOOK AND TRAIL A CERTIFICATE

Gather the Field Notebook pages from this trail into one booklet with a cover: “My Dinosaur Field Notebook,” your name and the dates you started and finished. Add a “Museum words” page that lists Triassic, Jurassic and Cretaceous and the dinosaurs from this trail that museum signs put in each.

When the booklet is done, a parent signs the Trail A certificate.

- **Ten stops:** At least one page for each dinosaur, each with a title and a date.
- **Names:** The meaning of each dinosaur’s name is written on its page.
- **Museum words:** A page lists the period names correctly, with a sentence explaining that dates on signs are interpretations.
- **Care:** Drawings are labeled and done carefully.

Answer key

1. “Tyrant lizard king.”
2. Three (one on the nose and two above the eyes).
3. The thagomizer.
4. Its front legs were longer than its back legs.
5. About the size of a turkey.
6. A heavy club of bone.
7. A tall sail held up by long spines.
8. Made a deep, low call, like a horn or a trombone.

9. "Thick-headed lizard."

10. Triassic, Jurassic and Cretaceous.

GREAT BATTLES ✕ TRAIL A: THE ANCIENT WORLD

The first trail of the Great Battles track visits eight battles of the ancient world, from Marathon to Alesia, and ends with two victories God gave His people by unlikely means: Jericho and Gideon. Every battle is taught through four questions: **the map** (where was it, and what was the ground like?), **the plan** (what did the commanders decide?), **the people** (who showed courage and faith?) and **why it mattered**.

This is the ● **Scout** level, for ages 7 to 9. Every stop has a terrain map to draw, a tabletop battle to set up with blocks or toy soldiers, and a “Choose your move” puzzle, where the child decides what the commander should do before learning what really happened. Stories are told with honor and without gore: when men died, the stop says so plainly and does not describe wounds.

Five stops earn the **Ancient Battles badge, part 1**; all eight earn part 2 and the **Trail A certificate**.

BEFORE YOU BEGIN

- Listen to a story of about five minutes and tell it back.
- Find Greece, Italy, North Africa and the Middle East on a globe or map (a grown-up may help).
- Count and compare numbers into the thousands, with help.

MASTERY CHECKLIST

- ☐ I can tell where each of the eight battles was fought and point to it on a map.
- ☐ I can explain the commander’s plan for each battle in one or two sentences.
- ☐ I can name a person who showed courage at each battle.
- ☐ I can set up a battle on a tabletop and show what happened.
- ☐ I can say why a battle mattered, and what Scripture says about courage and trust in God.

OPTIONAL BOOKS AND RESOURCES

- **Project Gutenberg: Herodotus and Plutarch** (<https://www.gutenberg.org>): For parents: the ancient sources behind Marathon, Thermopylae and Salamis (Herodotus) and the lives of Themistocles and Alexander (Plutarch).
- **United States Military Academy, Department of History: Atlases** (<https://www.westpoint.edu/academics/academic-departments/history/atlasses>): Free battle maps used to teach cadets, including Cannae and other ancient battles.

3.1 MARATHON (490 B.C.)

OBJECTIVES

- Find Marathon and Athens on a map of Greece.
- Explain Miltiades' plan: a thin center and strong wings.
- Tell the true story of the runners of Marathon.

Warm-up. Line up ten toy soldiers or blocks in a row. Now you have only ten, but the enemy has twenty. How could you arrange your ten to win? Keep your idea for the "Choose your move" puzzle.

Video slot. Video coming. The Battle of Marathon for young viewers: the map, the plan and the run. Search approved history channels (e.g., Simple History, Kings and Generals, The History Guy) and preview first.

KEY TERMS

Athens

A famous city in ancient Greece.

Persia

A great empire in the land that is now Iran, ruled by a king.

phalanx

A tight block of Greek foot soldiers with shields and long spears.

wing

The left or right end of an army's battle line.

CORE IDEAS

The map. In the year 490 B.C., a great Persian army sailed across the sea to Greece. Darius, the King of Persia, was angry with the city of Athens and wanted to punish it. His ships landed at a wide, flat bay called Marathon, about 25 miles from Athens. Hills stood around the plain, and marshes lay near the shore.

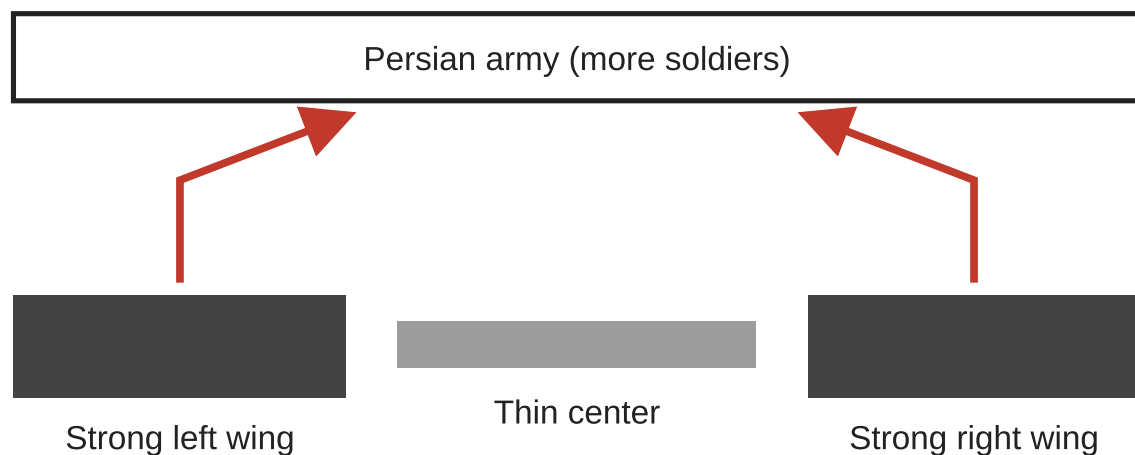
The people. Athens sent out its whole army, about ten thousand men, and the small city of Plataea sent about a thousand more to help. The Persians had many more soldiers. Before the battle, the Athenians sent a runner named Pheidippides to the city of Sparta to ask for help. The ancient historian Herodotus says he ran about 150 miles in two days! But the Spartans said they could not march until their religious festival was over.

The plan. One of the Athenian generals, Miltiades, made a bold plan. His army was smaller, so to make his line as long as the Persian line, he made the center of his line thin, only a few rows deep. But he made the two **wings**, the left and right ends, deep and strong. Then the Greeks charged across the plain at a run, heavy shields and all.

What happened. In the middle, the strong Persian soldiers pushed the thin Greek center back. But on both wings, the strong Greek **phalanxes** broke through. Then the two winning wings turned inward and came at the Persian center from both sides. The Persians fled to their ships. Herodotus says about 6,400 Persians died, and 192 Athenians. The Athenians buried their dead in a great mound that still stands on the plain of Marathon today.

Why it mattered. Little Athens had beaten the mighty Persian army. Later, people told the story of a runner who raced from Marathon to Athens to shout “We have won!” That story was written down long after the battle, but it gave its name to the long race we call a marathon. The real run that Herodotus tells about was the run to Sparta, before the battle.

