

GRADE 4 PHYSICAL EDUCATION & HEALTH

First edition

5 units

10 lessons • one quarter

A video for every lesson

FIRST EDITION

COURSE GUIDE

This short course follows five strands of health and fitness through one quarter of the school year: keeping active, water, food, strength and the heart and lungs. Each lesson is built around a real person or moment: Spyridon Louis, a water carrier, winning the first Olympic marathon at Athens in 1896; President John F. Kennedy's 1960 warning about "the soft American"; a scientist's simple urine color chart; pioneers planning water along the Oregon Trail; William Prout sorting foods into three groups in 1827; the Nutrition Facts label that appeared on packages in 1994; astronauts who must exercise every day in space; two teachers at the University of Leeds who invented circuit training; Paavo Nurmi and his stopwatch; and Sir John Floyer, the doctor who first counted pulses with a watch.

Every lesson follows the same path. First comes **the story**. Then **how they figured it out**: the question people faced, what they tried and what they measured. Then **how your body works**, explained for a fourth grader: muscles, bones, sweat, kidneys, food, heart and lungs. Last, **try it**: the student does a real workout, keeps a water or food log, reads labels, runs a paced lap or counts heartbeats, writes it down in a fitness journal, and tries to do a little better the second time.

God made the body good and gave it to us to care for. This course is about stewardship, strength, joy in movement and good habits. It is never about size or looks: students are measured only against their own effort and improvement. The old Latin saying *Fabricando fit faber*, "by making, one becomes a maker," fits fitness too: strength and endurance are built by practice, a little at a time. The quarter ends with a family fitness day, when the whole household moves, plays and eats together.

Most videos come from trusted teaching and health sources: Texas Children's Hospital, NASA, the Canadian Space Agency, SciShow Kids, the Olympics' official channel, Twinkl and Smithsonian Channel, with a few smaller channels chosen lesson by lesson (a history

podcast, a children's P.E. coach, a dietitian's teaching channel). Every video was previewed for accuracy and for modest dress. A few are short or made for a slightly older audience; the lesson notes say so. Some channels end with an invitation to subscribe or to visit their website; you can stop the video when the teaching ends. Watch together, and move along with any follow-along workout.

Start with Lesson 1.1 →

WHO IT IS FOR

Written for students in grade 4 (about ages 9–10) who read on their own, can tell time on a clock or timer, add and subtract, divide by 4, and make a simple bar graph with help. A parent or teacher reads along, supervises every activity and helps in the kitchen. Nothing needs to be bought: every activity uses household things such as a towel, a sturdy chair, a wall, the bottom stair, measuring cups, food packages and a timer.

HOW TO USE THIS COURSE

- 1. The weekly rhythm.** The quarter has 10 lessons, one a week, each with three sessions of 30–40 minutes. Session 1 is the warm-up, the video, the teaching and the picture study, with a little movement. Session 2 is the activity (the workout, the game, the water plan or the kitchen task) and the fitness journal. Session 3 repeats the activity and tries to improve on it. In the second week of each unit, use part of Session 3 for the unit review and the unit challenge. On the other days, aim for at least 60 minutes of active play, chores, sport and walking.
- 2. Check with your doctor first.** A parent should know about and supervise every activity. If your child has asthma, a heart condition, diabetes, a recent injury or any other health concern, check with your doctor before starting, and follow the doctor's advice about what to change.
- 3. Story, then science, then doing.** The core ideas are written to be read aloud together or read by the student. The paragraphs marked *The story* and *How they figured it out* tell what happened; *How your body works* explains the science; *Try it* explains the activity. After each paragraph, ask the student to tell it back in his or her own words.
- 4. Picture study.** Each lesson has one public-domain painting or historic photograph chosen for what it shows about play, work, food, water or rest. Look at it quietly

for two minutes, put it away and tell everything you remember, then look again and work through the “look for” items and questions.

5. **The fitness journal.** Use any notebook for the whole quarter. Every activity is done, recorded and done again: reps, seconds, minutes, cups of water, urine colors, grams on a label, heartbeats. Date every page. Write how it felt and what you will try next time. Honest records matter more than big numbers.
6. **Health, not looks.** In this course we talk about what bodies can do and how to care for them, never about size or shape. We do not weigh children, count food energy or call foods bad. Foods are “everyday foods” and “sometimes foods,” and feasts and treats are good gifts in their place. Grades come from effort, steady practice and personal improvement, never from comparing one child with another.
7. **Optional books and gear.** Some units list a free children’s-hospital, NASA or government web page, or simple gear such as a jump rope or a water bottle with ounce marks. They are never required.
8. **Unit review and unit challenge.** Each unit ends with a short review (30 points) and a unit challenge: a week-long activity log, a hike with a water plan, a three-day breakfast plan, a two-week circuit challenge, or a heart-rate chart and family fitness day. Keep the challenge pages in a folder.
9. **Safety.** Read the safety note before each activity. Warm up first and cool down after. Clear a space with a flat, non-slip floor and wear good shoes. Outdoors, stay with an adult, away from traffic, with water, shade and sun protection. Stop and tell an adult right away at chest pain, dizziness, fainting, trouble breathing or sharp pain; tired muscles are normal, but joint pain is not. Strength work in this course uses body weight only. A parent supervises knives and the stove, and checks for food allergies before any tasting. Exercise and food are never used as a reward or a punishment.
10. **The family fitness day.** In the last week, the student plans and leads a family fitness day: a warm-up, stations from every unit, a water table, a healthy snack the student helps make, a family walk-run and a cool-down. Everyone moves at his or her own pace.

SCOPE AND SEQUENCE

UNIT 1 • WEEKS 1–2

Keeping Active

Why God made bodies to move and how much activity children need, through Spyridon Louis and the 1896 Athens Olympics, with a backyard Olympic day and an activity log; and President Kennedy’s call to fitness, with a home fitness check scored only against yourself.

- 1.1 The Olympic Games Return
- 1.2 The Presidential Fitness Challenge

UNIT 3 • WEEKS 5–6

Nutrition

William Prout’s three groups of food (carbohydrates, proteins and fats) and what each does, with a three-fuel snack; and reading a Nutrition Facts label, with a label lab that measures serving sizes and added sugars.

- 3.1 Carbohydrates, Protein and Fats
- 3.2 Reading a Nutrition Facts Label

UNIT 5 • WEEKS 9–10

Aerobic Training

Paavo Nurmi’s stopwatch, the heart and lungs and even pacing, with a paced lap test; and Sir John Floyer’s pulse watch, heart rate before and after exercise, a bar graph and the family fitness day.

- 5.1 Paavo Nurmi and the Stopwatch
- 5.2 Heart Rate Before and After

UNIT 2 • WEEKS 3–4

Hydration

The warning signs of dehydration and the urine color chart, with a three-day water and color log; and how pioneers on the Oregon Trail planned their water, with a family walk and a water plan.

- 2.1 Warning Signs of Dehydration
- 2.2 Water on the Trail

UNIT 4 • WEEKS 7–8

Strength

Why astronauts must exercise in space and how muscles and bones grow stronger with work, rest, food and sleep, with an astronaut training week; and the circuit training invented at the University of Leeds, with a timed bodyweight circuit and a retest.

- 4.1 How Muscles Grow Stronger
- 4.2 A Bodyweight Circuit

WEEKLY PACING CALENDAR

WEEK	PLAN
1	• Session 1: Lesson 1.1 The Olympic Games Return: warm-up, video, teaching and picture study • Session 2: Lesson 1.1 activity and fitness journal • Session 3: Repeat the activity, try to improve, and log it <i>Three short sessions a week is the usual rhythm: one to learn, two to move. Keep moving every day, even on days with no lesson.</i>
2	• Session 1: Lesson 1.2 The Presidential Fitness Challenge: warm-up, video, teaching and picture study • Session 2: Lesson 1.2 activity and fitness journal • Session 3: Repeat the activity, try to improve, and log it • Session 3 (end of unit): Unit 1 review and unit challenge
3	• Session 1: Lesson 2.1 Warning Signs of Dehydration: warm-up, video, teaching and picture study • Session 2: Lesson 2.1 activity and fitness journal • Session 3: Repeat the activity, try to improve, and log it
4	• Session 1: Lesson 2.2 Water on the Trail: warm-up, video, teaching and picture study • Session 2: Lesson 2.2 activity and fitness journal • Session 3: Repeat the activity, try to improve, and log it • Session 3 (end of unit): Unit 2 review and unit challenge
5	• Session 1: Lesson 3.1 Carbohydrates, Protein and Fats: warm-up, video, teaching and picture study • Session 2: Lesson 3.1 activity and fitness journal • Session 3: Repeat the activity, try to improve, and log it
6	• Session 1: Lesson 3.2 Reading a Nutrition Facts Label: warm-up, video, teaching and picture study • Session 2: Lesson 3.2 activity and fitness journal • Session 3: Repeat the activity, try to improve, and log it • Session 3 (end of unit): Unit 3 review and unit challenge
7	• Session 1: Lesson 4.1 How Muscles Grow Stronger: warm-up, video, teaching and picture study

WEEK	PLAN
	• Session 2: Lesson 4.1 activity and fitness journal • Session 3: Repeat the activity, try to improve, and log it
8	• Session 1: Lesson 4.2 A Bodyweight Circuit: warm-up, video, teaching and picture study • Session 2: Lesson 4.2 activity and fitness journal • Session 3: Repeat the activity, try to improve, and log it • Session 3 (end of unit): Unit 4 review and unit challenge
9	• Session 1: Lesson 5.1 Paavo Nurmi and the Stopwatch: warm-up, video, teaching and picture study • Session 2: Lesson 5.1 activity and fitness journal • Session 3: Repeat the activity, try to improve, and log it
10	• Session 1: Lesson 5.2 Heart Rate Before and After: warm-up, video, teaching and picture study • Session 2: Lesson 5.2 activity and fitness journal • Session 3: Repeat the activity, try to improve, and log it • Session 3 (end of unit): Unit 5 review and unit challenge <i>Last week. Hold a family fitness day: the student leads the family through a warm-up, a favorite activity from each unit and a cool-down, serves a healthy snack and water, and shows the fitness journal.</i>

MATERIALS

Fitness journal (any notebook)

One for the quarter: logs, tallies, charts, labels copied out, heart-rate tables, how it felt and what to try next time.

A timer or stopwatch (a phone timer works)

For timed stations, work-and-rest circuits, lap splits and pulse counts.

Good athletic shoes and comfortable, modest clothes for exercise

Every activity lesson.

A towel or mat, a sturdy chair that will not slide, a wall and a bottom stair or sturdy step

For push-ups, planks, step-ups, wall sits and stretches.

A yardstick or tape measure, masking tape and sidewalk chalk (or a few cones, cups or shoes)

For the long jump, the sit-and-reach, the shuttle run and marking a running loop.

A reusable cup or water bottle and a measuring cup

For the water logs and the walk with a water plan in Unit 2.

Yellow, orange and brown colored pencils

For the urine color chart in Lesson 2.1.

Five or more food packages with Nutrition Facts labels, a teaspoon, sugar and a few clear cups

For the label lab in Lesson 3.2.

Everyday foods for a snack plate (fruit, whole-grain bread or crackers, cheese, yogurt, eggs, beans, nuts or nut butter)

For the three-fuel snack in Lesson 3.1. Check for allergies first.

Graph paper and colored pencils

For bar graphs of activity minutes, water, reps, lap times and heart rates.

GRADING

Grades come mostly from the activities and the fitness journal, because fitness is learned by doing, recording and doing again. A student who tries hard, records honestly and improves on his or her own numbers earns full credit, whatever those numbers are.

PART	%
Activities (effort, participation and good form)	40
Fitness journal (dated logs, tables, graphs and reflections)	25
Unit reviews	15
Unit challenges	20

Scale: A 90–100, B 80–89, C 70–79, D 60–69. Below 60: repeat the activity or review with help.

- Fitness marks reward effort, steady practice and improvement against the student's own earlier numbers. They never depend on body size, body

measurements or comparison with other children.

- A journal page earns full marks when it has a date, the numbers with units (reps, seconds, cups, grams, beats per minute), a sentence about how it felt and a sentence about what to try next time.
- Unit reviews may be done aloud for a student who writes slowly; the parent writes down the answers.
- A child who finds sport hard, or who has a health condition that limits some activities, is graded on faithful effort within what the doctor allows. Every body can grow stronger; the goal is faithfulness, not being the best.

A NOTE TO PARENTS

You do not need to be a coach to teach this course. Read the story aloud together, watch the video, and then be the timer, the counter and the cheerleader. Do the workouts alongside your child when you can. Children copy what they see, and a parent doing wall sits in the kitchen teaches more than any speech.

Keep the talk about bodies on what they can do and how to care for them. Praise effort, good form and honest records, not numbers alone. If a sibling or friend is faster or stronger, steer back to the journal: “Did you beat your own number from last week?” Exercise is good for the body, and Scripture says plainly that godliness is better still (1 Timothy 4:8). We move, eat, drink and rest to the glory of God.

Lesson 1.2 tells the history of the old Presidential fitness test. In our home version, every number is compared only with the child’s own earlier number; there are no national charts, badges or rankings. The Oregon Trail video in Lesson 2.2 mentions briefly that some travelers became sick from bad water; the lesson text keeps the focus on how families planned and cared for their water.

UNIT 1

KEEPING ACTIVE

God made your body to move: to run, jump, climb, carry and play. In this unit you will travel to Athens in 1896, when the Olympic Games began again after more than 1,500 years and a water carrier named Spyridon Louis won the first marathon by keeping a steady pace. You will learn how much activity children need each day, hold your own backyard Olympic day, and keep a log of your active minutes for a week.

Then you will learn how a simple test of schoolchildren in the 1950s worried two American presidents, and how President Kennedy called young Americans to be strong and active. You will learn the parts of fitness and do a five-station home fitness check, scored only against yourself, that you will repeat at the end of the quarter.

PREREQUISITES

- Can use a timer and read seconds
- Can add a column of numbers and make a simple bar graph with help
- Has a parent's permission (and the doctor's, if needed) to begin

MASTERY CHECKLIST

- ☐ I can tell the story of the 1896 Olympic Games and Spyridon Louis.
- ☐ I can explain how much activity children need each day and give examples of moderate and vigorous activity.
- ☐ I can tell how the Presidents' fitness programs began.
- ☐ I can name four parts of fitness and show good form in a curl-up and a push-up.
- ☐ I can keep an honest log and compare my numbers only with my own.

OPTIONAL BOOKS AND GEAR FOR THIS UNIT

- **“Train Like an Astronaut” (NASA):** Free. NASA’s fitness challenges for children, with activity sheets for running, jumping, balance and strength. Useful all quarter, especially with Unit 4.
- **A simple step counter or pedometer:** Optional, for counting steps on your log days. A tally of minutes works just as well.
- **A tape measure or yardstick:** For the long jump and the sit-and-reach. Most homes already have one.

Not required. Every activity in this unit works without them. School Launch has no ties to these authors, publishers or companies.

LESSONS IN THIS UNIT

1.1 The Olympic Games Return

3 sessions of 30–40 minutes

1.2 The Presidential Fitness Challenge

3 sessions of 30–40 minutes

UNIT 1 REVIEW

Answer each question in complete sentences. The review is worth 30 points. You may show a movement as part of your answer.

1. **5 pts**

Who was Spyridon Louis, and how did he win the first Olympic marathon in 1896?

2. **4 pts**

How much activity do children ages 6 to 17 need each day? What else should they do on at least 3 days a week?

3. **4 pts**

What is the difference between moderate and vigorous activity? Give one example of each.

4. (4 pts)

What did Dr. Hans Kraus's tests of schoolchildren find, and what did President Kennedy ask Americans to do in "The Soft American"?

5. (5 pts)

Name four parts of fitness and one station from your home fitness check that measures each.

6. (4 pts)

Why do we compare our fitness numbers only with our own earlier numbers?
What makes a retest fair?

7. (4 pts)

What would happen if you stopped moving and sat almost all day for a whole month?