Marathon: thin center, strong wings



Greek army (Athenians and Plataeans). Red arrows: the wings win and turn inward.

Miltiades' plan at Marathon: a thin center and strong wings.

PICTURE STUDY



The Soldier of Marathon, Luc-Olivier Merson, 1869 · Oil on canvas · École nationale supérieure des Beaux-Arts, Paris
Wikimedia Commons · Public domain

Luc-Olivier Merson was a French painter. He painted this scene of the famous legend: a runner arriving from Marathon with the news of victory. The painting shows the story people loved to tell, even though the oldest history, by Herodotus, tells of a different run.

Look closely

- Find the runner. How does he look after his long run?
- Look at the people around him. What are they feeling?
- Find the buildings. Where is this happening?

Talk about it

1. Why do you think people loved the story of the runner so much?
2. How can we tell the difference between what history records and a story added later?

HANDS-ON: TABLETOP MARATHON

Set up the battle of Marathon on a table or the floor and show how the plan worked.

You will need

- About 30 blocks, toy soldiers or pennies in one color (Greeks)
- About 40 in another color (Persians)
- A strip of blue paper for the sea

Steps

1. Lay the blue paper along one edge for the shore. Set the Persians in a long line in front of it.
2. Set the Greeks facing them in a line just as long: deep (3 or 4 rows) on the two ends, thin (1 row) in the middle.
3. Push the Persians forward in the middle; let the Greek center step back.
4. Push the Greek wings forward on both ends, then turn them inward to squeeze the Persian center from both sides.
5. Move the Persians back to their “ships” at the shore.

Check your work

- My Greek line has strong wings and a thin center.
- I can show how the wings turned inward.

FIELD NOTEBOOK

1. **Terrain map.** Draw the plain of Marathon: the sea on one side, hills on the other, a marsh near the shore, and the road to Athens. Mark the Greek and Persian lines.
2. Draw the runner, and write: “The real run in Herodotus was to Sparta, about 150 miles.”

Did you know? The modern marathon race is 26.2 miles long. That distance was set at the London Olympic Games of 1908. After the battle, the Athenian army marched quickly back to Athens to guard it, in case the Persian ships sailed there. The Spartans arrived after the battle was over. They looked at the battlefield and praised the Athenians.

Goes deeper in. Geography, Grade 5 and the high-school course “Geography and History” (Greece and the Aegean); the Composition series uses Marathon as a model narrative.

For families. Casualty figures are Herodotus’s (6,400 Persians, 192 Athenians). The stop separates Herodotus’s account (the run to Sparta) from the later legend of the run to Athens; the picture study shows the legend and says so.

PRACTICE

1. **MEDIUM Choose your move.** You are Miltiades. Your army is smaller than the Persian army, but your line must be as long as theirs so they cannot get around you. Will you (a) make every part of the line equally thin, (b) make the center thin and the wings strong, or (c) make the center strong and the wings thin?
2. **EASY** Who won the Battle of Marathon?
3. **MEDIUM** Where did Pheidippides run, according to Herodotus?

Make it a game · Strong Wings. Play tug-of-war with three ropes or scarves: left wing, center and right wing. Put more players on the two wings. Which side wins more “wings”?

Scripture. “When thou goest out to battle against thine enemies, and seest horses, and chariots, and a people more than thou, be not afraid of them: for the LORD thy God is with thee, which brought thee up out of the land of Egypt.” (Deuteronomy 20:1, KJV)

These words were spoken to Israel, not to Athens. But they remind us that a smaller side need not be afraid when God is with it.

Practice: answers

1. Miltiades chose (b): a thin center and strong wings. The wings won and turned inward to trap the Persian center.
2. The Athenians (with the Plataeans).
3. To Sparta, about 150 miles in two days, to ask for help before the battle.

3.2 THERMOPYLAE (480 B.C.)

OBJECTIVES

- Find the pass of Thermopylae on a map and explain why a narrow place helps a small army.
- Tell the story of Leonidas and the 300 Spartans and their allies.
- Explain how a brave defeat can still help win a war.

Warm-up. Stand in a doorway with your arms out. Could ten people get past you at once? Only one or two at a time can come through a narrow place. That is the secret of Thermopylae.

Video slot. Video coming. Thermopylae for young viewers: the narrow pass, the hidden path, the courage of the defenders (no gore). Search approved history channels (Simple History, Kings and Generals, The History Guy); preview first.

KEY TERMS

pass

A narrow way through mountains.

Sparta

A Greek city famous for its brave, well-trained soldiers.

ally

A friend who fights on your side.

Xerxes

The King of Persia, son of Darius (say “ZERK-seez”).

CORE IDEAS

The map. Ten years after Marathon, in 480 B.C., the new Persian king, Xerxes, came to conquer Greece with one of the biggest armies the world had ever seen. To march south into Greece, his army had to pass through a narrow strip of land between steep mountains and the sea. It was called Thermopylae, “the Hot Gates,” because of the hot springs there. In the narrowest place, there was hardly room for more than a few wagons side by side.

The people. Leonidas, one of the two kings of Sparta, marched north to hold the pass. With him were 300 Spartans and several thousand soldiers from other Greek cities, their **allies**. Xerxes sent a message telling them to give up their weapons. The Greek writer Plutarch says Leonidas sent back two words: “Come and take them.” When a man said the Persian arrows were so many they would hide the sun, a Spartan named Dieneces answered, “Then we shall fight in the shade.”

The plan. In the narrow pass, the huge Persian army could not use its numbers. Only a few men could fight at a time, and the Greeks, with their big shields and long spears, held their wall. For two days the Persians attacked, and for two days the Greeks held the pass.

What happened. Then a Greek man named Ephialtes, hoping for a reward, told Xerxes about a hidden mountain path that led around behind the pass. When Leonidas learned the Persians were coming around behind him, he sent most of the allies away to save them. He stayed with his 300 Spartans, about 700 men of Thespieae, who chose to stay, and some Thebans. They fought to the end. Leonidas and nearly all of the men who stayed with him were killed.

Why it mattered. Thermopylae was a defeat, but it was not wasted. The stand gave the rest of Greece time to get ready, and it showed that the Persians could be resisted. Later the Greeks put up a stone with words by the poet Simonides, often put into English as: “Go tell the Spartans, stranger passing by, that here, obedient to their laws, we lie.”

PICTURE STUDY



Plan of the Pass of Thermopylae, Jean-Denis Barbié du Bocage (engraved for an English edition), 1788 (first French edition) · Engraved map · Made for the book *Travels of Anacharsis the Younger in Greece*
Wikimedia Commons · Public domain

Jean-Denis Barbié du Bocage was a French mapmaker who drew maps of ancient Greece for a famous book. A good map can tell the story of a battle. On this map, find the mountains, the sea and the narrow pass between them. Then find the mountain path that led around behind the Greeks.

Look closely

- Find the sea. Find the mountains.

- Find the narrowest place in the pass. Why was it a good place to defend?
- Find the hidden path. Where does it come out?

Talk about it

1. Why could a few thousand Greeks hold back a huge army in this place?
2. What would you have done if you had been Leonidas when you learned about the path?

HANDS-ON: THE HOT GATES IN A BOX

Build the pass of Thermopylae and see why a narrow place helps a small army.

You will need

- A shoebox lid or a baking pan
- Clay or crumpled paper for mountains
- Blue paper for the sea
- Two colors of blocks or toy soldiers

Steps

1. Put the sea along one side of the pan and the mountains along the other, leaving a narrow pass between them.
2. Set a few Greek blocks across the narrowest part of the pass.
3. Line up many Persian blocks outside the pass. Try to push them through. How many can reach the Greeks at once?
4. Now make a little path over the mountains behind the Greeks. What happens when the Persians use it?

Check your work

- My pass is narrow between mountains and sea.
- I showed why only a few attackers could fight at once.
- I showed the hidden path.

FIELD NOTEBOOK

1. **Terrain map.** Draw the pass: sea, mountains, the narrow way and the hidden path. Mark where Leonidas stood.
2. Write the words of Simonides: "Go tell the Spartans, stranger passing by, that here, obedient to their laws, we lie."

Did you know? The sea has moved back since 480 B.C., so today the pass of Thermopylae is a wide plain, not a narrow strip. Spartan soldiers carried a heavy round shield called a hoplon; the soldiers were called hoplites. A bronze statue of Leonidas stands at Thermopylae today.

Goes deeper in. Geography, high-school “Geography and History” (Greece and the Aegean) (coming soon).

For families. The outline’s picture for this stop, Jacques-Louis David’s *Leonidas at Thermopylae* (1814), contains classical nudity, so the Scout level uses its listed alternate, a map of the pass. Quotations (“Come and take them,” “fight in the shade,” the Simonides epitaph) are as reported by Plutarch and Herodotus; the epitaph is a common English rendering.

PRACTICE

1. **MEDIUM Choose your move.** You are Leonidas. You learn that the Persians have found a path around behind you, and by morning you will be surrounded. Will you (a) march everyone away, (b) keep everyone and fight, or (c) send most of the army away to fight another day, and stay with a few to hold the pass a little longer?
2. **EASY** Why was the narrow pass a good place for a small army to fight?
3. **MEDIUM** Thermopylae was a defeat. How did it still help Greece?

Make it a game • Hold the Gate. Make a “pass” with two chairs. One or two defenders hold pool noodles across the gap. Attackers try to sneak through without being tagged. Count how long the defenders hold.

Scripture. “Greater love hath no man than this, that a man lay down his life for his friends.” (John 15:13, KJV)

Leonidas stayed so that his friends could get away. Jesus showed the greatest love of all when He laid down His life for us.

Practice: answers

1. Leonidas chose (c). He sent most of the allies away and stayed with the 300 Spartans, the Thespians and some Thebans to hold the pass and protect the others’ retreat.
2. The huge Persian army could not use its numbers; only a few men could fight at a time.
3. It gave the rest of Greece time to get ready and showed the Persians could be resisted.

3.3 SALAMIS (480 B.C.)

OBJECTIVES

- Find the island of Salamis and the narrow strait beside it on a map.
- Explain how Themistocles tricked the Persian fleet into the strait.
- Describe a trireme and how it fought.

Warm-up. Fill a bathtub or a pan with water and float some bottle caps. Push them all at once into a narrow corner. What happens? They bump and crowd each other. That is what happened to the Persian ships at Salamis.

Video slot. Video coming. The Battle of Salamis: triremes and the narrow strait. Search approved history channels (Kings and Generals, Simple History, The History Guy); preview first.

KEY TERMS

fleet

A group of warships.

trireme

A Greek warship rowed by about 170 men sitting in three rows on each side, with a bronze ram on its front (say “TRY-reem”).

ram

A heavy, pointed bronze beak on the front of a ship, used to smash holes in enemy ships.

strait

A narrow strip of sea between two pieces of land.

CORE IDEAS

The map. After Thermopylae, the Persian army marched south and captured Athens. The people of Athens had already left their city and crossed the water to the island of Salamis and to other safe places. Between Salamis and the mainland was a narrow **strait**, only about a mile wide in places. The Greek **fleet** waited there.

The people. The leader of the Athenians at sea was Themistocles. Years before, he had persuaded Athens to build a great fleet of warships called **triremes**. Each trireme was rowed by about 170 men in three rows on each side. On its front was a heavy bronze **ram**. A trireme fought by rowing hard and smashing its ram into the side of an enemy ship.

The plan. The Persian fleet was much bigger. In the open sea it could surround the Greeks. But in the narrow strait, its ships would get in each other’s way. So Themistocles played a trick. He sent a trusted servant, Sicinnus, secretly to King Xerxes with a message: the Greeks are about to run away; attack now and you will catch them! Xerxes believed it. That

night he sent his ships to block the ends of the strait, and in the morning they rowed in to attack.

What happened. Xerxes sat on a throne on a hillside above the shore to watch his great victory. But in the narrow water, the Persian ships crowded together and could not turn. The Greek triremes rowed out and rammed them. Ship after ship was sunk or broken, and many Persian sailors drowned. By evening the Persian fleet was beaten.

Why it mattered. Without his fleet, Xerxes could not keep his huge army supplied. He went home to Persia, leaving part of his army behind, and the next year the Greeks defeated that army at Plataea. Salamis saved Greece. Many people say that without it, the ideas and books of ancient Athens might never have reached us.

PICTURE STUDY



The Battle of Salamis, Wilhelm von Kaulbach, 1868 · Oil painting · Maximilianeum, Munich
Wikimedia Commons · Public domain

Wilhelm von Kaulbach was a German painter who made huge history paintings for the King of Bavaria. In this painting he shows the Greeks winning at Salamis, with King Xerxes watching from his throne on the shore.

Look closely

- Find Xerxes on his throne. Where is he?
- Find the ships. Which side seems to be winning?
- Look at the sky. How did Kaulbach make the scene feel exciting?

Talk about it

1. How do you think Xerxes felt as he watched?

2. Kaulbach painted this more than 2,300 years after the battle. How could he know what it looked like?

HANDS-ON: PAPER FLEET AT SALAMIS

Fold a paper fleet and fight the battle in a pan of water or on a blue sheet.

You will need

- Paper (two colors)
- A baking pan of water, or a blue sheet on the floor
- Two books for the island and the mainland

Steps

1. Fold about 8 paper boats of one color (Greeks) and 16 of another (Persians).
2. Make a narrow strait between two books (Salamis and the mainland).
3. Put the Greek fleet inside the strait. Bring the Persian fleet in from the ends.
4. Try to move the Persian boats in the narrow water without bumping. What happens? Let the Greeks “ram” the crowded boats.

Tips

- If you use real water, put towels down first.

Check your work

- I made a narrow strait.
- I showed why the big fleet was crowded.

FIELD NOTEBOOK

1. **Terrain map.** Draw the island of Salamis, the mainland, the narrow strait and the hill where Xerxes watched.
2. Draw a trireme from the side, with three rows of oars and the ram at the front.

Did you know? Before the war, the priestess at Delphi told the Athenians to trust in their “wooden wall.” Themistocles said the wooden wall meant their wooden ships. Athens paid for its fleet with silver from new mines at Laurium. The men who rowed the Athenian triremes were free citizens, many of them poor men, and they were proud of their part in the victory.