ANSWER KEY

1. He was a Greek water carrier from Marousi, near Athens. He kept a steady pace, passed the runners who had gone out fast, and ran into the stadium alone to win in 2 hours, 58 minutes and 50 seconds.
2. At least 60 minutes a day, mostly moderate or vigorous. On at least 3 days a week, include activity that works the muscles hard (climbing, push-ups) and activity that works the bones (running, jumping).
3. Moderate activity makes you breathe harder but you can still talk (brisk walking, easy biking). Vigorous activity is so hard you can say only a few words before taking a breath (running, tag, jumping rope).
4. More than half of the American children failed at least one simple test, but fewer than one in ten European children did. Kennedy warned that Americans were sitting more and moving less, and asked schools and families to help young people become strong and active.
5. Endurance (5-minute walk-run), strength (push-ups or curl-ups), flexibility (sit-and-reach), agility (shuttle run).
6. Every body is different and grows at its own pace; the goal is our own improvement and faithfulness, not beating others. A fair retest repeats everything the same way: the same stations, order, rests, and kind of push-up.
7. Your heart, lungs, muscles and bones would grow weaker, your endurance and strength would drop, you might sleep and feel worse, and your fitness numbers would go down. Fitness fades when you stop using it.

UNIT CHALLENGE: MY ACTIVE WEEK

Keep your 60-minute log for 7 days in a row. Each day, record what you did, for how many minutes, and whether it was moderate (M) or vigorous (V), and star the days with muscle or bone work. Make a bar graph of your daily minutes with a line at 60. At the end, write a paragraph: How many days did you reach 60 minutes? What helped? What will you change next week to move more and sit less?

LOOK FOR	WHAT IT MEANS
Complete log	All 7 days recorded with activities, minutes and M or V marks, and stars for muscle and bone days.
Bar graph	A neat bar graph of daily minutes with a labeled line at 60 minutes.
Honest reflection	A paragraph naming what helped, what got in the way and one specific plan for next week.
Effort	Real effort to move every day. Improvement and honesty count, not the size of the numbers.

1.1 THE OLYMPIC GAMES RETURN

OBJECTIVES

- Tell the story of the first modern Olympic Games at Athens in 1896 and of Spyridon Louis, the water carrier who won the marathon.
- Explain why God made our bodies to move and how much activity children need each day.
- Run a backyard Olympic day of four events, record your results, and try to beat your own numbers.
- Keep a week-long log of your active minutes.

Warm-up. Olympic warm-up: march in place for 1 minute, lifting your knees high. Then 10 big arm circles forward and 10 backward, 10 jumping jacks, 5 slow squats and 30 seconds of easy jogging in place. Put your hand on your chest. What changed? Think about it: why do you think people all over the world love to race, jump and throw?

WATCH

6th April 1896: The first modern Olympic Games open in Athens

HistoryPod · 2:35

<https://www.youtube.com/watch?v=BkewPyyp-jU>

WHEN TO WATCH

After the story paragraph. Listen for who started the modern Olympics, what the winners received in 1896, and how long Spyridon Louis took to run the marathon.

Note: A short history talk by a British teacher, with old photographs of the 1896 Games. It mentions in passing that one champion also won the wrestling event.

KEY TERMS

Olympic Games

An international sports festival held every four years. The ancient Games were held in Greece; the modern Games began again at Athens in 1896.

marathon

A long-distance running race. The first Olympic marathon in 1896 was about 40 kilometers (about 25 miles); today it is 42.195 kilometers (26.2 miles).

moderate activity

Movement that makes you breathe harder and warms you up, but you can still talk, such as brisk walking or an easy bike ride.

vigorous activity

Movement so hard that you can only say a few words before you need a breath, such as running, a game of tag or jumping rope.

endurance

The ability to keep going for a long time without stopping.

CORE IDEAS

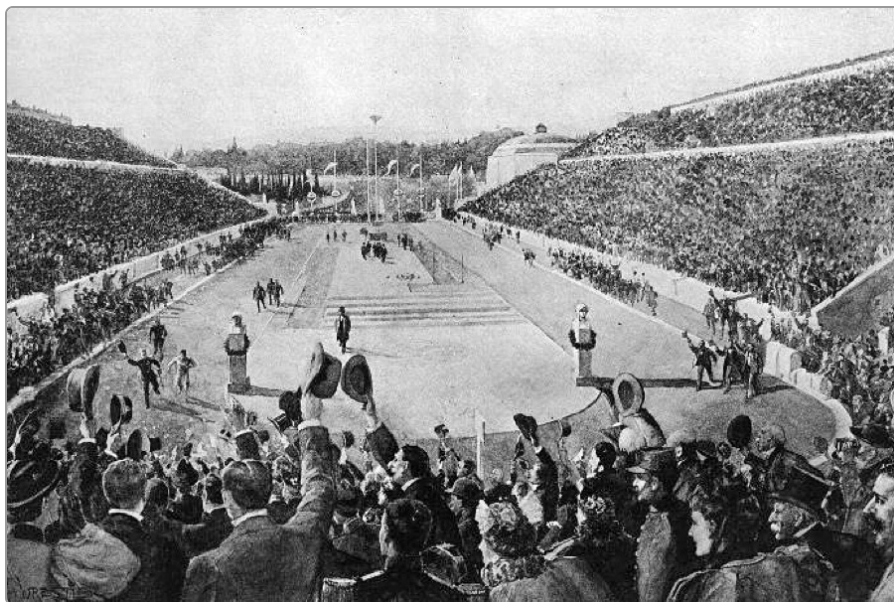
The story. On April 6, 1896, crowds filled the old marble stadium in Athens, Greece, for the opening of the first modern Olympic Games. About 240 athletes from 14 countries came to run, jump, throw, swim, lift, wrestle, fence and ride bicycles. The race the Greeks wanted most to win was the brand-new marathon, a run of about 40 kilometers (about 25 miles) from the town of Marathon to the stadium in Athens. It was named for an old legend about a messenger who ran from Marathon to Athens with news of a victory. Seventeen runners started on April 10. One of them was Spyridon Louis, a young man from the village of Marousi near Athens who earned his living carrying water into the city. Halfway through, foreign runners were in front. But Louis kept a steady pace, passed them one by one, and ran into the stadium alone. The crowd roared, and two Greek princes ran beside him to the finish line. He won in 2 hours, 58 minutes and 50 seconds, more than seven minutes ahead of the next runner.

How they figured it out. The Olympic Games of ancient Greece had ended more than 1,500 years before. A Frenchman named Pierre de Coubertin believed that sport made young people healthy, brave and fair, and he wanted the nations to meet in friendly contests instead of quarrels. In 1894 he gathered people in Paris who agreed to start the Games again, chose Athens as the first host city and formed the International Olympic Committee. In 1896 the winners did not receive gold medals: first place received a silver medal and an olive branch. People soon saw what Coubertin had hoped: ordinary people everywhere were inspired to get up and play. Louis had not trained in a fancy gym. Years of walking beside his water cart had given him **endurance**.

How your body works. God made your body to move. When you run and play, your muscles pull on your bones, your heart pumps harder to send blood and oxygen to those muscles, and your lungs breathe faster to bring the oxygen in. Doing this day after day makes your heart, lungs, muscles and bones stronger. Doctors in the United States say that children ages 6 to 17 need **at least 60 minutes of activity every day**. Most of it should be **moderate** (you breathe harder but can still talk) or **vigorous** (you can only say a few words before taking a breath). On at least 3 days a week, some of it should make your muscles work hard (climbing, push-ups, carrying) and some should make your bones work hard (running, jumping, skipping). Moving also helps you sleep well, think clearly and feel cheerful. Sitting for hours does the opposite, so get up and move at least once an hour.

Try it. This week you will hold your own backyard Olympic day with four events borrowed from 1896: a sprint, a long jump, a throw and a steady “mini-marathon.” You will record your results, and then try to beat your own numbers on a second day. You will also keep a log of your active minutes every day for a week, aiming for 60 minutes a day.

PICTURE STUDY



Spyridon Louis Entering the Stadium at Athens, 1896, Unknown illustrator, 1896 (published 1897) · Printed illustration · From the official report of the 1896 Olympic Games

Image: [Wikimedia Commons](#), public domain

This drawing shows the moment Spyridon Louis ran into the Panathenaic Stadium in Athens to win the first Olympic marathon. The stadium had been rebuilt in white marble for the Games, on the site of a stadium from ancient times. Tens of thousands of people were inside, and more watched from the hills around it.

Look closely

- Find the runner on the track. How small is he compared with the crowd? How far does he still have to go?
- Look at the people in the front. What are they doing with their hats? How do you think they felt?
- Look at the shape of the stadium: long and narrow with a tight turn at the far end. Why would a stadium for running be shaped like this?
- Find the two pillars on the track near the front. Runners had to go around them. What happens to your speed when you make a tight turn?

Talk about it

1. Louis ran about 25 miles. What do you think he did in the weeks before the race to get ready?

2. Why do you think a steady pace helped Louis pass the runners who started fast?
3. Who in your family could cheer you on during your backyard Olympic day?

Safety first. A parent should know about and supervise all activity. If you have asthma, a heart condition, diabetes, a recent injury or any health concern, check with your doctor before starting this course. Warm up first and cool down after; run and jump on grass or a safe, flat surface away from traffic, and stop and tell an adult right away if you feel chest pain, dizziness, faintness, trouble breathing or sharp pain (tired muscles are normal, but joint pain is not).

ACTIVITY

A Backyard Olympic Day and My 60-Minute Log

You will hold four events, each one borrowed from the 1896 Games and made safe for a backyard or park. Your results belong only to you. On a second day you will try to beat them, just as athletes train to beat their own best.

You will need

- A flat grassy yard or park, with an adult
- A tape measure or yardstick, sidewalk chalk or 4 cones (cups or shoes work)
- A soft ball, a beanbag or a pair of rolled-up socks for the throw
- A timer and a helper
- Fitness journal with a results table: Event, Day 1, Day 2
- A water bottle

Steps

1. **Warm up (5 minutes).** Walk briskly for 1 minute, then do the Olympic warm-up above, plus 10 skips and 5 gentle practice jumps.
2. **Event 1: The sprint.** Mark a start and a finish line 20 yards (60 feet) apart. Start standing, with one foot forward. On “Go!” run as fast as you can past the finish line, then slow down gradually. Your helper times you. Rest 2 minutes, then run once more. Record your better time.
3. **Event 2: The standing long jump.** Stand with your toes behind a line, feet about hip-width apart. Swing your arms back, bend your knees, then swing your arms forward and jump as far as you can, landing on both feet with your knees bent softly. Measure from the line to the back of your heels. Take 3 jumps, resting in between, and record your best.
4. **Event 3: The throw.** In 1896 athletes threw the heavy shot and the discus. You will throw something soft. Stand behind a line, step forward with the foot opposite your throwing arm and throw overhand as far as you can. Measure where it first lands. Take 3 throws and record your best. Make sure no one is in front of you.

5. **Event 4: The mini-marathon.** Louis won by keeping a steady pace. Mark a loop around the yard or park. Walk or jog for 6 minutes without stopping, at a pace you could keep going. Count your laps. If you need to slow down, walk; do not stop.
6. **Cool down (5 minutes).** Walk slowly for 2 minutes. Then hold gentle stretches for 20 seconds each: reach toward your toes, pull one heel toward your seat while holding a chair or a helper's shoulder, and stretch each arm across your chest. Drink some water.
7. **Your 60-minute log.** For the next 7 days, write down every activity that made you breathe harder: what you did and for how many minutes. Mark each one M (moderate) or V (vigorous). Add up each day's minutes. Put a star on days with muscle or bone work (climbing, jumping, push-ups).
8. **Session 3: Day 2 of the Games.** Warm up the same way and do all four events again, in the same order, with the same rests. Record your Day 2 results. Circle every number that improved, and write one goal for the end of the quarter.

Tips

- Land your jumps softly, with bent knees, like a cat. Stiff legs jar your knees.
- In the mini-marathon, start slower than you think you need to. Steady wins, just as it did for Louis.
- Chores count in your log if they make you breathe harder: raking, carrying groceries, sweeping.

Check your work

- ☐ I can tell the story of Spyridon Louis and the first modern Olympics.
- ☐ I can explain how much activity children need each day, and the difference between moderate and vigorous.
- ☐ I recorded my results on two days and kept an honest activity log for a week.

FITNESS JOURNAL

1. Copy your results table for all four events. Circle every Day 2 number that was better than Day 1.
2. Make a bar graph of your active minutes for each of the 7 days. Draw a line across at 60 minutes.

3. Draw the stadium at Athens and Spyridon Louis running in. Write one sentence about what helped him win.
4. Write two sentences: Which event did you enjoy most? Which day of your log was the hardest to reach 60 minutes, and why?

From history. Before the 1896 Games, the Greeks held a trial race over the marathon route, and Louis placed fifth in it, so few people expected him to win. His victory made him a hero in Greece for the rest of his life. Forty years later, at the 1936 Games in Berlin, the old champion was given the honor of carrying the Greek flag at the opening ceremony.

COMMON MISTAKES

- Sprinting or jumping without warming up. Cold muscles strain more easily.
- Starting the mini-marathon at full speed and then having to stop. Choose a pace you can keep.
- Thinking only sports count as activity. Play, chores, walking and biking all count.
- Comparing your numbers with someone else's. In this course you race only against yourself.

Make it a game • Backyard Marathon Story. Set a short marathon course of five laps around the yard or room. Tell Spyridon Louis's marathon story as you run each lap, one fact per lap, with your parent as race official. If you run out of facts she gives a hint. Finish by saying how much activity children need each day. Time yourself.

Scripture. "Know ye not that they which run in a race run all, but one receiveth the prize? So run, that ye may obtain." (1 Corinthians 9:24, KJV)

Paul uses runners to teach us to live with purpose and steady effort. Only one runner won the marathon in 1896, but every one of us can run our own race faithfully.

1.2 THE PRESIDENTIAL FITNESS CHALLENGE

OBJECTIVES

- Tell how a test of American schoolchildren in the 1950s led to President Eisenhower’s fitness council and President Kennedy’s 1960 article “The Soft American.”
- Name four parts of health-related fitness: endurance, strength, flexibility and agility.
- Complete a five-station home fitness check with good form, score it only against yourself, and retest.

Warm-up. Station warm-up: 30 seconds each of marching, arm circles, side steps across the room and back, gentle toe touches (bend your knees a little), and jumping jacks. Repeat once. Think about it: what does it mean to be “fit”? Is it only being fast?

WATCH

President John Fitzgerald Kennedy on Physical Fitness, 30 March 1962

President John Fitzgerald Kennedy · 2:27

<https://www.youtube.com/watch?v=m1zIDPem4zA>

WHEN TO WATCH

After the story paragraph. Listen for what President Kennedy asked schools and families to do.

Note: A 1962 film of President Kennedy speaking to the nation about the physical fitness of young people, with a still photograph of him for the second half. The channel posts historical footage and has no description; the recording itself is the history.

KEY TERMS

physical fitness

Your body’s ability to work, play and meet everyday tasks with energy to spare.

strength

How much force your muscles can make, as in lifting, pushing or pulling.

flexibility

How far your joints and muscles can move, as in reaching toward your toes.

agility

How quickly you can change direction while keeping your balance, as in a shuttle run or a game of tag.

baseline

Your first set of measurements, so that later you can see how much you have improved.

CORE IDEAS

The story. In the early 1950s, a New York doctor named Hans Kraus and his co-workers gave thousands of schoolchildren in the United States and in Europe six very simple tests of muscle strength and flexibility, such as doing one sit-up and bending to touch the floor. The results surprised everyone. More than half of the American children failed at least one test, but fewer than one in ten of the European children did. Many European children still walked and biked everywhere and played outdoors for hours, while more American children rode in cars and buses. When President Dwight Eisenhower heard about the study, he called a meeting, and in 1956 he formed the President's Council on Youth Fitness. Four years later, just before he became president, John F. Kennedy wrote a magazine article called "The Soft American." He warned that Americans were sitting more and moving less, and he asked schools and families to help young people become strong and active.

How they figured it out. To know whether children were growing fitter, schools needed a way to measure. Over the following years, the President's fitness program gave schools a set of tests: sit-ups or curl-ups, a shuttle run, a long run, pull-ups and a sitting reach. For many years, children who scored high earned a Presidential Physical Fitness Award. Later, teachers and doctors decided that it is better for each child to compare himself only with his own earlier scores and with what is healthy, not to race against a chart of other children. That is how we will do it: your first numbers are your **baseline**, and your only goal is to improve on them.

How your body works. Fitness has several parts. **Endurance** lets your heart and lungs keep you going in a long game. **Strength** lets your muscles push, pull and lift. **Flexibility** lets your joints move through their full range, so you can reach, bend and twist without strain. **Agility** lets you start, stop and change direction quickly without

falling. Each one grows when you practice it, and each one fades when you stop. That is why a little activity every day is better than a lot once in a while.

Good form. Curl-up: lie on your back, knees bent, feet flat, arms crossed over your chest; tuck your chin and curl your shoulders up until your shoulder blades leave the floor, then lower slowly. **Push-up:** body straight as a board from head to heels (or knees), hands under your shoulders, chest down to about a fist from the floor or wall. **Sit-and-reach:** reach slowly and smoothly; never bounce. **Shuttle run:** bend your knees as you turn so you do not slip.

Try it. This week you will do a five-station home fitness check, a little like the one President Kennedy's council made for schools, but scored only against yourself. You will retest on a second day and again at the end of the quarter.

PICTURE STUDY



Gymnasium, Mount Holyoke, Bain News Service, Early 1900s · Photograph (glass negative) · Library of Congress, Washington, D.C. (George Grantham Bain Collection)

Image: [Wikimedia Commons](#), public domain

Mount Holyoke, a women's college in Massachusetts, was one of the first American colleges to require physical training for its students. In this photograph from the early 1900s, students pose in the college gymnasium in the gym clothes of their day. Long before President Kennedy's article, schools and colleges were already teaching that a strong body helps a person study, work and serve.

Look closely

- Find the ladder and the bar. What exercises do you think the students did with them?
- Look at the two students sitting high on the ladder. What strength would it take to climb up there?
- Look at their clothes and shoes. How are they different from what you wear to exercise? How are they the same?
- Find the balcony at the top. What might it have been used for?

Talk about it

1. Which parts of fitness (endurance, strength, flexibility, agility) would climbing a ladder build?

2. Why do you think colleges and schools have taught exercise for so long?
3. If you could add one station from this gymnasium to your home fitness check, what would it be?

Safety first. Warm up first. Do curl-ups and push-ups on a mat or towel on a flat floor, and do the shuttle run on grass or a non-slip floor with plenty of room at each end. Reach slowly in the sit-and-reach, never bounce, and stop if anything hurts sharply or in a joint.

ACTIVITY

My Home Fitness Check

You will measure five things your body can do. These numbers are your baseline. You will never compare them with anyone else's, only with your own numbers later in the quarter.

You will need

- A timer and a helper to time and count
- A towel or mat on a flat, non-slip floor, and a wall
- Masking tape and a yardstick or tape measure
- Two small objects for the shuttle run (blocks, beanbags or rolled socks)
- Fitness journal with a table: Station, Day 1, Day 2, End of quarter
- A cup of water

Steps

1. **Warm up (5 minutes)** with the station warm-up above, plus 30 seconds of easy jogging.
2. **Station 1: Curl-ups (1 minute).** Use the form in the lesson: knees bent, feet flat, arms crossed over your chest. Curl up until your shoulder blades leave the floor, then lower all the way. Your helper counts only good ones. Rest 2 minutes.
3. **Station 2: Push-ups (30 seconds).** Choose wall, knee or full push-ups, write down which kind, and use the same kind every time you retest. Count good-form push-ups. Rest 2 minutes.
4. **Station 3: Shuttle run.** Put two tape lines 30 feet apart and set two small objects behind the far line. On "Go!" run to the far line, pick up one object, run back and set it behind the start line, then run for the second object and carry it back across the start line. Your helper times it. Rest 2 minutes, run once more, and record your better time.
5. **Station 4: Sit-and-reach.** Tape a yardstick to the floor and put a strip of tape across it at the 15-inch mark. Sit with the yardstick between your legs, the 0 end toward you, and your heels at the tape, about 10 inches apart. Keep your

knees straight (a helper may rest a hand lightly on them). Put one hand on top of the other and reach slowly forward along the yardstick three times; hold the third reach for 2 seconds. Record the inch mark at your fingertips.

6. **Station 5: Steady 5-minute walk-run.** On a measured loop outdoors with an adult (or back and forth across a yard), walk or jog for 5 minutes at a steady pace. Count your laps. Then rest and take a sip of water.
7. **Cool down (5 minutes):** walk slowly for 2 minutes, then gentle stretches for your legs, back and shoulders, 20 seconds each. Write one sentence about how you felt.
8. **Session 3: Retest.** On another day, warm up the same way and do all five stations again in the same order, with the same rests and the same kind of push-up. Record your Day 2 numbers, circle every improvement, and choose one station you will practice this quarter. Keep this table: you will retest once more in the last week.

Tips

- A slow, full curl-up counts; a quick bounce off the floor does not.
- In the shuttle run, bend low to pick up the object and set it down; do not throw it.
- Breathe out when you push or curl up. Never hold your breath.

Check your work

- ☐ I can tell how a study of schoolchildren led to the Presidents' fitness programs.
- ☐ I can name four parts of fitness and give an example of each.
- ☐ I recorded my own baseline honestly and retested it on a second day.

FITNESS JOURNAL

1. Copy your fitness check table. Next to each station, write which part of fitness it measures.
2. Make a bar graph with two bars for each station (Day 1 and Day 2).
3. Write a short letter to President Kennedy telling him what you do each day to stay active.
4. Choose one station to practice. Write your plan: what you will do, how often, and your goal for the end of the quarter.

From history. President Kennedy's article appeared in *Sports Illustrated* on December 26, 1960, less than a month before he took office. As president he renamed the council the President's Council on Physical Fitness, and in 1962 he spoke to the nation on film asking every school to give its students vigorous daily exercise.

COMMON MISTAKES

- Pulling on your neck during curl-ups. Keep your arms crossed on your chest and your chin tucked.
- Bouncing in the sit-and-reach. Reach slowly; bouncing can strain a muscle.
- Changing the test the second time (a different push-up or different rests). A fair retest repeats it exactly.
- Feeling bad about a low number. A baseline is a starting line, not a grade.

Make it a game • Fitness Four Stations. Make four stations for endurance, strength, flexibility and agility: for example jogging in place, wall sit, toe reach and shuttle steps. Do thirty seconds at each while your parent times. Say which part of fitness each station tests. Record your baseline numbers, then retest later and see if you improved.

UNIT 1

KEEPING ACTIVE

God made your body to move: to run, jump, climb, carry and play. In this unit you will travel to Athens in 1896, when the Olympic Games began again after more than 1,500 years and a water carrier named Spyridon Louis won the first marathon by keeping a steady pace. You will learn how much activity children need each day, hold your own backyard Olympic day, and keep a log of your active minutes for a week.

Then you will learn how a simple test of schoolchildren in the 1950s worried two American presidents, and how President Kennedy called young Americans to be strong and active. You will learn the parts of fitness and do a five-station home fitness check, scored only against yourself, that you will repeat at the end of the quarter.

PREREQUISITES

- Can use a timer and read seconds
- Can add a column of numbers and make a simple bar graph with help
- Has a parent's permission (and the doctor's, if needed) to begin

MASTERY CHECKLIST

- ☐ I can tell the story of the 1896 Olympic Games and Spyridon Louis.
- ☐ I can explain how much activity children need each day and give examples of moderate and vigorous activity.
- ☐ I can tell how the Presidents' fitness programs began.
- ☐ I can name four parts of fitness and show good form in a curl-up and a push-up.
- ☐ I can keep an honest log and compare my numbers only with my own.

OPTIONAL BOOKS AND GEAR FOR THIS UNIT

- **“Train Like an Astronaut” (NASA):** Free. NASA’s fitness challenges for children, with activity sheets for running, jumping, balance and strength. Useful all quarter, especially with Unit 4.
- **A simple step counter or pedometer:** Optional, for counting steps on your log days. A tally of minutes works just as well.
- **A tape measure or yardstick:** For the long jump and the sit-and-reach. Most homes already have one.

Not required. Every activity in this unit works without them. School Launch has no ties to these authors, publishers or companies.

LESSONS IN THIS UNIT

1.1 The Olympic Games Return

3 sessions of 30–40 minutes

1.2 The Presidential Fitness Challenge

3 sessions of 30–40 minutes

UNIT 1 REVIEW

Answer each question in complete sentences. The review is worth 30 points. You may show a movement as part of your answer.

1. **5 pts**

Who was Spyridon Louis, and how did he win the first Olympic marathon in 1896?

2. **4 pts**

How much activity do children ages 6 to 17 need each day? What else should they do on at least 3 days a week?

3. **4 pts**

What is the difference between moderate and vigorous activity? Give one example of each.

4. (4 pts)

What did Dr. Hans Kraus's tests of schoolchildren find, and what did President Kennedy ask Americans to do in "The Soft American"?

5. (5 pts)

Name four parts of fitness and one station from your home fitness check that measures each.

6. (4 pts)

Why do we compare our fitness numbers only with our own earlier numbers?
What makes a retest fair?

7. (4 pts)

What would happen if you stopped moving and sat almost all day for a whole month?

ANSWER KEY

1. He was a Greek water carrier from Marousi, near Athens. He kept a steady pace, passed the runners who had gone out fast, and ran into the stadium alone to win in 2 hours, 58 minutes and 50 seconds.
2. At least 60 minutes a day, mostly moderate or vigorous. On at least 3 days a week, include activity that works the muscles hard (climbing, push-ups) and activity that works the bones (running, jumping).
3. Moderate activity makes you breathe harder but you can still talk (brisk walking, easy biking). Vigorous activity is so hard you can say only a few words before taking a breath (running, tag, jumping rope).
4. More than half of the American children failed at least one simple test, but fewer than one in ten European children did. Kennedy warned that Americans were sitting more and moving less, and asked schools and families to help young people become strong and active.
5. Endurance (5-minute walk-run), strength (push-ups or curl-ups), flexibility (sit-and-reach), agility (shuttle run).
6. Every body is different and grows at its own pace; the goal is our own improvement and faithfulness, not beating others. A fair retest repeats everything the same way: the same stations, order, rests, and kind of push-up.
7. Your heart, lungs, muscles and bones would grow weaker, your endurance and strength would drop, you might sleep and feel worse, and your fitness numbers would go down. Fitness fades when you stop using it.

UNIT CHALLENGE: MY ACTIVE WEEK

Keep your 60-minute log for 7 days in a row. Each day, record what you did, for how many minutes, and whether it was moderate (M) or vigorous (V), and star the days with muscle or bone work. Make a bar graph of your daily minutes with a line at 60. At the end, write a paragraph: How many days did you reach 60 minutes? What helped? What will you change next week to move more and sit less?

LOOK FOR	WHAT IT MEANS
Complete log	All 7 days recorded with activities, minutes and M or V marks, and stars for muscle and bone days.
Bar graph	A neat bar graph of daily minutes with a labeled line at 60 minutes.
Honest reflection	A paragraph naming what helped, what got in the way and one specific plan for next week.
Effort	Real effort to move every day. Improvement and honesty count, not the size of the numbers.

UNIT 2

HYDRATION

Your body is about 60 percent water, and it loses some every day in sweat, breath and urine. In this unit you will learn the warning signs that your body is running low, and how a scientist named Lawrence Armstrong showed that the color of urine is a simple, reliable guide. You will color your own eight-shade chart and keep a three-day log of water, color and thirst, including an active day.

Then you will travel with the pioneers on the Oregon Trail, who planned their whole journey around rivers, springs and water barrels. You will plan a family walk, decide how much water to carry and when to drink, measure what you really drank, and improve the plan on a second walk.

PREREQUISITES

- Knows the warm-up and cool-down from Unit 1
- Can measure with a measuring cup and add and subtract halves ($\frac{1}{2}$ cup)
- Can make a simple bar graph

MASTERY CHECKLIST

- ☐ I can name five warning signs of dehydration.
- ☐ I can use a urine color chart and explain why urine gets darker when I am low on water.
- ☐ I can explain how much water children my age need and how to drink during activity.
- ☐ I can tell how the pioneers planned their water on the Oregon Trail.
- ☐ I can make and follow a water plan for a walk or hike.

OPTIONAL BOOKS AND GEAR FOR THIS UNIT

- **“Dehydration” (Nemours KidsHealth):** Free. A clear kids’ article on the signs of dehydration and how to prevent it. Read it with Lesson 2.1.
- **“Why Drinking Water Is the Way to Go” (Nemours KidsHealth):** Free. Why water is the best everyday drink, written for children.
- **Kids & Youth, Oregon National Historic Trail (National Park Service):** Free. Junior Ranger activities and pages about life on the trail, for Lesson 2.2.
- **A reusable water bottle with ounce marks:** Optional. Makes the water logs easier. Any bottle and a measuring cup work just as well.

Not required. Every activity in this unit works without them. School Launch has no ties to these authors, publishers or companies.

LESSONS IN THIS UNIT

2.1 Warning Signs of Dehydration

3 sessions of 30–40 minutes

2.2 Water on the Trail

3 sessions of 30–40 minutes

UNIT 2 REVIEW

Answer each question. Show your work for the calculation. The review is worth 30 points.

1. **5 pts**

List five warning signs of dehydration.

2. **4 pts**

What did Lawrence Armstrong’s 1994 study show about urine color? What colors mean you are drinking enough?

3. **4 pts**

Why does urine get darker when you are low on water? Which organs make the decision?

4. **5 pts**

Noah starts a walk with 3 cups of water in his bottle. When he gets home, $1\frac{1}{2}$ cups are left. How much did he drink on the trail? If the walk took 60 minutes and he drank every 20 minutes, about how much did he drink each time?

5. **4 pts**

Why did the Oregon Trail follow rivers? Name two ways the pioneers planned for water.

6. **4 pts**

Give a good water plan for an hour-long walk on a warm day.

7. **4 pts**

What would happen if you played soccer for an hour on a hot day and drank nothing?

ANSWER KEY

1. Any five: thirst, dry or sticky mouth, dark yellow urine (or very little urine), headache, tiredness, dizziness, grumpiness, feeling weak during play.
2. That the color of urine, matched to a chart of eight shades, agreed closely with laboratory tests of how much water the body has. Pale yellow like lemonade (colors 1–3) means you are drinking enough; dark like apple juice means you need water.
3. The kidneys hold on to as much water as they can, so the wastes in urine are mixed with less water and the urine looks darker and there is less of it.
4. $3 - 1\frac{1}{2} = 1\frac{1}{2}$ cups on the trail. $60 \div 20 = 3$ drinks, so $1\frac{1}{2} \div 3 = \frac{1}{2}$ cup each time.
5. People and animals needed water every day, and rivers supplied it. Any two: guidebooks listing camps with water, wood and grass; water barrels on the wagons; canteens; filling every container before a dry stretch; camping at springs and streams; boiling bad water or avoiding it.
6. Drink 1 cup before leaving; carry enough water; take about $\frac{1}{2}$ cup (3–4 big gulps) every 15–20 minutes, resting in the shade; drink 1 cup at the end; check urine color afterward. Walk in the cooler part of the day.
7. You would lose a lot of water in sweat; you would become thirsty, your urine would turn dark, and you might get a headache, feel tired or dizzy, play worse and be at risk of a heat illness. You should stop, rest in the shade, sip water and tell an adult.

UNIT CHALLENGE: A FAMILY HIKE WITH A WATER PLAN

Plan and lead your family on a walk or hike of at least 45 minutes. Make a map, a water plan for every walker, and a packing list. On the walk, run the water stops on time and keep the log: cups drunk, thirst, energy and the weather. Afterward, measure what everyone drank, check your urine color, and make a bar graph comparing what each walker planned to drink with what each one actually drank. Finish with a paragraph: What went well? What will you change next time?

LOOK FOR	WHAT IT MEANS
Careful plan	A clear map, a water plan with the math worked out, and a packing list including hats, sunscreen and water for everyone.
Following the plan	Water stops kept on time with the log filled in at each stop.
Measuring and graphing	Water drunk measured by subtraction and shown in a neat bar graph of planned versus actual cups.
Reflection	A paragraph naming what worked, what did not and one specific change for next time. Effort and honest records count.