Goes deeper in. Geography, Grade 8 (straits and ports) (coming soon).

For families. The trick of Sicinnus is told by Herodotus (Book 8). Herodotus also gives large numbers for the Persian fleet; modern historians think they were smaller, but agree that the Persians had more ships.

PRACTICE

1. **MEDIUM Choose your move.** You are Themistocles. The Persian fleet is much bigger than yours. Will you (a) sail out to fight them in the open sea, (b) wait in the narrow strait and get them to come in to you, or (c) sail far away?
2. **EASY** What was a trireme's main weapon?
3. **MEDIUM** How did Themistocles get the Persians to attack in the strait?

Make it a game • Ramming Speed. Two teams sit in rows like rowers. A caller beats a drum or claps. Rowers “row” with their arms in time. The team that stays together longest without missing a beat wins.

Scripture. “For by wise counsel thou shalt make thy war: and in multitude of counsellors there is safety.” (Proverbs 24:6, KJV)

Themistocles won by a wise plan, not by having more ships. Wisdom is worth more than numbers.

Practice: answers

1. Themistocles chose (b). He tricked Xerxes into attacking in the narrow strait, where the big Persian fleet was crowded and could not use its numbers.
2. Its bronze ram, used to smash enemy ships.
3. He sent his servant Sicinnus to tell Xerxes the Greeks were about to run away, so Xerxes attacked at once.

3.4 GAUGAMELA (331 B.C.)

OBJECTIVES

- Find Gaugamela on a map, in what is now northern Iraq.
- Explain Alexander's slanting move that opened a gap in the Persian line.
- Tell how Alexander's army handled the scythed chariots.

Warm-up. Have a friend hold a long rope stretched tight between two hands. Walk sideways along it. The friend has to stretch to keep up. What happens to the rope in the middle? It can sag or tear. Alexander used that idea.

Video slot. Video coming. Alexander the Great at Gaugamela: the oblique advance and the Companion cavalry. Search approved history channels (Kings and Generals, Simple History); preview first.

KEY TERMS

Macedonia

A kingdom north of Greece, Alexander's home.

cavalry

Soldiers who fight on horseback.

chariot

A two-wheeled cart pulled by horses, used in battle.

gap

An open space or hole in a line.

CORE IDEAS

The people. About 150 years after Marathon, a young king named Alexander came to the throne of Macedonia, north of Greece. He was only twenty years old. He crossed into Asia to fight the Persian Empire, now ruled by King Darius III. Alexander rode a great black horse named Bucephalus, which he had tamed as a boy when no one else could.

The map. In the year 331 B.C., Darius gathered a huge army on a wide, flat plain near a village called Gaugamela, in what is now northern Iraq. He had his men smooth the ground flat so that his **chariots** could charge. These chariots had long, sharp blades fixed to their wheels. Alexander's army was much smaller.

The plan. Alexander did not charge straight ahead. He led his army forward at a slant, moving to his right, toward the edge of the smoothed ground. Darius sent soldiers sideways to keep up with him. As the Persian line stretched to follow, a **gap** began to open in it. Alexander was watching for exactly that.

What happened. When the scythed chariots charged, Alexander's foot soldiers simply stepped aside and opened lanes, and many of the chariots rolled harmlessly through, while others were stopped by soldiers with javelins. Then Alexander himself, leading his best horsemen, the Companion **cavalry**, formed a wedge and drove straight into the gap, toward King Darius. Darius turned and fled from the battlefield, and his great army broke apart.

Why it mattered. After Gaugamela, the Persian Empire fell to Alexander. He went on to rule lands from Greece to Egypt to India. The Greek language and Greek ideas spread across the whole eastern world. Three hundred years later, the New Testament would be written in Greek, so the good news of Jesus could be read by people in many lands.

PICTURE STUDY



The Alexander Mosaic, Unknown Roman artist, probably copying an earlier Greek painting, c. 100 B.C. · Floor mosaic of small stones · National Archaeological Museum, Naples (found in the House of the Faun, Pompeii)

Wikimedia Commons · CC BY-SA 2.0

This picture is made of more than a million tiny colored stones. It was found in 1831 on the floor of a house in Pompeii, the Roman town buried by a volcano in A.D. 79. It shows Alexander charging toward Darius. It has long been called a picture of the battle of Issus (333 B.C.), and most historians still think so, though some argue it shows Gaugamela. Either way, it shows the moment both battles were famous for: Darius turning to flee.

Look closely

- Find Alexander, without a helmet, on the left. Where is he looking?
- Find Darius in his chariot. What is his face like?
- Look at the long spears in the background. What do they tell you about the battle?

Talk about it

1. How did the artist show that Alexander is brave and Darius is afraid?
2. Why do you think someone wanted this picture on the floor of his house?

HANDS-ON: THE SLANTING LINE

Show Alexander's slanting move on a tabletop and watch a gap open.

You will need

- About 20 blocks or toy soldiers in one color (Persians)
- About 12 in another color (Macedonians)
- One special piece for Alexander, and one for Darius

Steps

1. Set the Persians in a long line, with Darius in the middle. Set the Macedonians in a shorter line facing them, with Alexander on the right end.
2. Move the Macedonian line forward and to the right, a little at a time.
3. Each time, move the Persian left end sideways to follow. Leave the Persian center where it is.
4. When a gap opens between the Persians who moved and the Persian center, drive Alexander's piece through it toward Darius.

Check your work

- I moved my line at a slant.
- I showed how a gap opened in the Persian line.
- I showed Alexander's charge through the gap.

FIELD NOTEBOOK

1. **Terrain map.** Draw the flat plain of Gaugamela with the smoothed ground for chariots. Mark the Persian line, the Macedonian line, the gap and Alexander's charge.
2. Draw Bucephalus, Alexander's horse.

Did you know? Alexander studied as a boy under the great Greek thinker Aristotle. Alexander named a city after his horse Bucephalus, and more than one after himself; the most famous is Alexandria in Egypt. The prophet Daniel foretold a swift king from the west who would defeat the Persians (Daniel 8). Many Christians have read this as a picture of Alexander.

Goes deeper in. Geography, high-school "Geography and History" (the Middle East and the empires) (coming soon).

For families. Exact army sizes at Gaugamela are uncertain; ancient writers give very large Persian numbers. The stop says only that Alexander's army was much smaller. The mosaic is traditionally identified as Issus, and most scholars favor that; a minority argue for Gaugamela. The stop says so.

PRACTICE

1. **MEDIUM Choose your move.** You are Alexander. The enemy has many more men and has smoothed the ground for chariots. Will you (a) charge straight into the middle, (b) move your army at a slant and wait for a gap to open, or (c) stay still and wait for them to attack?
2. **EASY** What did Alexander's soldiers do when the scythed chariots charged?
3. **MEDIUM** Why did Gaugamela matter for the spread of the gospel later?

Make it a game • Find the Gap. Players link arms in a line. A runner calls out moves ("Step left! Step left!"). When a gap opens in the line, the runner dashes through. Then trade places.

Scripture. "Some trust in chariots, and some in horses: but we will remember the name of the LORD our God." (Psalm 20:7, KJV)

Darius trusted in his chariots, but they did not save him. Our trust should be in God, not in weapons or numbers.