2.1 WARNING SIGNS OF DEHYDRATION

OBJECTIVES

- Name the warning signs of dehydration: thirst, dry mouth, dark urine, headache and tiredness.
- Tell how a scientist tested urine color as a simple guide to how much water the body has.
- Make an eight-shade color chart and keep a three-day log of water, urine color and thirst, including an active day.

Warm-up. Water-carrier warm-up: walk around the room carrying an empty bucket or a jug in each hand for 1 minute, standing tall. Then 10 arm circles each way, 10 jumping jacks and 30 seconds of jogging in place. Touch your lips and tongue. Are they moist or dry? Think about it: how does your body tell you it needs water?

WATCH

Hydration: What Color Is Your Urine? - Texas Children's Sports Nutrition

Texas Children's • 2:04

<https://www.youtube.com/watch?v=stgKD1A8B6U>

WHEN TO WATCH

After the “How they figured it out” paragraph. Listen for the two drinks she compares urine colors to.

Note: A short talk by the director of sports nutrition at Texas Children's Hospital in Houston, with two cups of colored liquid as a model of the chart.

BACKUP VIDEO

What Happens if You Don't Drink Water? | Water Soldiers

Schooling Online Kids • 6:01

<https://www.youtube.com/watch?v=MeZKb2depak>

For a cartoon trip through the body showing what water does and what happens when a boy drinks too little.

KEY TERMS

dehydration

When the body has lost more water than it has taken in, so it does not have enough to work well.

kidneys

Two bean-shaped organs in your lower back that clean your blood and decide how much water to keep or let go.

hydrated

Having enough water in your body for it to work well.

urine

The liquid waste your kidneys make from extra water and wastes filtered out of your blood.

thirst

The dry, wanting-a-drink feeling your brain sends when your body is low on water.

CORE IDEAS

The story. Athletes, soldiers and farmworkers who work hard in the heat can lose a lot of water in sweat. Coaches and doctors wanted a simple way to tell whether a person was drinking enough, without a laboratory. In 1994 an American scientist named Lawrence Armstrong, who studies how people handle exercise and heat, published a study that answered the question with something everyone can see: the color of urine.

How they figured it out. Armstrong and his team at the University of Connecticut ran two studies in their laboratory and one out in the field with active people who were exercising and sweating. Over many days they collected urine samples and tested each one with careful laboratory measurements of how concentrated it was, which shows how much water the body is holding on to. They also matched each sample's color against a printed chart of eight shades, from very pale yellow to dark brownish-amber. The simple color chart matched the laboratory tests closely. Pale yellow, like lemonade, meant the body had plenty of water; dark yellow, like apple juice, meant the body was low. Today coaches put copies of color charts like Armstrong's in locker rooms and school bathrooms, and doctors teach children to use them.

How your body works. About 60 percent of your body is water. Every day you lose water when you sweat, when you breathe out (breathe on a cold mirror and you can

see it) and when you use the bathroom. Your **kidneys** clean your blood and decide how much water to keep. When you are low on water, they hold on to as much as they can, so your urine becomes darker and there is less of it. At the same time, your brain makes you feel **thirsty**. If you still do not drink, you may get a dry, sticky mouth, a **headache**, and feel **tired**, dizzy or grumpy, and you will not play or think as well. Children your age need about 7 to 8 cups of drinks a day (1 cup = 8 ounces $\approx$ 240 mL), mostly water, and more on hot or very active days. Milk, soup, fruits and vegetables supply some water too.

Think it through. Thirst is a good signal, but by the time you feel very thirsty you are already a little low. That is why it helps to drink with every meal and snack, and to take a few big gulps of water every 15 to 20 minutes while you play hard. Some foods and vitamins can change the color of urine for a while; if it ever looks red, brown or strange, tell a parent.

Try it. This week you will color your own eight-shade chart, then keep a three-day log of what you drink, your urine color and your thirst. On the third day you will play hard and see how your body's signals change.

PICTURE STUDY



The Noonning, Winslow Homer, About 1872 · Oil on canvas · Wadsworth Atheneum Museum of Art, Hartford, Connecticut

Image: [Wikimedia Commons](#), public domain

Winslow Homer painted many scenes of American country children in the years after 1870. “Nooning” was an old word for the rest that farm families took in the middle of the day, when the sun was hottest. Here a boy has found the coolest place he can: deep shade on the grass.

Look closely

- Where is the sunlight brightest in the painting? Where is the shade?
- Look at the boy’s hat and clothes. How do they help him stay cool?
- What season do you think it is? What clues tell you?
- Is there anything in the picture that could give the boy water? Where might he go for a drink?

Talk about it

1. Why would farm families rest in the shade at noon instead of working in the hot sun?
2. If this boy had been working in the fields all morning, what warning signs of dehydration might he feel?
3. What is your family’s plan for staying cool and drinking water on a hot day?

Safety first. Drink water steadily through the day, but never have drinking contests or try to drink a huge amount at once. On the active day, play in the shade or the cooler part of the day. If you feel dizzy, sick to your stomach, very tired or get a bad headache while active, stop, go to the shade, sip water and tell an adult right away.

ACTIVITY

My Color Chart and Three-Day Water Log

Like the people in Lawrence Armstrong's studies, you will use a color chart to read your body's signals. You will make the chart yourself, then keep a careful log for three days.

You will need

- White paper and yellow, orange and brown colored pencils
- Your usual cup or water bottle and a measuring cup
- Fitness journal with a log table: Day, Time, Drink, Amount (cups), Urine color (1–8), Thirst (1–5), Other signs
- A timer and a safe place for active play

Steps

1. **Make your chart.** Draw 8 squares in a column and number them 1 to 8. Color square 1 very pale yellow, and make each square a little darker, until square 8 is dark amber-brown. Next to squares 1–3 write “Well done: keep drinking.” Next to 4–5 write “Drink a cup soon.” Next to 6–8 write “Drink now and tell a parent if it stays dark.” Tape the chart where you can see it in the bathroom.
2. **Measure your cup.** Fill your usual cup or bottle with water, pour it into a measuring cup and write how many cups it holds.
3. **Day 1 and Day 2 (ordinary days).** Each time you drink, write the time, the drink and the amount. Check your urine color in the morning, after lunch and before bed, and write the number. Rate your thirst from 1 (not thirsty) to 5 (very thirsty) at the same times. Note any headache or tiredness.
4. Each evening, add your cups. Did you reach about 7 cups? How many of your colors were 1–3?
5. **Day 3 (active day).** Plan 30 minutes of hard play: tag, biking, a walk-run or 3 rounds of your fitness-check stations. Drink 1 cup of water before, 3 or 4 big gulps every 15 minutes while you play, and 1 cup afterward. Log everything, and check your urine color an hour after you finish.

6. **Dehydration detective.** With a parent, read these three cases and decide what each person should do: (a) Sam played soccer for an hour in the sun, has a headache and his urine is color 6. (b) Grace drank water at every meal and her urine is color 2. (c) Eli feels tired and grumpy in the afternoon and has drunk only one glass of juice all day.
7. **Graph it.** Make a bar graph of your total cups for each day, with a line at 7 cups. Under each bar, write that day's afternoon urine color.
8. **Session 3: Improve.** Look at your log. Find the time of day when you drank least. Make a one-sentence plan to fix it (for example, a full bottle on your desk during schoolwork), follow it for a day, and log your colors again. Did they get lighter?

Tips

- Drink with every meal and snack. That alone is 5 or 6 cups.
- Keep a filled water bottle where you can see it. People drink more when water is in reach.
- Water is the best everyday drink. Milk is a good drink at meals. Juice and sweet drinks are sometimes drinks.

Check your work

- ☐ I can name five warning signs of dehydration.
- ☐ I made a color chart and kept an honest three-day log.
- ☐ I can explain why urine gets darker when my body is low on water.

FITNESS JOURNAL

1. Glue or copy your eight-shade color chart into your journal, with the meaning of each group of colors.
2. Copy your bar graph of cups per day. Write which day had the lightest colors and why.
3. Draw a person and label five warning signs of dehydration where they are felt or seen.
4. Write two sentences: What surprised you about your log? What is your plan for drinking enough on a busy day?

From history. The color chart is still used by many sports teams, the military and workers who labor in the heat, because it costs almost nothing and anyone can use it. Doctors remind people that it is a guide, not a perfect test: a large glass of water can make urine pale for a while, and some foods and vitamins change its color.

COMMON MISTAKES

- Waiting until you are very thirsty to drink. By then you are already a little low.
- Thinking a sweet drink is just as good as water. Water hydrates without added sugar.
- Drinking a huge amount at once to “catch up.” Steady sips through the day work better and are safer.
- Forgetting to drink on cool or rainy days. You still lose water by breathing and sweating.

Make it a game • Warning Sign Charades. Take turns acting out a dehydration warning sign without speaking: thirst, dry mouth, dark urine, headache or tiredness. The guesser names it and says what to do next. Keep score on paper. Then explain how a color chart helps. First to guess all five correctly, and tell the kidney's job, wins.

2.2 WATER ON THE TRAIL

OBJECTIVES

- Tell how pioneers on the Oregon Trail planned their journey around rivers, springs and water barrels.
- Plan how much water to carry for a walk or hike, and when to drink it.
- Take a family walk with a water plan, measure what you drank, and improve the plan for a second walk.

Warm-up. Trail warm-up: 1 minute of marching with high knees, 10 walking lunges (step long and lower gently), 10 heel raises, 10 arm swings forward and back, and 30 seconds of walking in place with a backpack on. Think about it: if you were walking 15 miles today, what would you need to carry?

WATCH

History of the Oregon Trail for Kids | Bedtime History

Bedtime History • 9:47

https://www.youtube.com/watch?v=_uLFDDzeqBE

WHEN TO WATCH

After the story paragraph. Listen for how the pioneers crossed rivers and what they did when the water tasted bad.

Note: A calm history story for children, told over old paintings, photographs and maps. It mentions briefly that some travelers became sick from bad water and died; preview it if you have young listeners nearby.

BACKUP VIDEO

What the Oregon Trail Looks Like Today From Above

Smithsonian Channel • 2:11

<https://www.youtube.com/watch?v=m4qGnEI2-Wg>

To see the wagon ruts that can still be seen on the prairie today, and the landmarks the pioneers walked toward.

KEY TERMS

pioneer

One of the first people to travel to and settle in a new region.

Oregon Trail

A wagon road about 2,000 miles long from Missouri to Oregon, used by hundreds of thousands of travelers from the 1840s to the 1860s.

canteen

A bottle or flask for carrying drinking water on a journey.

water plan

Deciding ahead of time how much water to carry, when to drink and where to refill.

CORE IDEAS

The story. In the 1840s, families in Missouri began loading covered wagons for a journey of about 2,000 miles to the green valleys of Oregon. The trip took four to six months. Most people walked the whole way beside their wagons, often about 15 miles a day, through prairies, mountains and dry sagebrush plains. More than anything else, people and their oxen needed water every single day. So the trail followed rivers: west along the wide, muddy Platte River across Nebraska, then the North Platte, then the Sweetwater River up to South Pass in the Rocky Mountains. Travelers joked that the muddy Platte was “a mile wide and an inch deep,” and they let buckets of its water stand until the mud settled.

How they figured it out. The pioneers planned their water carefully. Guidebooks written by earlier travelers listed the good camping places, with notes on where to find water, firewood and grass for the animals. Families tied wooden water barrels to the sides of their wagons and carried canteens. Before a long dry stretch, they filled every barrel and kettle. They camped beside springs and streams when they could, and they learned which water to avoid: if a spring tasted bad or a sign warned of bad water, they boiled their water or moved on. Careful planning kept families healthy on a hard road.

How your body works. When you walk or hike, your muscles make heat, and you sweat to cool down. On a warm day an active child can lose a cup or more of water in sweat every hour, plus more in the breath. If you do not replace it, the warning signs you learned in Lesson 2.1 appear: thirst, dark urine, headache and tiredness. Your legs feel heavy and the trail feels longer. Drinking a little at a time keeps your blood

flowing well to your muscles and skin so you stay cool and strong. A good rule for a walk or hike: drink 1 cup of water before you start, take 3 or 4 big gulps (about half a cup) every 15 to 20 minutes, and drink again when you finish. On hot days, rest in the shade and drink more.

Try it. This week you will plan a family walk or hike of 30 to 60 minutes, decide how much water to carry and when to drink, measure exactly how much you drank, and then improve your plan for a second walk.

PICTURE STUDY



Emigrants Crossing the Plains, Albert Bierstadt, 1867 · Oil on canvas · National Cowboy & Western Heritage Museum, Oklahoma City

Image: [Wikimedia Commons](#), public domain

Albert Bierstadt was a German-born American painter who traveled west in the 1850s and 1860s and painted its mountains and plains. In this large painting a wagon train moves west at the end of a day, toward a stream and the shelter of trees. Bierstadt made the light glow to show how grand and hopeful the journey seemed.

Look closely

- Find the water in the painting. Why would a wagon train stop near it for the night?
- Find the animals. What do the oxen, cattle and horses need at the end of a long day?
- Look at the people walking beside the wagons. How far do you think they walked today?
- Look at the sky. What time of day is it? Why might travelers walk in the cooler morning and evening?

Talk about it

1. If you were leading this wagon train, what would you need to know about the next day's water?

2. Why did the Oregon Trail follow rivers whenever it could?
3. What would you pack for a family walk so that everyone has enough water?

Safety first. Walk or hike only with an adult, on a safe path away from traffic, and tell someone where you are going. Wear good shoes, a hat and sunscreen, and avoid the hottest part of the day. Drink steadily but do not force huge amounts, and never drink from a stream, pond or spring unless an adult has made the water safe.

ACTIVITY

My Trail Water Plan

Like the pioneers, you will plan before you go. You will map a family walk, decide how much water to carry, follow your plan, measure what you drank, and then make a better plan for a second walk.

You will need

- A safe walking route of 30 to 60 minutes (a park path, a trail or your neighborhood), with an adult
- A water bottle for each walker, and a measuring cup
- A small backpack, a hat and sunscreen
- A timer or watch, and a thermometer or weather report
- Fitness journal with a plan page and a log page

Steps

1. **Map it.** With a parent, choose your route. Draw a simple map in your journal showing the start, the turn-around point, any shady rest spots and any place to refill water.
2. **Plan it.** Write how long the walk will take and the temperature. Use the rule: 1 cup before you leave, about half a cup every 15–20 minutes, and 1 cup when you finish. Work out how many cups you need to carry. (Example: a 60-minute walk with a drink every 20 minutes needs $3 \text{ drinks} \times \frac{1}{2} \text{ cup} = 1\frac{1}{2} \text{ cups}$ in the bottle.) Fill your bottle with a little extra and measure exactly how much you put in.
3. **Before you go.** Drink 1 cup of water. Check your urine color on your chart and write it down. Rate your energy from 1 (tired) to 5 (full of energy).
4. **On the trail.** Walk at a brisk pace. Set a timer for every 15 or 20 minutes; each time it rings, stop in the shade, take your planned drink, and rate your thirst (1–5) and energy (1–5).
5. **After the walk.** Drink 1 cup of water. Pour what is left in your bottle into the measuring cup. Subtract it from what you started with to find how much you drank on the trail.

6. **An hour later**, check your urine color again. Write it down, with how your legs feel.
7. **Session 3: The second walk.** Read your log. Were you thirsty before the timer rang? Did water run short, or did you carry much more than you needed? Was your color light afterward? Change one thing in your plan (more water, more frequent sips, an earlier start to avoid the heat), take the walk again, and compare.

Tips

- Freeze a bottle half full the night before, then top it up with water in the morning. It stays cold for hours.
- Pack a snack with water in it, such as an orange, grapes or apple slices.
- Everyone in the group needs a water plan, including grown-ups and the dog.

Check your work

- ☐ I can tell how pioneers on the Oregon Trail planned their water.
- ☐ I made a water plan, followed it and measured how much I drank.
- ☐ I changed my plan for a second walk based on what I learned.

FITNESS JOURNAL

1. Draw your walking map with water stops and shade marked.
2. Copy your trail log: time, cups drunk, thirst and energy at each stop, and urine color before and after.
3. Write the subtraction that shows how much you drank on the trail, for both walks.
4. Write two sentences: What did you change for the second walk? Did it help?

From history. Long before the Oregon Trail, the explorers Meriwether Lewis and William Clark traveled up the Missouri River and over the Rocky Mountains to the Pacific (1804–1806), largely by following rivers. In places on the old trail, deep ruts cut by thousands of wagon wheels can still be seen today, and many are protected as part of the Oregon National Historic Trail.

COMMON MISTAKES

- Leaving without water because the walk is “only short.” Even an hour in the sun can make you low on water.
- Drinking all your water in the first ten minutes and having none later.

- Drinking from a stream or pond because it looks clear. Clear water can still carry germs.
- Walking in the hottest part of the afternoon. Morning and evening are cooler and safer.

Make it a game • Pack the Trail. Set a pretend hike and give your parent the length and temperature. Gather cups, jars or bottles and fill them to show the water you would carry. Explain when you would drink: before, during and after. She plays a pioneer and objects if your plan is too small. Defend it with a number.

Scripture. “As the hart panteth after the water brooks, so panteth my soul after thee, O God.” (Psalm 42:1, KJV)

A thirsty deer runs to the stream because it needs water to live. The psalmist says we need God even more than that, and He is the one who gives both water for the body and life for the soul.

UNIT 2

HYDRATION

Your body is about 60 percent water, and it loses some every day in sweat, breath and urine. In this unit you will learn the warning signs that your body is running low, and how a scientist named Lawrence Armstrong showed that the color of urine is a simple, reliable guide. You will color your own eight-shade chart and keep a three-day log of water, color and thirst, including an active day.

Then you will travel with the pioneers on the Oregon Trail, who planned their whole journey around rivers, springs and water barrels. You will plan a family walk, decide how much water to carry and when to drink, measure what you really drank, and improve the plan on a second walk.

PREREQUISITES

- Knows the warm-up and cool-down from Unit 1
- Can measure with a measuring cup and add and subtract halves ($\frac{1}{2}$ cup)
- Can make a simple bar graph

MASTERY CHECKLIST

- ☐ I can name five warning signs of dehydration.
- ☐ I can use a urine color chart and explain why urine gets darker when I am low on water.
- ☐ I can explain how much water children my age need and how to drink during activity.
- ☐ I can tell how the pioneers planned their water on the Oregon Trail.
- ☐ I can make and follow a water plan for a walk or hike.

OPTIONAL BOOKS AND GEAR FOR THIS UNIT

- **“Dehydration” (Nemours KidsHealth):** Free. A clear kids’ article on the signs of dehydration and how to prevent it. Read it with Lesson 2.1.
- **“Why Drinking Water Is the Way to Go” (Nemours KidsHealth):** Free. Why water is the best everyday drink, written for children.
- **Kids & Youth, Oregon National Historic Trail (National Park Service):** Free. Junior Ranger activities and pages about life on the trail, for Lesson 2.2.
- **A reusable water bottle with ounce marks:** Optional. Makes the water logs easier. Any bottle and a measuring cup work just as well.

Not required. Every activity in this unit works without them. School Launch has no ties to these authors, publishers or companies.

LESSONS IN THIS UNIT

2.1 Warning Signs of Dehydration

3 sessions of 30–40 minutes

2.2 Water on the Trail

3 sessions of 30–40 minutes

UNIT 2 REVIEW

Answer each question. Show your work for the calculation. The review is worth 30 points.

1. **5 pts**

List five warning signs of dehydration.

2. **4 pts**

What did Lawrence Armstrong’s 1994 study show about urine color? What colors mean you are drinking enough?

3. **4 pts**

Why does urine get darker when you are low on water? Which organs make the decision?

4. **5 pts**

Noah starts a walk with 3 cups of water in his bottle. When he gets home, $1\frac{1}{2}$ cups are left. How much did he drink on the trail? If the walk took 60 minutes and he drank every 20 minutes, about how much did he drink each time?

5. **4 pts**

Why did the Oregon Trail follow rivers? Name two ways the pioneers planned for water.

6. **4 pts**

Give a good water plan for an hour-long walk on a warm day.

7. **4 pts**

What would happen if you played soccer for an hour on a hot day and drank nothing?

ANSWER KEY

1. Any five: thirst, dry or sticky mouth, dark yellow urine (or very little urine), headache, tiredness, dizziness, grumpiness, feeling weak during play.
2. That the color of urine, matched to a chart of eight shades, agreed closely with laboratory tests of how much water the body has. Pale yellow like lemonade (colors 1–3) means you are drinking enough; dark like apple juice means you need water.
3. The kidneys hold on to as much water as they can, so the wastes in urine are mixed with less water and the urine looks darker and there is less of it.
4. $3 - 1\frac{1}{2} = 1\frac{1}{2}$ cups on the trail. $60 \div 20 = 3$ drinks, so $1\frac{1}{2} \div 3 = \frac{1}{2}$ cup each time.
5. People and animals needed water every day, and rivers supplied it. Any two: guidebooks listing camps with water, wood and grass; water barrels on the wagons; canteens; filling every container before a dry stretch; camping at springs and streams; boiling bad water or avoiding it.
6. Drink 1 cup before leaving; carry enough water; take about $\frac{1}{2}$ cup (3–4 big gulps) every 15–20 minutes, resting in the shade; drink 1 cup at the end; check urine color afterward. Walk in the cooler part of the day.
7. You would lose a lot of water in sweat; you would become thirsty, your urine would turn dark, and you might get a headache, feel tired or dizzy, play worse and be at risk of a heat illness. You should stop, rest in the shade, sip water and tell an adult.

UNIT CHALLENGE: A FAMILY HIKE WITH A WATER PLAN

Plan and lead your family on a walk or hike of at least 45 minutes. Make a map, a water plan for every walker, and a packing list. On the walk, run the water stops on time and keep the log: cups drunk, thirst, energy and the weather. Afterward, measure what everyone drank, check your urine color, and make a bar graph comparing what each walker planned to drink with what each one actually drank. Finish with a paragraph: What went well? What will you change next time?

LOOK FOR	WHAT IT MEANS
Careful plan	A clear map, a water plan with the math worked out, and a packing list including hats, sunscreen and water for everyone.
Following the plan	Water stops kept on time with the log filled in at each stop.
Measuring and graphing	Water drunk measured by subtraction and shown in a neat bar graph of planned versus actual cups.
Reflection	A paragraph naming what worked, what did not and one specific change for next time. Effort and honest records count.

UNIT 3

NUTRITION

Food is a gift from God and the fuel for everything you do. In this unit you will meet William Prout, the English doctor who in 1827 sorted the main parts of food into three great groups that we now call carbohydrates, fats and proteins, and who noticed that milk contains all three. You will learn what each group does in your body, sort your kitchen into the three groups, and make a three-fuel snack.

Then you will learn how the Nutrition Facts label came to be printed on almost every package in 1994, and how it was updated with a line for added sugars. You will run a label lab: read five labels, measure a real serving, show added sugars with teaspoons of sugar and compare two foods.

PREREQUISITES

- Knows that water is the best everyday drink (Unit 2)
- Can divide by 4 and use measuring cups and spoons
- Knows to wash hands before handling food

MASTERY CHECKLIST

- ☐ I can tell how William Prout sorted foods into three groups.
- ☐ I can explain what carbohydrates, proteins and fats do and name foods rich in each.
- ☐ I can plan and make a snack with all three groups.
- ☐ I can read the serving size, added sugars, fiber, protein and calcium on a Nutrition Facts label and use the 5% and 20% guide.
- ☐ I can change grams of added sugar into teaspoons and compare two foods.

OPTIONAL BOOKS AND GEAR FOR THIS UNIT

- **“Figuring Out Food Labels” (Nemours KidsHealth)**: Free. A kids’ guide to the Nutrition Facts label, for Lesson 3.2.
- **“What Are Carbohydrates?” (Nemours KidsHealth)**: Free. A clear kids’ article on starches, sugars and fiber, for Lesson 3.1. The same site also has a kids’ article on fats.
- **“How to Understand and Use the Nutrition Facts Label” (U.S. Food and Drug Administration)**: Free. The FDA’s own guide to the label, for parents.

Not required. Every activity in this unit works without them. School Launch has no ties to these authors, publishers or companies.

LESSONS IN THIS UNIT

3.1 Carbohydrates, Protein and Fats

3 sessions of 30–40 minutes

3.2 Reading a Nutrition Facts Label

3 sessions of 30–40 minutes

UNIT 3 REVIEW

Answer each question. Show your work for the calculations. The review is worth 30 points.

1. **4 pts**

What did William Prout discover in 1827, and what did he notice about milk?

2. **6 pts**

What does each group do in your body? Name two foods rich in each.

3. **4 pts**

Why is a snack of apple slices, cheese and peanut butter a three-fuel snack?

4. **4 pts**

When did the Nutrition Facts label appear on nearly every package, and what new line was added in the update?

5. **4 pts**

A yogurt has 16 grams of added sugars in one serving. About how many teaspoons is that? A cereal has 2 servings in your usual bowl and 9 grams of added sugars per serving. How many grams are in your bowl?

6. **4 pts**

What do 5% and 20% Daily Value mean? Name two nutrients you want to be high and two you want to be low most of the time.

7. **4 pts**

What would happen if you ate only sweets for breakfast before a morning of hard play?

ANSWER KEY

1. He found that the main parts of foods fall into three groups (today's carbohydrates, fats and proteins). He noticed that milk contains all three: milk sugar, cream (fat) and curd (protein).
2. Carbohydrates: main, quick energy for muscles and brain (oatmeal, whole-wheat bread, rice, fruit, beans). Proteins: build and repair muscles and the rest of the body (eggs, fish, chicken, beans, milk, cheese). Fats: store energy for long work, help use vitamins A, D, E and K (nuts, olive oil, avocado, fish).
3. The apple gives carbohydrates, the cheese gives protein (and some fat), and the peanut butter gives fat and protein, so all three groups are there.
4. By May 1994 (after a 1990 law). The update, required of large companies starting in 2020, added a line for Added Sugars and made the serving size bigger and bolder.
5. $16 \div 4 = 4$ teaspoons. $9 \times 2 = 18$ grams of added sugars in the bowl (about $4\frac{1}{2}$ teaspoons).
6. 5% or less is low; 20% or more is high. High: fiber, calcium, iron, potassium, vitamin D (any two). Low: added sugars, sodium (or saturated fat).
7. You would get quick energy that runs out fast, so you might feel tired, hungry and less able to play or think well later in the morning. A breakfast with whole grains, protein and some fat gives steady energy that lasts.

UNIT CHALLENGE: MY THREE-FUEL BREAKFAST PLAN

Plan three breakfasts for three days, each with all three fuel groups, at least one fruit or vegetable, and a drink of water or milk. Use labels to choose foods low in added sugars (5% DV or less when you can) and with fiber. Write each menu, help prepare each breakfast with a parent, and rate your energy (1–5) at mid-morning each day during active play. Finish with a page showing each menu, the groups in each food, one label you used, your energy ratings, and a paragraph about which breakfast you liked best and why.

LOOK FOR	WHAT IT MEANS
Balanced menus	Three breakfasts, each with carbohydrates, protein, fat, a fruit or vegetable and a good drink, with the groups labeled.
Label skills	At least one label copied and used correctly, with added sugars changed into teaspoons.
Kitchen help	The student helped prepare each breakfast, washed hands and followed the parent's safety rules.
Record and reflection	Energy ratings for all three days and a paragraph about what was learned. Effort and honest records count.

3.1 CARBOHYDRATES, PROTEIN AND FATS

OBJECTIVES

- Tell how the English doctor William Prout sorted the main parts of food into three groups in 1827.
- Explain what carbohydrates, proteins and fats each do in the body, and name everyday foods rich in each.
- Sort the foods in your kitchen into the three groups and prepare a three-fuel snack plate.

Warm-up. Fuel warm-up: jog in place for 30 seconds (“carbohydrates: quick energy”), hold a wall sit for 20 seconds (“protein: building strong muscles”), then walk slowly around the room for 1 minute (“fats: long, slow energy”). Finish with 10 arm circles each way. Think about it: why do you feel hungry after a morning of hard play?

WATCH



Nutrition for Kids | What Is Nutrition? | Twinkl USA

Twinkl Teaching Resources - United States • 3:45

<https://www.youtube.com/watch?v=VpfYP2NtHfs>

WHEN TO WATCH

After the “How your body works” paragraph. Listen for the six kinds of nutrients and what each one does.

Note: A short cartoon from a large educational publisher. It ends with an invitation to its website.

KEY TERMS

nutrient

A part of food that the body needs to work, grow and repair itself, such as carbohydrates, proteins, fats, vitamins, minerals and water.

carbohydrate

A nutrient in grains, fruits, vegetables, beans and milk that gives the body its main, quick energy. Starches, sugars and fiber are carbohydrates.

protein

A nutrient in meat, fish, eggs, beans, nuts, milk and cheese that builds and repairs muscles, skin, blood and every other part of the body.

fat

A nutrient in oils, nuts, seeds, avocados, butter, cheese and meat that stores energy, helps the body use some vitamins and keeps you warm.

fiber

The part of plant foods that the body does not digest. It keeps your digestion working well and helps you feel full.

CORE IDEAS

The story. Two hundred years ago, nobody knew what food was made of. People knew that bread, meat and milk kept them alive, but not why. William Prout was an English doctor and chemist in London who spent years studying food in his laboratory. In 1827 he reported to the Royal Society, a famous club of scientists, that the important parts of foods fall into three great groups. He called them the “saccharine” group (sugars and starches), the “oily” group and the “albuminous” group, named for egg white. Today we call them **carbohydrates**, **fats** and **proteins**.

How they figured it out. Prout carefully analyzed small samples of many foods, measuring the elements each one was made of, and he noticed that they fell into three kinds. Then he noticed something wonderful about milk, the first food of every baby. Milk contains all three groups: the sugar of milk, the cream (a fat) and the curd (a protein). Prout reasoned that if milk alone can feed a growing baby, then good meals need all three groups too. Later scientists added vitamins and minerals to the list, but Prout’s three groups are still at the center of nutrition today.

How your body works. **Carbohydrates** are your body’s main fuel. Your digestion breaks starches and sugars down into a sugar called glucose, which your blood carries to your muscles and brain. Whole grains (oatmeal, brown rice, whole-wheat bread), fruits, vegetables and beans give steady energy plus fiber, vitamins and minerals. **Proteins** are your building blocks. Your body uses them to build and repair muscle, skin, hair, blood and organs, which matters a great deal while you are growing. Children your age need about 34 grams a day, easy to get from ordinary meals: an egg has about 6 grams and a cup of milk about 8. **Fats** store energy for long, slow work, help your body use vitamins A, D, E and K, and help build your

brain. Nuts, seeds, olive oil, avocados and fish give especially good fats. Every meal works best with some of each, and God gave us a great variety of foods to enjoy them in.

Think it through. Most foods contain more than one group. Peanut butter has protein and fat; milk has all three; bread is mostly carbohydrate with some protein. We sort a food by its *main* nutrient. Foods with a lot of added sugar, such as candy and soda, are sometimes foods: they give quick energy but little else.

Try it. This week you will become a food detective: you will sort the foods in your kitchen into Prout's three groups using their labels, then plan and make a three-fuel snack plate and notice how long its energy lasts when you play.

PICTURE STUDY



A Woman Preparing Bread and Butter for a Boy, Pieter de Hooch, About 1660–1663 · Oil on canvas · J. Paul Getty Museum, Los Angeles

Image: [Wikimedia Commons](#), public domain

Pieter de Hooch was a Dutch painter who loved to paint quiet moments in ordinary homes, with light pouring in through doors and windows. Here a mother butters bread for her son before he leaves. Through the doorway, on the building across the street, you can read the word “Schole,” old Dutch for school. The boy holds his hat and bows his head, perhaps saying grace before he eats.

Look closely

- Find the loaf of bread and the butter dish. Which of Prout’s groups is bread mostly made of? Which group is butter?
- Look at the boy. What is he doing with his hat and his head? Why might he do that before eating?
- Find the word on the building across the street. Where do you think the boy is going after his breakfast?
- Follow the light from the windows and the open door. Where is it brightest?

Talk about it

1. Bread and butter gives carbohydrates and fat. What could the boy add for protein?
2. Why is it wise to eat before a morning of school and play?