Practice: answers

1. Alexander chose (b). His slanting advance made the Persian line stretch and open a gap; then he charged through it toward Darius.
2. They stepped aside and opened lanes, so many chariots rolled harmlessly through.
3. Alexander's victory spread the Greek language across the East, and the New Testament was later written in Greek, which many peoples could read.

3.5 CANNAE (216 B.C.)

OBJECTIVES

- Find Cannae in southern Italy on a map.
- Explain Hannibal's double envelopment.
- Tell how Rome kept going after a terrible defeat.

Warm-up. Hold your two hands open in front of you, palms facing each other, and slowly close them around a ball. You have just made a “double envelopment,” the trap Hannibal set at Cannae.

Video slot. Video coming. Hannibal at Cannae: the double envelopment explained with a map. Search approved history channels (Kings and Generals, Simple History, The History Guy); preview first.

KEY TERMS

Carthage

A great city in North Africa, in what is now Tunisia, and Rome's rival.

legion

A large unit of the Roman army.

double envelopment

A trap in which an army is surrounded on both sides and from behind.

flank

The side of an army.

CORE IDEAS

The people. Hannibal was a general from the city of **Carthage** in North Africa. When he was a boy, his father made him promise to be an enemy of Rome. In 218 B.C., Hannibal did something no one thought possible: he marched an army, with horses and even elephants, over the snowy Alps mountains and down into Italy.

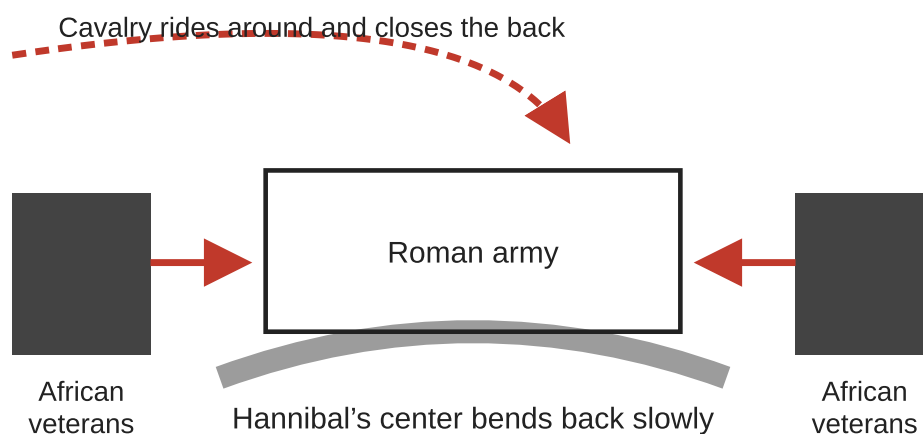
The map. Two years later, in the summer of 216 B.C., near the village of Cannae in southern Italy, Hannibal met the biggest army Rome had ever sent out, about 80,000 men. Hannibal had only about 50,000. The battlefield was a flat plain beside a river.

The plan. Hannibal set a trap. He put his weaker troops in the center of his line, pushed forward in a curve toward the Romans. On the two ends, he put his best soldiers, tough African veterans, and on the far edges, his horsemen. When the Romans attacked, Hannibal's center slowly bent backward, step by step, but did not break. The Romans pushed deeper and deeper into the middle, crowding together.

What happened. Then Hannibal gave the signal. The African veterans on each side turned inward and attacked the Romans' **flanks**. Hannibal's horsemen, who had already driven off the Roman cavalry, rode around and closed in from behind. The Roman army was surrounded on every side, a **double envelopment**. Tens of thousands of Romans died that day, one of the worst defeats in all of Rome's history.

Why it mattered. Many nations would have given up. Rome did not. The Romans refused to make peace. They raised new **legions**, avoided big battles with Hannibal, and kept fighting for years. In the end, as you will see at the next stop, Rome won the war. Cannae is still studied by soldiers today, at West Point and other military academies, as the most famous example of a double envelopment.

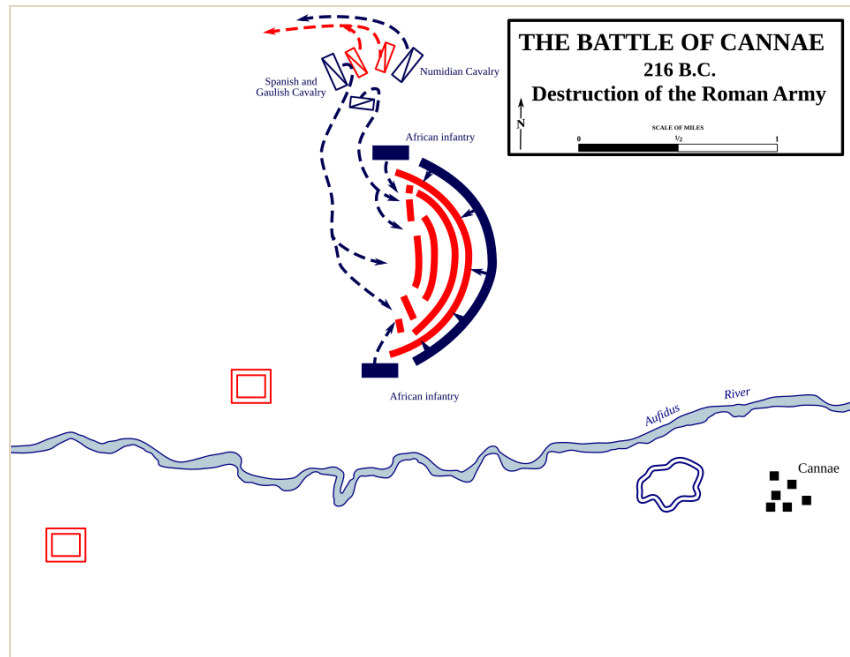
Cannae: the double envelopment



Hannibal's army (filled shapes) surrounds the Romans on every side.

Hannibal's double envelopment at Cannae.

PICTURE STUDY



Battle of Cannae (map), Frank Martini, cartographer, Department of History, United States Military Academy (redrawn for Wikimedia Commons), 20th century · Map · West Point history atlas (public domain) · Wikimedia Commons · Public domain

Soldiers learn battles from maps. This map was made by the history teachers at West Point, the United States Military Academy, to teach young officers about Cannae. Maps made by the United States government are free for everyone to use.

Look closely

- Find the Roman army. What shape is it?
- Find Hannibal's army. Where are his strongest troops?
- Find the river. How did it help Hannibal?

Talk about it

1. Why do you think soldiers still study a battle that happened more than 2,000 years ago?
2. Can you tell the story of the battle just from the map?

HANDS-ON: SAND-TABLE CANNAE

Build Cannae in a sandbox, a pan of sand or rice, or on a blanket, and spring Hannibal's trap.

You will need

- A tray of sand or rice, or a blanket
- A blue ribbon for the river
- About 30 pieces in one color (Romans) and about 20 in another (Hannibal)

Steps

1. Lay the river along one side. Pack the Romans into a deep, crowded block in the middle.
2. Set Hannibal's weaker troops in a curve bulging toward the Romans, with the best troops on both ends and horsemen at the far edges.
3. Push the Romans forward; let Hannibal's curved center bend back without breaking.
4. Turn the best troops inward on both sides, then bring the horsemen around behind the Romans. The trap is closed!