3. What is your family's habit before meals? Why do Christians give thanks for food?

Safety first. Wash your hands before handling food. Check with a parent about food allergies (especially nuts, milk, eggs and wheat) before making or tasting any snack, and let a parent handle sharp knives.

ACTIVITY

Food Detective and the Three-Fuel Snack

You will sort the foods in your kitchen into Prout's three groups, then use what you learn to make a snack with all three. Finally you will test how long its energy lasts.

You will need

- About 15 foods from your kitchen (packages with Nutrition Facts labels, plus fresh foods)
- Three sheets of paper labeled Carbohydrates, Proteins and Fats
- Snack foods chosen with a parent: for example, apple slices, whole-grain crackers, cheese, yogurt, a hard-boiled egg, peanut butter, hummus, carrots
- A plate, a butter knife, and a parent to help
- Fitness journal and a timer

Steps

1. **Wash your hands.** Lay out the three labeled sheets on the table.
2. **Sort.** For each package, find the Nutrition Facts label and read the grams of Total Carbohydrate, Protein and Total Fat. Put the food on the sheet for the group with the *most* grams. For fresh foods without labels, decide together (fruits and vegetables: carbohydrates; eggs, meat and beans: proteins; oils and nuts: fats, though nuts have protein too).
3. **Record.** In your journal, make a table with three columns and list every food in its group. Put a star next to any food that clearly belongs to two groups.
4. **Plan a three-fuel snack.** Choose one food from each group, for example apple slices (carbohydrate), cheese (protein) and a spoonful of peanut butter (fat and protein), or whole-grain crackers, an egg and a few walnuts. Draw your plate and label each food.
5. **Make it** with a parent's help, using a butter knife. Give thanks, eat it slowly and drink a glass of water with it.

6. **Energy test.** About an hour after your snack, play actively for 20 minutes (tag, biking or 3 rounds of your fitness-check stations). Rate your energy from 1 to 5 at the start, after 10 minutes and at the end.
7. **Session 3: Compare.** On another day, try a different three-fuel snack (or have the same one before a different activity). Repeat the energy test the same way and compare. Which snack kept your energy up longest? Write what you think made the difference.

Tips

- Choose whole grains when you can: look for the word “whole” at the start of the ingredient list.
- A snack is a small meal, not a feast. A few crackers, a slice of cheese and half an apple are plenty.
- Fruits and vegetables count as carbohydrates and also bring vitamins, minerals, water and fiber.

Check your work

- ☐ I can tell how William Prout sorted foods into three groups.
- ☐ I can explain what carbohydrates, proteins and fats each do and name two foods rich in each.
- ☐ I sorted my kitchen foods, made a three-fuel snack and recorded my energy test.

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1. Copy your three-column food table. Star the foods that belong to more than one group.
2. Draw your three-fuel snack plate and label each food with its group.
3. Make a small chart of your energy ratings (1–5) at three times for both snacks.
4. Write two sentences: Which group gives quick energy? Which builds your muscles? Which stores energy for long, slow work?

From history. The word “protein” was first used in 1838 by the Dutch chemist Gerardus Mulder, from a Greek word meaning “of first importance.” Scientists did not discover vitamins until the early 1900s, when they found that animals fed only purified carbohydrates, proteins and fats became sick: something else in real foods was needed too.

COMMON MISTAKES

- Thinking carbohydrates or fats are bad. Your body needs all three groups; the best sources are whole grains, fruits, vegetables, beans, nuts and oils.
- Thinking you need special foods or drinks to grow strong. Ordinary meals give children all the protein they need.
- Eating a snack of only sweets. Quick sugar runs out fast; add a protein or fat for lasting energy.
- Skipping breakfast before an active morning. Your muscles and brain need fuel.

Make it a game • Prout's Three Piles. Pick ten foods from the kitchen. Race the clock to sort them into three piles: carbohydrate, protein and fat. Say what each does in the body, then tell William Prout's story. Your parent can challenge one answer. Whoever defends a sort best gets the point. Beat your time on a second sort.

Scripture. “Whether therefore ye eat, or drink, or whatsoever ye do, do all to the glory of God.” (1 Corinthians 10:31, KJV)

Even an ordinary snack can be done to God’s glory: thanking Him for it, choosing foods that fuel our work and play, and giving some to others.

3.2 READING A NUTRITION FACTS LABEL

OBJECTIVES

- Tell how the Nutrition Facts label came to be printed on packaged foods in 1994 and updated with an added-sugars line.
- Find the serving size, servings per container, added sugars, fiber, protein and calcium on a label, and use the 5 percent and 20 percent guide.
- Measure a real serving, change grams of added sugar into teaspoons, and compare two foods.

Warm-up. Grocery-store warm-up: carry two full cans or water bottles, one in each hand, and walk around the room for 1 minute, standing tall (a “farmer’s carry”). Then 10 squats, as if lifting a box from a low shelf, and 10 reaches up to a high shelf on your toes. Think about it: when you choose a box of cereal, how do you know what is inside?

WATCH

How to Read a Nutrition Label for Kids [United States]

Dietitian Success Center Inc. • 10:17

<https://www.youtube.com/watch?v=Epv2wQ2Pv3s>

WHEN TO WATCH

After the “How they figured it out” paragraph. Follow along with a real label in your hand as the video goes through the five steps.

Note: Made for children by a registered dietitian’s teaching channel. It shows the current U.S. label and reads its numbers, including the food-energy line, which we skip in this course. It ends with a short advertisement for the channel’s website.

KEY TERMS

Nutrition Facts label

The box printed on packaged foods in the United States that tells the serving size and the nutrients in one serving.

serving size

The amount of food that all the numbers on the label are based on, such as 1 cup of cereal or 2 crackers.

% Daily Value

How much of a whole day's need (or limit) for a nutrient one serving gives. 5% or less is low; 20% or more is high.

added sugars

Sugars and syrups put into a food when it is made, not the sugar found naturally in fruit or plain milk.

gram

A small unit of weight. A paper clip weighs about 1 gram, and 4 grams of sugar is about 1 teaspoon.

CORE IDEAS

The story. A hundred years ago, most families bought flour, beans and coffee from a clerk who scooped them from barrels behind a counter. In 1916 a grocer in Memphis named Clarence Saunders opened Piggly Wiggly, one of the first stores where shoppers walked the aisles and chose packages for themselves. As more and more food came in boxes and cans, people began to ask: what is inside this package? In 1990 the United States Congress passed a law requiring a clear, matching nutrition label on almost all packaged foods. A designer named Burkey Belser designed the plain black-and-white box, with bold lines and the title "Nutrition Facts," so that anyone could read it quickly. By May 1994 it was on nearly every package in the country.

How they figured it out. Belser and the Food and Drug Administration (FDA) tried many versions before choosing one that was quick and easy to read. They chose one typeface, put the most important facts at the top and used thick lines to separate the parts. Over the years, doctors learned that people were eating far more added sugar than was good for them, so the FDA updated the label. Starting in 2020, large companies had to make the serving size bigger and bolder and add a new line: **Added Sugars.**

How your body works. Read a label from the top. **1. Serving size and servings per container.** Every number on the label is for one serving; if you eat two servings, double them. **2. The nutrients.** You will find Total Fat, Sodium (salt), Total Carbohydrate (with Dietary Fiber and Added Sugars underneath), Protein, and minerals such as Calcium and Iron. **3. % Daily Value.** 5% or less is low; 20% or more is high. Look for foods high in fiber, calcium, iron and potassium, which help your digestion, bones and blood. Choose foods low in added sugars and sodium most of

the time. Doctors suggest that children have less than about 25 grams of added sugar a day, about 6 teaspoons. Since 4 grams of sugar is about 1 teaspoon, a drink with 24 grams of added sugar holds about 6 teaspoons, a whole day's worth.

Think it through. A label helps you choose; it does not make any food “good” or “bad.” A birthday cake is a fine treat at a party. The label simply helps you know which foods are everyday foods and which are sometimes foods. In this course we skip the food-energy line at the top of the label; you will learn about it in older grades.

Try it. This week you will run a label lab: read five labels, measure a real serving, show added sugars with teaspoons of sugar, and compare two foods to choose the better everyday choice.

PICTURE STUDY



Interior of a Piggly Wiggly Self-Service Grocery Store, Clarence Saunders (publisher), 1918 · Photograph · Library of Congress, Washington, D.C.
Image: [Wikimedia Commons](#), public domain

This photograph shows one of the first Piggly Wiggly stores in Memphis, Tennessee, in 1918, two years after Clarence Saunders opened the first one. Shoppers came in through the turnstile, picked up a basket, walked past every shelf and chose their own packages. For the first time, the package itself had to tell the shopper what was inside.

Look closely

- Find the turnstile at the front. Why would a store want everyone to go in one way?
- Look at the shelves. Are most of the foods in cans, boxes or jars? Why would packaged foods suit a self-service store?
- Can you find any fresh fruits or vegetables in the picture? Where might people have bought them?
- Imagine walking the aisle. How would you know what was in each can without a label?

Talk about it

1. What would a shopper in 1918 have read on a can? What would you want to know that they could not find out?

2. Why do you think the government decided that every package should have the same kind of label?
3. Which five packages in your kitchen would you most like to check?

Safety first. If you taste or handle food, wash your hands first and check with a parent about allergies. Use a clean spoon for the sugar display, put the sugar back or use it in cooking afterward, and do not eat spoonfuls of plain sugar.

ACTIVITY

The Label Lab

You will read real labels like a scientist, measure a real serving, and turn grams of added sugar into teaspoons you can see.

You will need

- Five or more packages with Nutrition Facts labels: for example, a breakfast cereal, a yogurt, crackers, a granola bar and a juice or other sweet drink
- Measuring cups, a teaspoon, a small bowl of sugar and five clear cups
- A cereal bowl
- Fitness journal with a label table: Food, Serving size, Servings per container, Added sugars (g and %DV), Fiber (g), Protein (g), Calcium (%DV)

Steps

1. **Read five labels.** For each package, copy the serving size, servings per container, added sugars (grams and % Daily Value), fiber, protein and calcium into your table.
2. **High or low?** Beside each % Daily Value, write L (5% or less) or H (20% or more). Circle any food that is high in fiber or calcium, and any that is high in added sugars.
3. **Sugar in teaspoons.** For each food, divide the grams of added sugars by 4 to find about how many teaspoons are in one serving. (Example: $12 \text{ grams} \div 4 = 3 \text{ teaspoons}$.) Label a clear cup for each food and spoon in that many level teaspoons of sugar. Line up the cups from least to most.
4. **The serving-size test.** Pour yourself a bowl of cereal the way you usually do. Then pour it into a measuring cup. How does your usual bowl compare with the serving size on the box? If you usually eat two servings, double the numbers on the label.
5. **Compare two foods.** Choose two foods of the same kind (two cereals, two yogurts or two granola bars). For each one, write the fiber, protein and added

sugars. Using the 5% and 20% guide, decide which is the better everyday choice and explain why in one sentence.

6. **Move break.** Between steps, do 10 farmer's-carry steps with two cans or full bottles, or 10 squats. Label lab is still P.E.!
7. **Session 3: Shop like a scientist.** On your next trip to the store with a parent (or with packages at home), find a breakfast food or snack that is low in added sugars (5% DV or less) and has at least 3 grams of fiber. Copy its label into your journal. Then add one new food to your sugar-cup line and see where it fits.

Tips

- Plain milk and fruit contain natural sugar, but their Added Sugars line says 0 g. Read that line, not just Total Sugars.
- Drinks often have the most added sugar of all. Water and milk are the best everyday drinks.
- Check the ingredient list too: ingredients are listed from most to least by weight.

Check your work

- ☐ I can tell how the Nutrition Facts label began and why the added-sugars line was added.
- ☐ I can find the serving size and use the 5% and 20% guide.
- ☐ I can turn grams of added sugar into teaspoons by dividing by 4.

FITNESS JOURNAL

1. Copy your label table for five foods, with L and H marked beside each % Daily Value.
2. Draw your line of sugar cups from least to most, with the food and the number of teaspoons under each.
3. Draw a Nutrition Facts label from memory and label the serving size, added sugars, fiber, protein and calcium.
4. Write two sentences: Which food surprised you most? What everyday swap would you like to make?

From history. Before 1994, some packages listed nutrients and some did not, and each company could use its own design and serving sizes. Belser's design firm made the label without charge, as a public service. Many other countries have since adopted labels that look very much like it.

COMMON MISTAKES

- Forgetting the serving size. If you eat two servings, you get twice everything on the label.
- Reading Total Sugars instead of Added Sugars. Fruit and milk have natural sugar; Added Sugars shows what was put in.
- Thinking a food is healthy because the front of the box says so. The label on the back tells the facts.
- Thinking one sweet food ruins a day. Treats are fine in their place; the label helps with everyday choices.

Make it a game • Label Lab Blitz. Choose a food package and give yourself sixty seconds to find the serving size, servings per container, added sugars, fiber and protein. Tell what the 5 percent and 20 percent guide says about each. Your parent keeps score of correct answers. Then use a second package to beat your record.

UNIT 3

NUTRITION

Food is a gift from God and the fuel for everything you do. In this unit you will meet William Prout, the English doctor who in 1827 sorted the main parts of food into three great groups that we now call carbohydrates, fats and proteins, and who noticed that milk contains all three. You will learn what each group does in your body, sort your kitchen into the three groups, and make a three-fuel snack.

Then you will learn how the Nutrition Facts label came to be printed on almost every package in 1994, and how it was updated with a line for added sugars. You will run a label lab: read five labels, measure a real serving, show added sugars with teaspoons of sugar and compare two foods.

PREREQUISITES

- Knows that water is the best everyday drink (Unit 2)
- Can divide by 4 and use measuring cups and spoons
- Knows to wash hands before handling food

MASTERY CHECKLIST

- ☐ I can tell how William Prout sorted foods into three groups.
- ☐ I can explain what carbohydrates, proteins and fats do and name foods rich in each.
- ☐ I can plan and make a snack with all three groups.
- ☐ I can read the serving size, added sugars, fiber, protein and calcium on a Nutrition Facts label and use the 5% and 20% guide.
- ☐ I can change grams of added sugar into teaspoons and compare two foods.

OPTIONAL BOOKS AND GEAR FOR THIS UNIT

- **“Figuring Out Food Labels” (Nemours KidsHealth):** Free. A kids’ guide to the Nutrition Facts label, for Lesson 3.2.
- **“What Are Carbohydrates?” (Nemours KidsHealth):** Free. A clear kids’ article on starches, sugars and fiber, for Lesson 3.1. The same site also has a kids’ article on fats.
- **“How to Understand and Use the Nutrition Facts Label” (U.S. Food and Drug Administration):** Free. The FDA’s own guide to the label, for parents.

Not required. Every activity in this unit works without them. School Launch has no ties to these authors, publishers or companies.

LESSONS IN THIS UNIT

3.1 Carbohydrates, Protein and Fats

3 sessions of 30–40 minutes

3.2 Reading a Nutrition Facts Label

3 sessions of 30–40 minutes

UNIT 3 REVIEW

Answer each question. Show your work for the calculations. The review is worth 30 points.

1. **4 pts**

What did William Prout discover in 1827, and what did he notice about milk?

2. **6 pts**

What does each group do in your body? Name two foods rich in each.

3. **4 pts**

Why is a snack of apple slices, cheese and peanut butter a three-fuel snack?

4. **4 pts**

When did the Nutrition Facts label appear on nearly every package, and what new line was added in the update?

5. **4 pts**

A yogurt has 16 grams of added sugars in one serving. About how many teaspoons is that? A cereal has 2 servings in your usual bowl and 9 grams of added sugars per serving. How many grams are in your bowl?

6. **4 pts**

What do 5% and 20% Daily Value mean? Name two nutrients you want to be high and two you want to be low most of the time.

7. **4 pts**

What would happen if you ate only sweets for breakfast before a morning of hard play?