Check your work

- My center bent back but did not break.
- My two ends turned inward.
- My horsemen closed the back.

FIELD NOTEBOOK

1. **Terrain map.** Draw the plain of Cannae and the river. Draw the Roman block, and Hannibal's army curving around it on three sides, with arrows for the horsemen closing the back.
2. Write: "Rome lost at Cannae, but Rome did not give up."

Did you know? Hannibal's elephants crossed the Alps, but most of them died in the cold winter that followed. Few, if any, were left by the time of Cannae. Hannibal lost an eye from an infection while marching through marshes in Italy. Hannibal stayed in Italy for about fifteen years without ever capturing the city of Rome.

Goes deeper in. Geography, high-school "Geography and History," Lesson A3.2 "The Alps" (Hannibal's crossing) (coming soon).

For families. Roman losses at Cannae are given by ancient writers as roughly 50,000 to 70,000; the stop says "tens of thousands" without dwelling on it. Army sizes are approximate.

PRACTICE

1. **MEDIUM Choose your move.** You are Hannibal. The Roman army is bigger and is going to charge straight at your middle. Will you (a) make your middle very strong to stop them, (b) let your middle bend back slowly while your strong ends wait to close in from the sides, or (c) run away?
2. **EASY** What mountains did Hannibal cross to reach Italy?
3. **MEDIUM** What did Rome do after its terrible defeat at Cannae?

Make it a game • Close the Trap. Players make a curved line holding hands. One player walks into the curve. On "Close!", the two ends swing around to surround her. Then trade

places.

Scripture. “The horse is prepared against the day of battle: but safety is of the LORD.”
(Proverbs 21:31, KJV)

Rome had the bigger army but lost at Cannae; armies and plans matter, but in the end safety comes from God.

Practice: answers

1. Hannibal chose (b). His center bent back without breaking; then his best troops closed in from both sides and his cavalry from behind: the double envelopment.
2. The Alps.
3. It refused to make peace, raised new legions and kept fighting, and in the end won the war.

3.6 ZAMA (202 B.C.)

OBJECTIVES

- Find Zama in North Africa, near Carthage, on a map.
- Explain how Scipio opened lanes for Hannibal's elephants.
- Tell how Zama ended the long war between Rome and Carthage.

Warm-up. Stand in two rows with a friend or family, leaving a clear lane between you. Have someone run straight down the lane. Nobody gets knocked over! Scipio used lanes like that against charging elephants.

Video slot. Video coming. The Battle of Zama: Scipio, Hannibal and the elephants. Search approved history channels (Kings and Generals, Simple History); preview first.

KEY TERMS

war elephant

An elephant trained to charge into the enemy in battle.

maniple

A small block of Roman soldiers (say “MAN-ih-pul”).

lane

A clear, narrow path.

Numidia

A kingdom of North Africa famous for its skilled horsemen.

CORE IDEAS

The people. While Hannibal was still in Italy, a young Roman general named Publius Cornelius Scipio had a bold idea. Instead of chasing Hannibal around Italy, he would sail across the sea and attack Carthage itself, in Africa! When he did, Carthage called Hannibal home to defend it. At last, in 202 B.C., near a place called Zama, the two great generals faced each other.

The map. The battle was fought on open ground in North Africa, not far from Carthage, in what is now Tunisia. Scipio had a new friend: Masinissa, a king of **Numidia**, who brought thousands of fast, skilled horsemen to fight on Rome's side.

The plan. Hannibal put about eighty **war elephants** in front of his army. A charge of elephants could smash through a line of soldiers. But Scipio had a clever plan. Instead of making a solid wall, he lined up his small blocks of soldiers, called **maniples**, one behind another, with clear **lanes** running between them from front to back.

What happened. When the elephants charged, the Romans blew their trumpets and shouted. Some elephants were frightened and turned back into Hannibal's own horsemen. Others ran down the open lanes, straight through the Roman army and out the back, without trampling the soldiers. Then the foot soldiers fought a long, hard battle. At the end, the Roman and Numidian horsemen came back and attacked Hannibal's army from behind. Hannibal was defeated at last.

Why it mattered. Zama ended the long war between Rome and Carthage, called the Second Punic War, which had lasted seventeen years. Carthage made peace in 201 B.C. Scipio was given the name "Africanus" for his victory. Rome became the strongest power around the Mediterranean Sea, the same Roman world in which Jesus would be born about two hundred years later.

PICTURE STUDY



The Battle of Zama, Cornelis Cort, after Giulio Romano, 1567 · Engraving · Rijksmuseum, Amsterdam, and other collections
Wikimedia Commons · CC0

Giulio Romano was an Italian painter who worked with the great Raphael. He designed a famous picture of the Battle of Zama for a tapestry, and in 1567 the Dutch engraver Cornelis Cort made this print of it, so that many people could see it.

Look closely

- Find the elephants. What do they carry on their backs?
- Find the soldiers on horseback.
- Is there a calm place anywhere in this picture?

Talk about it

1. The artist lived more than 1,700 years after the battle. Which parts do you think he imagined?
2. How would you show Scipio's lanes in a picture?

HANDS-ON: ELEPHANT LANES

Test Scipio's lanes on a tabletop with a rolling "elephant."

You will need

- A toy car, a ball or a can (the elephant)
- About 20 dominoes or blocks (Roman soldiers)
- A smooth table or floor

Steps

1. First, set the dominoes in a solid wall across the table. Roll the "elephant" into them. How many fall?
2. Now set them up in small blocks of 2 or 3, one behind another, with clear lanes between the columns.
3. Roll the elephant down a lane. How many fall now?
4. Talk about it: why were lanes better than a solid wall against elephants?

Check your work

- I tested a solid wall.
- I tested lanes.
- I can explain why the lanes worked.

FIELD NOTEBOOK

1. **Terrain map.** Draw the open plain of Zama. Draw the Roman blocks with lanes between them, and arrows for the elephants running down the lanes.
2. Write: "Scipio won the name Africanus at Zama."

Did you know? Scipio had studied Hannibal's battles carefully. In a way, Hannibal was his teacher. After the war, Hannibal became a leader in Carthage and worked to help his city recover. The Roman historian Livy tells that Scipio and Hannibal met and talked before the battle, but could not agree on peace.

Goes deeper in. Geography, high-school "Geography and History" (the Mediterranean) (coming soon).

For families. Livy and Polybius describe the elephant lanes and the role of Masinissa's cavalry. The figure of about eighty elephants is from Polybius.

PRACTICE

1. **MEDIUM Choose your move.** You are Scipio. Hannibal has about eighty war elephants ready to charge. Will you (a) make a solid wall of soldiers, (b) leave clear lanes through your army so the elephants run through, or (c) charge the elephants first?
2. **EASY** Which two great generals fought at Zama?
3. **EASY** Which war did Zama end?

Make it a game • Elephant Run. Players stand in columns with lanes between. The “elephant” (on hands and knees, or on a scooter board) charges down a lane. Anyone standing in a lane is out. Practice opening the lanes quickly on the signal!

Scripture. “A time to love, and a time to hate; a time of war, and a time of peace.” (Ecclesiastes 3:8, KJV)

God rules over the times of war and the times of peace. Zama brought a long war to an end.

Practice: answers

1. Scipio chose (b). His soldiers stood in blocks with lanes between them; trumpets and shouting frightened the elephants, and many ran harmlessly down the lanes.
2. Scipio (for Rome) and Hannibal (for Carthage).
3. The Second Punic War between Rome and Carthage.

3.7 ALESIA (52 B.C.)

OBJECTIVES

- Find Alesia in France (ancient Gaul) on a map.
- Explain Julius Caesar's two rings of walls.
- Tell how Vercingetorix surrendered with courage.

Warm-up. Make a circle of blocks around a toy. Now make a second, bigger circle outside the first. Which way does each wall face? You are building like Julius Caesar at Alesia.

Video slot. Video coming. Caesar at Alesia: the two walls (circumvallation and contravallation). Search approved history channels (Kings and Generals, Simple History); preview first.

KEY TERMS

Gaul

The old name for the land that is now France and nearby lands.

siege

Surrounding a town or fort so that no one can get in or out, until it gives up.

fortification

A wall, ditch or tower built to defend a place.

surrender

To give up and stop fighting.

CORE IDEAS

The people. Julius Caesar was a Roman general who spent years conquering the land of **Gaul**, which is now France. In 52 B.C., the tribes of Gaul joined together under a brave young chief named Vercingetorix (say “ver-sin-JET-o-rix”) to fight the Romans. Vercingetorix led his army into a hilltop town called Alesia, with steep sides and rivers around its base.

The plan. Caesar decided not to attack the hill. Instead he would starve the Gauls out with a **siege**. His soldiers dug ditches and built a wall with towers all the way around the hill, about eleven Roman miles around (about ten of our miles). Now no one could get out. But Caesar knew the other tribes of Gaul would send a huge army to help. So his soldiers built a second wall, about fourteen Roman miles around, facing outward. Caesar's army now lived in a ring between two walls!

The map. Picture it: the hill of Alesia in the middle, with Vercingetorix's army on top. Around it, Caesar's inner wall facing in. Then Caesar's army. Then the outer wall facing out. And outside, the great relief army of Gaul, which arrived at last.

What happened. The Gauls attacked from both sides at once, inside and outside. The fighting was fierce, and at the most dangerous moment Caesar himself, in his bright red cloak, rode to the place where his walls were close to breaking and led his men. The Roman line held. The relief army broke apart and went home. Vercingetorix knew there was no hope left.

Why it mattered. Vercingetorix rode out of Alesia on his horse, laid down his weapons at Caesar's feet and **surrendered**, giving himself up so that his people might be spared. Gaul became part of the Roman world. Today the French remember Vercingetorix as a hero, and a great statue of him stands near Alesia. Caesar's own book, *The Gallic War*, tells the story.

PICTURE STUDY



Vercingetorix Throws Down His Arms at the Feet of Julius Caesar, Lionel Royer, 1899 · Oil on canvas · Musée Crozatier, Le Puy-en-Velay, France
Wikimedia Commons · Public domain

Lionel Royer was a French painter. In this painting he shows the end of the siege of Alesia: Vercingetorix, on horseback, throws his weapons down before Caesar. Royer painted Vercingetorix as a proud and noble figure, as the French have long remembered him.

Look closely

- Find Vercingetorix. How does he look: proud, afraid or sad?
- Find Caesar. Where is he sitting?
- Look at the Roman soldiers. What are they holding?

Talk about it

1. Why do you think the painter made the defeated chief look so noble?
2. What does it take to surrender with courage?

HANDS-ON: TWO RINGS OF WALLS

Build Alesia and Caesar's two walls with blocks or clay.

You will need

- A bowl turned upside down, or a mound of clay or sand (the hill)
- Blocks, LEGO bricks or popsicle sticks (the walls)
- Toy soldiers or buttons in three colors

Steps

1. Set the hill in the middle and put the Gauls (one color) on top.
2. Build an inner ring of wall around the hill, with the wall facing in.
3. Place Caesar's Romans (second color) outside the inner ring.
4. Build a bigger outer ring around the Romans, facing out. Put the relief army (third color) outside it.
5. Attack from both sides at once! Which walls hold?

Check your work

- I built two rings of walls.
- I can explain why Caesar needed both.

FIELD NOTEBOOK

1. **Terrain map.** Draw the hill of Alesia with its two rivers, the inner wall, the outer wall and the relief army.
2. Write: "Caesar built two walls: one to keep the Gauls in, and one to keep the relief army out."

Did you know? In the 1860s, the French emperor Napoleon III had archaeologists dig at Alise-Sainte-Reine, in Burgundy, where they found Caesar's ditches. The statue of Vercingetorix he put up there still stands. Caesar's soldiers dug pits with sharp stakes hidden in them in front of the walls. The soldiers had nicknames for them, like "lilies." Caesar wrote about himself in the third person, calling himself "Caesar" instead of "I."

Goes deeper in. Geography, high-school "Geography and History," Lesson A2.1 "The Rhine" (Rome's frontier) (coming soon).

For families. Distances for the walls are Caesar's own (*Gallic War*, Book 7: eleven and fourteen Roman miles). Caesar also gives a very large number for the Gallic relief army, which many historians think is exaggerated; the stop does not repeat it.

PRACTICE

1. **MEDIUM Choose your move.** You are Caesar. You have trapped the Gauls on a hill, but you hear a great army is coming to help them. Will you (a) leave before it arrives, (b) attack the hill at once, or (c) build a second wall facing outward, so you can defend in both directions?
2. **EASY** Who led the Gauls at Alesia?
3. **MEDIUM** Why did Caesar need two walls?

Make it a game · Inside and Outside. Two circles of players: an inner ring facing in and an outer ring facing out. Runners inside and outside try to slip through. The rings must hold hands and stay strong.

Scripture. “Thou therefore endure hardness, as a good soldier of Jesus Christ.” (2 Timothy 2:3, KJV)

Caesar’s soldiers worked and fought for weeks without rest. Paul tells Christians to be faithful and hard-working like good soldiers, serving Christ.

Practice: answers

1. Caesar chose (c). He built a second, outer wall and held both walls when the Gauls attacked from inside and outside.
2. Vercingetorix.
3. The inner wall kept Vercingetorix’s army in; the outer wall kept the relief army out.

3.8 JERICHO AND GIDEON

OBJECTIVES

- Retell how God gave Israel the city of Jericho (Joshua 6).
- Retell how Gideon's 300 men won with trumpets, pitchers and lamps (Judges 7).
- Explain why God chose such unlikely ways to win.

Warm-up. Count out 32,000 in your head: that is about how many people fill a big stadium. Now picture only 300 people, about enough to fill a few classrooms. Which army would you rather have? Today we learn why God chose the smaller one.

Video slot. Video coming. Bible battles for children: Jericho and Gideon. Use a trusted Bible-story source that follows the KJV text; preview first.