ANSWER KEY

1. He found that the main parts of foods fall into three groups (today's carbohydrates, fats and proteins). He noticed that milk contains all three: milk sugar, cream (fat) and curd (protein).
2. Carbohydrates: main, quick energy for muscles and brain (oatmeal, whole-wheat bread, rice, fruit, beans). Proteins: build and repair muscles and the rest of the body (eggs, fish, chicken, beans, milk, cheese). Fats: store energy for long work, help use vitamins A, D, E and K (nuts, olive oil, avocado, fish).
3. The apple gives carbohydrates, the cheese gives protein (and some fat), and the peanut butter gives fat and protein, so all three groups are there.
4. By May 1994 (after a 1990 law). The update, required of large companies starting in 2020, added a line for Added Sugars and made the serving size bigger and bolder.
5. $16 \div 4 = 4$ teaspoons. $9 \times 2 = 18$ grams of added sugars in the bowl (about $4\frac{1}{2}$ teaspoons).
6. 5% or less is low; 20% or more is high. High: fiber, calcium, iron, potassium, vitamin D (any two). Low: added sugars, sodium (or saturated fat).
7. You would get quick energy that runs out fast, so you might feel tired, hungry and less able to play or think well later in the morning. A breakfast with whole grains, protein and some fat gives steady energy that lasts.

UNIT CHALLENGE: MY THREE-FUEL BREAKFAST PLAN

Plan three breakfasts for three days, each with all three fuel groups, at least one fruit or vegetable, and a drink of water or milk. Use labels to choose foods low in added sugars (5% DV or less when you can) and with fiber. Write each menu, help prepare each breakfast with a parent, and rate your energy (1–5) at mid-morning each day during active play. Finish with a page showing each menu, the groups in each food, one label you used, your energy ratings, and a paragraph about which breakfast you liked best and why.

LOOK FOR	WHAT IT MEANS
Balanced menus	Three breakfasts, each with carbohydrates, protein, fat, a fruit or vegetable and a good drink, with the groups labeled.
Label skills	At least one label copied and used correctly, with added sugars changed into teaspoons.
Kitchen help	The student helped prepare each breakfast, washed hands and followed the parent's safety rules.
Record and reflection	Energy ratings for all three days and a paragraph about what was learned. Effort and honest records count.

UNIT 4

STRENGTH

Strength is the power to push, pull, lift, carry and hold your body steady. In this unit you will learn why astronauts on the International Space Station must exercise about two hours every day: in space, muscles and bones that are not used grow weaker. You will learn the rule of “use it or lose it,” and how muscles and bones grow stronger with work, rest, food and sleep. Then you will run your own astronaut training week with five bodyweight exercises and a retest.

Next you will meet Ronald Morgan and Graham Adamson, two teachers at the University of Leeds who invented circuit training in 1953 so that every student in a crowded gym could work at once. You will set up and run your own six-station circuit with a timer, keep your numbers, retest to improve and teach it to your family.

PREREQUISITES

- Has done the home fitness check (Lesson 1.2) and knows the warm-up and cool-down
- Knows that protein builds and repairs the body (Unit 3)
- Can use a timer for 30-second intervals

MASTERY CHECKLIST

- ☐ I can explain why astronauts must exercise in space and what “use it or lose it” means.
- ☐ I can explain how muscles and bones grow stronger through work, rest, food and sleep.
- ☐ I can show good form in the squat, push-up, wall sit, plank and step-up.
- ☐ I can tell how circuit training was invented and set up a six-station circuit with a timer.
- ☐ I can train safely: body weight only, good form first, rest days, and stop at pain.

OPTIONAL BOOKS AND GEAR FOR THIS UNIT

- **“Train Like an Astronaut” (NASA):** Free. NASA’s fitness missions for children, with activity sheets for strength, balance and endurance. A good companion to Lesson 4.1.
- **“Why Do I Need to Sleep?” (Nemours KidsHealth):** Free. A kids’ article on how much sleep children need and why, for the recovery part of Lesson 4.1.

Not required. Every activity in this unit works without them. School Launch has no ties to these authors, publishers or companies.

LESSONS IN THIS UNIT

4.1 How Muscles Grow Stronger

3 sessions of 30–40 minutes

4.2 A Bodyweight Circuit

3 sessions of 30–40 minutes

UNIT 4 REVIEW

Answer each question in complete sentences. The review is worth 30 points. You may show a movement as part of your answer.

1. **5 pts**

Why must astronauts on the International Space Station exercise about two hours every day? Name the three machines they use.

2. **5 pts**

Name the four things your muscles and bones need to grow stronger, with an example of each.

3. **4 pts**

What does “use it or lose it” mean? Give an example from space and one from your own life.

4. **4 pts**

Who invented circuit training, where and when, and what problem were they solving?

5. **4 pts**

Give one form cue each for the squat, the push-up and the plank.

6. **4 pts**

Maya did 12 squats in 30 seconds on Monday. She adds 1 squat each workout and trains on Wednesday, Friday and the next Monday. How many squats will she aim for on the next Monday? Why does she rest on Tuesday and Thursday?

7. **4 pts**

What would happen if you did as many push-ups as you could every day, with no rest days and very little sleep?

ANSWER KEY

1. In microgravity their muscles and bones barely have to work, so the muscles shrink and the bones lose mineral (about 1 percent or more a month unless they exercise hard). They use a treadmill with a harness, a stationary bicycle and a weight-lifting machine (ARED).
2. Work (exercise that is a little hard, such as squats or jumping); rest (a day off between hard workouts for the same muscles); food (protein such as eggs, milk or beans, and calcium for bones); sleep (9 to 12 hours a night for children ages 6–12).
3. Muscles and bones grow stronger when they work and weaker when they are not used. In space, astronauts' legs weaken because they never stand or walk. On earth, a child who stops playing and sits all summer becomes weaker; a child who runs and climbs grows stronger.
4. Ronald Morgan and Graham Adamson at the University of Leeds in England, in 1953. They needed a way for many students in one gym to get a good workout at the same time in a short class.
5. Squat (any one): sit back as onto a chair, chest up, knees over toes, heels down. Push-up: body straight as a board, hands under shoulders, chest to a fist from the floor. Plank: elbows under shoulders, straight line from head to heels, squeeze seat and stomach, breathe.
6. $12 + 1 + 1 + 1 = 15$ squats. She rests so her muscles can recover and rebuild stronger.
7. Your muscles would not have time to recover, so you would become tired and sore, your form would slip, your numbers would stop improving or drop, and you could get hurt. Rest and sleep are part of training.

UNIT CHALLENGE: TWO-WEEK CIRCUIT CHALLENGE

Use your round-1 numbers from Lesson 4.2 as your “before” numbers. For two weeks, run your six-station circuit (or your astronaut training) every other day, about 7 workouts, keeping a chart of every workout and adding a rep or 5 seconds when your form stays good. Rest, play, eat well and sleep on the days in between. At the end, run the circuit again exactly the same way and record your “after” numbers. Make a before-and-after bar graph for each station and write a paragraph about what improved, what was hard and what you learned about getting stronger little by little.

LOOK FOR	WHAT IT MEANS
Faithful training	About 7 workouts in two weeks, each recorded with the date and numbers, with rest days in between.
Good form	A parent watches the after test and confirms good form at every station.
Fair before-and-after test	The same stations, times, rests and push-up level for both tests, with numbers recorded honestly.
Graph and reflection	A neat before-and-after bar graph and a paragraph naming what improved, what was hard and what was learned. Effort and improvement count, not the size of the numbers.

4.1 HOW MUSCLES GROW STRONGER

OBJECTIVES

- Tell why astronauts on the International Space Station must exercise about two hours every day.
- Explain how muscles and bones grow stronger through work, rest, food and sleep (“use it or lose it”).
- Find starting numbers for five bodyweight exercises, train three times in a week with rest days, and retest.

Warm-up. Astronaut warm-up: “float” slowly in place for 30 seconds (big slow arm and leg movements), then 10 jumping jacks, 10 squats, 10 slow arm circles each way and 20 seconds of fast marching. Think about it: if you floated all day and never stood or walked, what would happen to your legs?

WATCH

STEMonstrations: Exercise

NASA Johnson · 2:44

<https://www.youtube.com/watch?v=lssYrWDvv6w>

WHEN TO WATCH

After the story paragraph. Watch for what happens to bones and muscles in space and the three machines astronauts use.

Note: NASA astronaut Joe Acaba explains, aboard the International Space Station. Some astronauts are shown exercising in T-shirts or sleeveless shirts and shorts.

BACKUP VIDEO

Physical activity in space

Canadian Space Agency · 2:05

https://www.youtube.com/watch?v=YL_7SATIW-Q

To see a Canadian astronaut show the bicycle, the treadmill with its harness, and the weight-lifting machine up close.

KEY TERMS

muscle

Body tissue that pulls (contracts) to make movement. Skeletal muscles pull on bones; the heart is a muscle too.

microgravity

The nearly weightless condition astronauts feel in orbit, where they float instead of standing.

repetition (rep)

One complete movement of an exercise, such as one squat. A set is a group of reps done in a row.

recovery

The rest, food and sleep after exercise when the body repairs itself and becomes stronger.

use it or lose it

The rule that muscles and bones grow stronger when they work and weaker when they are not used.

CORE IDEAS

The story. Since the year 2000, astronauts have lived and worked aboard the International Space Station, about 250 miles above the earth, often for six months at a time. Up there, everything floats. Astronauts do not stand, walk or lift heavy things, so their legs and backs barely have to work. Doctors who studied the first long space missions found a serious problem: in space, astronauts' muscles shrink and their bones grow weaker. In space, the bones that carry an astronaut's weight on earth can lose about 1 percent or more of their mineral (the hard part of bone) every month unless the astronaut works hard to prevent it, far faster than bones change on earth. That is why every astronaut on the space station exercises for about two hours every day.

How they figured it out. NASA scientists measured astronauts' muscles and bones before and after missions, and tried different kinds of exercise to see what worked best. They built special machines. On the treadmill, an astronaut wears a harness with stretchy straps that pull him down onto the belt so he can run. The stationary bicycle has no seat; astronauts clip in their feet and pedal. The weight-lifting machine, called ARED, uses vacuum cylinders instead of heavy weights, which would float away, so astronauts can do squats, heel raises and lifts. The scientists learned that running keeps the heart and lungs strong, but muscles and bones also

need hard pushing and lifting. With the right workouts, astronauts now come home much stronger than the early space travelers did.

How your body works. You have more than 600 skeletal muscles. Each one pulls on a bone across a joint to move it. When you make a muscle work harder than it is used to, its fibers are challenged. Then, during **recovery**, your body repairs them a little stronger. Bones work the same way: when you run, jump and carry, your bones feel the pressure and build themselves stronger. This is the rule of **use it or lose it**. To grow stronger, your body needs four things: **work** (exercise that is a little hard), **rest** (a day off between hard workouts for the same muscles), **food** (protein to rebuild, carbohydrates for energy, calcium for bones) and **sleep** (children ages 6 to 12 need 9 to 12 hours a night, and much of the repair happens then).

Good form. Doctors agree that strength exercise is safe and good for children when it is supervised, uses good form and starts easy. In this course you will use only your own body weight. Move slowly and with control, breathe out as you push, and stop if anything hurts sharply or in a joint. Tired, burning muscles are normal; pain is a signal to stop and tell an adult.

Try it. This week you will be an astronaut in training. You will find your starting numbers for five exercises that work the muscles and bones astronauts must protect, train three times with rest days in between, keep a log of your sleep and protein foods, and retest at the end of the week.

PICTURE STUDY



Astronaut Shane Kimbrough with the Treadmill on the International Space Station, NASA, 2017 · Digital photograph · NASA (International Space Station, Tranquility module)

Image: [Wikimedia Commons](#), public domain

NASA astronaut Shane Kimbrough commanded the International Space Station in 2016 and 2017. Here he is working on the station's treadmill, the machine astronauts run on every day to keep their hearts, muscles and bones strong. Photographs taken by NASA belong to the public.

Look closely

- Find the treadmill belt. Why is it set into the wall or floor instead of standing on legs?
- Look at how the astronaut is holding himself still. What does he hold on to? Is he standing?
- Look at all the handrails, cables and equipment. How would it feel to live and work in this small space for six months?
- Find something in the picture that could float away. How would you keep it in place?

Talk about it

1. Why does an astronaut need a harness to run on this treadmill?
2. Which of your muscles would get weaker if you floated for six months? How would you keep them strong?

3. What do you do every day that keeps your bones strong without even trying?

Safety first. Use body weight only. Warm up first, move slowly with good form, and breathe out as you push; never hold your breath. Jump on grass or a non-slip floor and land softly. Rest at least one day between hard workouts for the same muscles, and stop and tell an adult if you feel sharp pain, pain in a joint, dizziness or chest pain.

ACTIVITY

Astronaut Training Week

Astronauts protect their legs, backs, arms and bones every day. You will train the same parts with five bodyweight exercises, three times this week, with a rest day between workouts, and log the food and sleep that help your body rebuild.

You will need

- A towel or mat on a flat, non-slip floor, and a wall
- A timer and a helper to count and check your form
- Fitness journal with a training chart: Date, Exercise, Starting number, Workout 1, Workout 2, Workout 3, Retest
- A water bottle

Steps

1. **Warm up (5 minutes)** with the astronaut warm-up above, plus 1 minute of easy jogging in place.
2. **Find your starting numbers** (Session 2), resting 2 minutes between exercises: (1) **Squats**: as many good-form squats as you can in 30 seconds. (2) **Wall sit**: back flat against the wall, knees bent to about a right angle over your ankles; hold as long as you can, up to 60 seconds. (3) **Push-ups**: wall, knee or full (choose one and write it down), as many good-form push-ups as you can in 30 seconds. (4) **Superman hold**: lie face down, arms stretched forward; lift your arms, chest and legs a few inches and hold, up to 30 seconds. (5) **Bone builders**: small two-footed hops in place, landing softly, for 30 seconds (count them).
3. **Workout 1**. After resting 5 minutes, do 2 rounds of all five exercises at your starting numbers, resting 1 minute between exercises and 2 minutes between rounds.
4. **Rest day**. Play, walk or bike, but no hard strength work. Write down your protein foods and how many hours you slept.
5. **Workout 2 (two days later)**. Warm up, then do 2 rounds again, adding 1 rep to the squats and push-ups and 5 seconds to the wall sit and superman hold.

Log every number.

6. **Rest day, then Workout 3:** add 1 more rep and 5 more seconds if your form stays good. If not, stay at the same number. That is fine.
7. **Cool down after every workout:** walk for 2 minutes, then hold gentle stretches for 20 seconds each: thighs (hold a chair and pull your heel toward your seat), calves (press against the wall), chest (hands clasped behind your back) and back (hug your knees lying down).
8. **Session 3: Retest.** At the end of the week, after a rest day, repeat the starting test exactly as before. Compare your numbers and circle every improvement.

Tips

- Good form first, numbers second. A slow, full rep builds more strength than three sloppy ones.
- Eat a meal or snack with protein within a couple of hours after a workout: eggs, milk, yogurt, cheese, beans, chicken or peanut butter.
- Go to bed on time on workout days. Sleep is when much of your body's repair happens.

Check your work

- ☐ I can explain why astronauts exercise every day in space.
- ☐ I can name the four things muscles and bones need to grow stronger: work, rest, food and sleep.
- ☐ I trained three times with rest days and recorded every set and my retest.

FITNESS JOURNAL

1. Copy your training chart and circle every number that went up from the start to the retest.
2. Draw a bent arm and label the bone, the muscle that pulls (biceps), a tendon and the elbow joint.
3. Make a table of your sleep hours and protein foods for each day of the week.
4. Write two sentences: Which exercise improved most? How did the rest days help?

From history. Astronauts lose bone fastest in their hips, legs and spine, the bones that carry their weight on earth. When they return home after months in space, they work with trainers for several weeks to rebuild their strength and balance. What NASA learns about keeping bones strong in space also helps doctors care for older people on earth.

COMMON MISTAKES

- Training the same muscles hard every day with no rest. Muscles grow stronger during recovery.
- Holding your breath during a wall sit or plank. Breathe steadily the whole time.
- Letting form slip to get one more rep: knees caving in on squats, hips sagging on push-ups.
- Thinking you need weights or machines. At your age, your own body weight is plenty.

Make it a game • Astronaut Training Week. Be an astronaut on the space station who must exercise about two hours a day to keep muscles and bones strong. Do a short training block: squat, wall push-up, plank and march. Count reps in thirty seconds each. Explain use it or lose it. Beat your reps tomorrow.

Scripture. “Come ye yourselves apart into a desert place, and rest a while” (Mark 6:31, KJV)

Jesus told His tired disciples to rest. Rest is not laziness: our muscles grow stronger while we rest and sleep, and God made us to need it.