KEY TERMS

Canaan

The land God promised to Abraham and his children, later called Israel.

ram's horn

A trumpet made from the horn of a ram. The priests blew them at Jericho.

Midianites

A people who raided Israel in Gideon's day, stealing the crops.

pitcher

A clay jar for carrying water.

CORE IDEAS

Jericho: the people. After forty years in the wilderness, the people of Israel crossed the Jordan River into **Canaan** under their new leader, Joshua. The first city in their way was Jericho, with strong walls. The Bible says Jericho "was straitly shut up," and none went out and none came in (Joshua 6:1).

Jericho: God's plan. God gave Joshua a plan no general would ever invent. The army would march around the city once a day for six days, with seven priests blowing trumpets of **rams' horns** and carrying the ark of the covenant. On the seventh day they would march around seven times. Then the priests would blow a long blast, all the people would shout, and the wall would fall down flat.

Jericho: what happened. Israel obeyed, exactly as God said. On the seventh day, "the people shouted with a great shout, that the wall fell down flat" (Joshua 6:20). Rahab, who had hidden Israel's spies, was saved with her family because she trusted the God of Israel.

Gideon: the people. Years later, the **Midianites** came every harvest like a swarm of grasshoppers and took Israel's food. God called a farmer named Gideon to save Israel. Gideon gathered 32,000 men. But God said the army was too big, so that Israel would not boast, "Mine own hand hath saved me" (Judges 7:2).

Gideon: God's plan. God told Gideon to send home everyone who was afraid, and 22,000 went home, leaving 10,000. Then God tested them at the water, and only 300 men were chosen. Gideon gave each man a trumpet, and an empty **pitcher** with a lamp burning inside it.

Gideon: what happened. In the middle of the night, the 300 surrounded the Midianite camp. At Gideon's signal they blew the trumpets, broke the pitchers so the lamps blazed out, and cried, "The sword of the LORD, and of Gideon" (Judges 7:20). The Midianites woke in a panic and fled.

Why it mattered. In both battles, God won the victory by means that looked foolish to men: marching and shouting, trumpets and clay jars. He did it so that everyone would know the victory was His. The bravest thing Joshua and Gideon did was to trust and obey God.

PICTURE STUDY



The Seven Trumpets of Jericho, James Tissot, c. 1896–1902 · Gouache on board · The Jewish Museum, New York

Wikimedia Commons · Public domain

James Tissot was a French painter who traveled to the Holy Land to study its people and places. He then spent years painting hundreds of pictures of Bible stories, trying to show them as they might really have looked.

Look closely

- Find the priests. What are they carrying?
- Find the walls of Jericho.

- What sounds would you hear if you were there?

Talk about it

1. Why do you think the people obeyed such a strange plan?
2. Would you have marched around the walls?

HANDS-ON: GIDEON'S LAMPS

Make a Gideon pitcher and lamp, and act out the night battle (with no real fire).

You will need

- A paper cup or small paper bag (the pitcher)
- A small flashlight or battery tea light
- A paper-towel tube (the trumpet)

Steps

1. Turn the flashlight on and cover it with the cup so the light is hidden.
2. In a dark room, family members stand in a circle around a pretend camp.
3. On the signal, “blow” the trumpets, lift the cups away and shout, “The sword of the LORD, and of Gideon!”
4. Talk about it: how would the sudden lights and noise seem to the sleeping camp?

Tips

- Use only battery lights, never candles.

Check your work

- I made a pitcher and lamp.
- I can tell how 300 men won.
- I know who won the victory: God.

FIELD NOTEBOOK

1. **Terrain map.** Draw Jericho with its walls and the path Israel marched seven times. On another half-page, draw Gideon’s 300 around the Midianite camp, each with a trumpet and a lamp.
2. Copy Joshua 1:9.

Did you know? Seven appears again and again at Jericho: seven priests, seven trumpets, seven days, and seven times around on the seventh day. Gideon was hiding while threshing wheat in a winepress when the angel of the LORD called him “thou mighty man of valour” (Judges 6:11–12). Gideon asked God for signs with a fleece of wool, once wet and once dry (Judges 6:36–40).

Goes deeper in. Bible reading: Joshua 2 and 6; Judges 6–7.

For families. This stop takes the biblical accounts as true history and quotes the KJV. Read Joshua 6 and Judges 7 aloud together before or after the stop.

PRACTICE

1. **MEDIUM Choose your move.** You are Gideon. God says your army of 32,000 is too big. Will you (a) argue with God, (b) obey and send men home, even if only 300 are left, or (c) quietly keep everyone?
2. **EASY** How many times did Israel march around Jericho on the seventh day?
3. **EASY** What three things did each of Gideon’s men carry?

Make it a game · Walls of Jericho. Build a tall wall of cardboard boxes or pillows. March around it seven times, quietly. On the seventh lap, blow pretend trumpets, shout together and gently push the wall down.

Scripture. “Have not I commanded thee? Be strong and of a good courage; be not afraid, neither be thou dismayed: for the LORD thy God is with thee whithersoever thou goest.” (Joshua 1:9, KJV)

God spoke these words to Joshua before Jericho. Real courage comes from knowing God is with us.

Practice: answers

1. Gideon chose (b). He obeyed God, and 300 men won so that all would know the victory was God’s.
2. Seven times.
3. A trumpet, a pitcher and a lamp inside the pitcher.

TRACK 3 BADGE QUIZZES

The badge quizzes are optional. Read each question aloud; the child may answer by talking, pointing or drawing. Four right out of five earns the first badge; three right out of four earns the second. Badges and the certificate are earned by doing the stops, not by scores.

Badge quiz 1 (Stops A1–A5)

1. Where did the runner Pheidippides run to ask for help before Marathon?
2. How many Spartans stayed with King Leonidas at Thermopylae?
3. Where did the Greeks fight the Persian ships at Salamis?
4. Which king won at Gaugamela?
5. What shape did Hannibal's army make at Cannae?

Badge quiz 2 (Stops A6–A8)

6. How did Scipio deal with the elephants at Zama?
7. Why did Caesar build two walls at Alesia?
8. What did Gideon's men shout?
9. Who won the victories at Jericho and with Gideon?

TRAIL CERTIFICATE: MY BATTLE MAP BOOK AND TRAIL A CERTIFICATE

Gather the terrain maps from this trail into one booklet: "My Battle Map Book," with your name and dates. Add a timeline page with all eight battles in order.

Pick one leader from the trail and write or tell one sentence about a virtue they showed (courage, loyalty, wisdom, faith).

When the booklet is done, a parent signs the Trail A certificate.

- **Eight maps:** A labeled terrain map for each battle, with a title and a date.
- **Timeline:** The battles are placed in the right order.
- **Virtue:** One leader's virtue is named and explained.
- **Care:** Maps are neat and labeled.

Answer key

1. To Sparta (about 150 miles in two days, says Herodotus).
2. Three hundred.
3. In a narrow strait between the island of Salamis and the mainland.
4. Alexander the Great.
5. A curve that closed around the Romans like a trap (pincers).
6. He left lanes so they ran through his army.
7. One kept the Gauls in; one kept the relief army out.
8. "The sword of the LORD, and of Gideon."
9. God.