4.2 A BODYWEIGHT CIRCUIT

OBJECTIVES

- Tell how two teachers at the University of Leeds invented circuit training in 1953.
- Explain how a circuit uses stations, a timer and rest to train the whole body.
- Set up and complete a six-station bodyweight circuit with good form, record your reps, and retest to improve.

Warm-up. Circuit warm-up: 20 seconds each of marching, arm circles, side steps, gentle trunk twists, heel raises and easy jumping jacks, moving from one spot in the room to the next like stations. Repeat once. Think about it: how could a teacher give thirty students a good workout at the same time in one gym?

WATCH

Kids Circuit Training | Ultimate Kids P.E Lessons | Focuz-Fit

Focuz-Fit · 13:33

<https://www.youtube.com/watch?v=9qGXe-sjWg0>

WHEN TO WATCH

In Session 2, after the warm-up. Follow along: six exercises, 10 reps each, three rounds.

Note: A follow-along circuit led by a British children’s coach in a T-shirt and shorts. Use the knee or wall push-up if full push-ups are too hard, and skip the diamond push-ups if your wrists or form are not ready.

KEY TERMS

circuit

A set of exercise stations done one after another, with a set time or number of reps at each and short rests in between.

station

One place in a circuit where you do one exercise.

interval

A set period of time, such as 30 seconds of work followed by 30 seconds of rest.

core

The muscles around your middle (stomach, sides and back) that hold your body steady.

round

One trip through every station of the circuit.

CORE IDEAS

The story. In 1953, at the University of Leeds in England, two physical education teachers named Ronald Morgan and Graham Adamson had a problem. They had many students, one gymnasium and only a short time for each class. How could every student get a good workout at once? Their answer was to set up exercises at stations around the gym: stepping, pressing up, skipping, lifting and more. Students moved from one station to the next in a loop, or **circuit**, so everyone was working at the same time. In 1957 they wrote a book called *Circuit Training*, and schools and sports teams around the world soon copied their idea.

How they figured it out. Morgan and Adamson wanted each student to work hard but not too hard. So first, each student tested how many reps of each exercise he could do. Then he trained at about half that number, going around the circuit several times and timing the whole thing. Every few weeks, as the students grew fitter, they tried to finish the same circuit faster, or they retested and raised their numbers. Every student had his own target, so the strong and the not-yet-strong could train side by side, each one improving.

How your body works. A good circuit trains your whole body by taking turns. While your legs rest, your arms work; while your arms rest, your core works. Your heart and lungs keep working the whole time, so a circuit builds strength and endurance together. Squats and step-ups train the big muscles of your thighs and hips, which you use to run, jump and climb stairs. Push-ups train your chest, shoulders and the backs of your arms. Planks and bear crawls train your **core**, which holds your middle steady and protects your back. Jumping jacks keep your heart pumping. Short rests between stations let your muscles recover enough to keep good form.

Good form. Squat: feet shoulder-width apart, sit back as if onto a chair, chest up, knees over toes, heels down. **Push-up:** body straight as a board, hands under shoulders, chest down to a fist from the floor or wall. **Step-up:** whole foot on the step, push through your heel, stand tall at the top, step down with control. **Plank:** elbows under shoulders, straight line from head to heels, squeeze your seat and stomach, breathe. **Bear crawl:** hands under shoulders, knees just off the floor, back flat like a table, small steps.

Try it. This week you will set up your own six-station circuit at home, run it with a timer, count your reps, and run it again later in the week to beat your own numbers. Then you will teach it to someone in your family.

PICTURE STUDY



United Workers Boys' Club, New Haven, Connecticut: In the Gymnasium, Lewis Wickes Hine, 1909 · Photograph · Library of Congress, Washington, D.C. (National Child Labor Committee Collection)

Image: [Wikimedia Commons](#), public domain

Lewis Hine was an American photographer who traveled the country photographing children, often to show where they were being made to work too hard in mills and factories. Here he photographed something good: a boys' club in New Haven, Connecticut, where working boys could come to play and exercise. The boys are in the middle of an arm exercise, all together.

Look closely

- Count the boys you can see. How many are doing the exercise the same way?
- Find the basketball hoop. Basketball had been invented only eighteen years earlier, in 1891. What else might the boys have done in this gym?
- Look at the boys' clothes and shoes. Were they dressed for exercise? What would you change?
- Look at the floor and the walls. How much room did each boy have?

Talk about it

1. These boys all did the same exercise at the same time. How is a circuit different?
2. If you could set up six stations in this gym, what would they be?

3. Why do you think a club for working boys would give them a gym?

Safety first. Body weight only. Set up stations on a flat, non-slip floor with space between them and nothing to trip over. Use the bottom stair (holding the rail) or a sturdy step that will not slide for step-ups. Keep good form, breathe steadily, drink water between rounds, and stop if you feel sharp or joint pain, dizziness or trouble breathing.

ACTIVITY

My Six-Station Circuit

Like Morgan and Adamson's students, you will set up stations, work with a timer, and keep your own numbers. Then you will try to beat them.

You will need

- Six spots in a room, yard or garage, each marked with a paper sign showing the exercise and one form cue
- The bottom stair or a sturdy step, a towel or mat, and a wall
- A timer that can count 30-second intervals (or a helper with a watch)
- Fitness journal with a circuit chart: Station, Round 1, Round 2, Retest round 1, Retest round 2
- A water bottle

Steps

1. **Set up.** Make six station signs: (1) Jumping jacks, (2) Squats, (3) Push-ups (your level), (4) Step-ups on the bottom stair, (5) Plank hold, (6) Bear crawl back and forth across the room. Write one form cue on each sign. Place them in a loop.
2. **Warm up (5 minutes)** with the circuit warm-up above.
3. **Round 1 (Session 2).** Work at each station for 30 seconds, then rest 30 seconds while you move to the next. Your helper counts reps at stations 1–4 and 6 (bear crawl: count lengths of the room) and seconds at station 5. One round takes 6 minutes.
4. Rest 2 minutes and drink water. Do Round 2 the same way. If your form is still good, you may do a third round.
5. **Record** every number in your circuit chart. These are your “before” numbers.
6. **Follow along** with the video circuit on another day this week for extra practice, keeping your form cues in mind.
7. **Cool down:** walk slowly for 2 minutes, then hold gentle stretches for 20 seconds each for your thighs, calves, chest and back.

8. Session 3: Retest and teach. At least two days later, run the same circuit in exactly the same way. Try to add 1 or 2 reps (or 5 seconds) at each station while keeping good form. Record your numbers and circle every improvement. Then teach the circuit to a family member: show each station, say the form cue and be the timer.

Tips

- Start each station at a pace you can keep for all 30 seconds. Going all-out in the first 10 seconds makes the rest of the station hard.
- If a station is too hard, make it easier: wall push-ups, a shorter plank, slower jumping jacks. If it is too easy, slow down and do each rep perfectly.
- Count out loud on the way up. It reminds you to breathe out as you push.

Check your work

- ☐ I can tell how Morgan and Adamson invented circuit training and why.
- ☐ I can show good form and name a form cue at each of my six stations.
- ☐ I completed my circuit with a timer, recorded my reps and retested to improve.

FITNESS JOURNAL

1. Draw a map of your circuit with the six stations in a loop. Write the form cue beside each one.
2. Copy your circuit chart for both days. Make a bar graph with two bars (before and retest) for each station.
3. Write which muscles each station trains (legs, arms and chest, core, or heart and lungs).
4. Write two sentences: Which station was hardest? How did teaching it to someone else go?

From history. Ronald Morgan and Graham Adamson first described circuit training in the 1950s, and their book *Circuit Training* appeared in 1957. Circuits are still used today in school P.E. classes, sports teams and gyms, because they train many people at once with simple equipment.

COMMON MISTAKES

- Rushing through reps with poor form to get a bigger number. Slow, full reps build more strength.

- Skipping the rest between stations. Rest lets you keep good form at the next station.
- Putting two leg stations or two arm stations next to each other. Take turns so muscles can recover.
- Placing stations too close together or near furniture. Give yourself room to move safely.

Make it a game · Six Station Spin. Set up six numbered stations with a card at each: squat, push-up, plank, lunge, jumping jack, and balance. Roll or pick a card and do that station for thirty seconds. Rest fifteen seconds between. Say which body parts each uses. Complete two rounds and tell how the Leeds teachers invented circuit training.

UNIT 4

STRENGTH

Strength is the power to push, pull, lift, carry and hold your body steady. In this unit you will learn why astronauts on the International Space Station must exercise about two hours every day: in space, muscles and bones that are not used grow weaker. You will learn the rule of “use it or lose it,” and how muscles and bones grow stronger with work, rest, food and sleep. Then you will run your own astronaut training week with five bodyweight exercises and a retest.

Next you will meet Ronald Morgan and Graham Adamson, two teachers at the University of Leeds who invented circuit training in 1953 so that every student in a crowded gym could work at once. You will set up and run your own six-station circuit with a timer, keep your numbers, retest to improve and teach it to your family.

PREREQUISITES

- Has done the home fitness check (Lesson 1.2) and knows the warm-up and cool-down
- Knows that protein builds and repairs the body (Unit 3)
- Can use a timer for 30-second intervals

MASTERY CHECKLIST

- ☐ I can explain why astronauts must exercise in space and what “use it or lose it” means.
- ☐ I can explain how muscles and bones grow stronger through work, rest, food and sleep.
- ☐ I can show good form in the squat, push-up, wall sit, plank and step-up.
- ☐ I can tell how circuit training was invented and set up a six-station circuit with a timer.
- ☐ I can train safely: body weight only, good form first, rest days, and stop at pain.

OPTIONAL BOOKS AND GEAR FOR THIS UNIT

- **“Train Like an Astronaut” (NASA):** Free. NASA’s fitness missions for children, with activity sheets for strength, balance and endurance. A good companion to Lesson 4.1.
- **“Why Do I Need to Sleep?” (Nemours KidsHealth):** Free. A kids’ article on how much sleep children need and why, for the recovery part of Lesson 4.1.

Not required. Every activity in this unit works without them. School Launch has no ties to these authors, publishers or companies.

LESSONS IN THIS UNIT

4.1 How Muscles Grow Stronger

3 sessions of 30–40 minutes

4.2 A Bodyweight Circuit

3 sessions of 30–40 minutes

UNIT 4 REVIEW

Answer each question in complete sentences. The review is worth 30 points. You may show a movement as part of your answer.

1. **5 pts**

Why must astronauts on the International Space Station exercise about two hours every day? Name the three machines they use.

2. **5 pts**

Name the four things your muscles and bones need to grow stronger, with an example of each.

3. **4 pts**

What does “use it or lose it” mean? Give an example from space and one from your own life.

4. **4 pts**

Who invented circuit training, where and when, and what problem were they solving?

5. (4 pts)

Give one form cue each for the squat, the push-up and the plank.

6. (4 pts)

Maya did 12 squats in 30 seconds on Monday. She adds 1 squat each workout and trains on Wednesday, Friday and the next Monday. How many squats will she aim for on the next Monday? Why does she rest on Tuesday and Thursday?

7. (4 pts)

What would happen if you did as many push-ups as you could every day, with no rest days and very little sleep?

ANSWER KEY

1. In microgravity their muscles and bones barely have to work, so the muscles shrink and the bones lose mineral (about 1 percent or more a month unless they exercise hard). They use a treadmill with a harness, a stationary bicycle and a weight-lifting machine (ARED).
2. Work (exercise that is a little hard, such as squats or jumping); rest (a day off between hard workouts for the same muscles); food (protein such as eggs, milk or beans, and calcium for bones); sleep (9 to 12 hours a night for children ages 6–12).
3. Muscles and bones grow stronger when they work and weaker when they are not used. In space, astronauts' legs weaken because they never stand or walk. On earth, a child who stops playing and sits all summer becomes weaker; a child who runs and climbs grows stronger.
4. Ronald Morgan and Graham Adamson at the University of Leeds in England, in 1953. They needed a way for many students in one gym to get a good workout at the same time in a short class.
5. Squat (any one): sit back as onto a chair, chest up, knees over toes, heels down. Push-up: body straight as a board, hands under shoulders, chest to a fist from the floor. Plank: elbows under shoulders, straight line from head to heels, squeeze seat and stomach, breathe.
6. $12 + 1 + 1 + 1 = 15$ squats. She rests so her muscles can recover and rebuild stronger.
7. Your muscles would not have time to recover, so you would become tired and sore, your form would slip, your numbers would stop improving or drop, and you could get hurt. Rest and sleep are part of training.

UNIT CHALLENGE: TWO-WEEK CIRCUIT CHALLENGE

Use your round-1 numbers from Lesson 4.2 as your “before” numbers. For two weeks, run your six-station circuit (or your astronaut training) every other day, about 7 workouts, keeping a chart of every workout and adding a rep or 5 seconds when your form stays good. Rest, play, eat well and sleep on the days in between. At the end, run the circuit again exactly the same way and record your “after” numbers. Make a before-and-after bar graph for each station and write a paragraph about what improved, what was hard and what you learned about getting stronger little by little.

LOOK FOR	WHAT IT MEANS
Faithful training	About 7 workouts in two weeks, each recorded with the date and numbers, with rest days in between.
Good form	A parent watches the after test and confirms good form at every station.
Fair before-and-after test	The same stations, times, rests and push-up level for both tests, with numbers recorded honestly.
Graph and reflection	A neat before-and-after bar graph and a paragraph naming what improved, what was hard and what was learned. Effort and improvement count, not the size of the numbers.

UNIT 5

AEROBIC TRAINING

Your heart and lungs work together to bring oxygen to your muscles, and they grow stronger when you use them. In this unit you will meet Paavo Nurmi, the Finnish runner who carried a stopwatch to keep an even pace and won nine Olympic gold medals. You will learn how the heart and lungs work, measure a loop, and run a stopwatch lap test, trying to make your splits more even.

Then you will meet Sir John Floyer, the English doctor who in 1707 first counted the pulse with a special watch. You will find your own pulse, measure your heart rate at rest, after exercise and during recovery, make a bar graph, and end the quarter by planning and leading a family fitness day.

PREREQUISITES

- Can multiply by 4 and make a bar graph
- Knows the warm-up, cool-down and water plan from earlier units
- Has the fitness-check table from Lesson 1.2 and the circuit from Lesson 4.2

MASTERY CHECKLIST

- ☐ I can tell how Paavo Nurmi used a stopwatch and why an even pace helps.
- ☐ I can explain how my heart and lungs bring oxygen to my muscles.
- ☐ I can record splits and work to make my pace more even.
- ☐ I can find my pulse and work out my heart rate in beats per minute.
- ☐ I can explain what happens to my heart rate during exercise and recovery, and why a fitter heart recovers faster.

OPTIONAL BOOKS AND GEAR FOR THIS UNIT

- **“Your Heart & Circulatory System” (Nemours KidsHealth):** Free. A clear kids’ article on how the heart and blood vessels work, for Lessons 5.1 and 5.2.
- **A jump rope:** Optional. A good extra station for the family fitness day and a fine way to raise your heart rate.
- **A stopwatch with a lap button:** Optional. A phone timer works just as well for splits and pulse counts.

Not required. Every activity in this unit works without them. School Launch has no ties to these authors, publishers or companies.

LESSONS IN THIS UNIT

5.1 Paavo Nurmi and the Stopwatch

3 sessions of 30–40 minutes

5.2 Heart Rate Before and After

3 sessions of 30–40 minutes

UNIT 5 REVIEW

Answer each question. Show your work for the calculations. The review is worth 30 points.

1. **4 pts**

Who was Paavo Nurmi, and why did he carry a stopwatch?

2. **4 pts**

Why does an even pace usually work better than starting very fast?

3. **4 pts**

Describe the path of oxygen from the air to a leg muscle.

4. **4 pts**

Leo’s four lap splits were 1:10, 1:15, 1:25 and 1:30. What is the difference between his fastest and slowest lap? What advice would you give him?

5. **4 pts**

What did Sir John Floyer do in 1707, and why was it new?

6. 5 pts

Ava counts 21 beats in 15 seconds at rest and 38 beats in 15 seconds after jumping jacks. What are her two heart rates in beats per minute? How much did her heart rate go up?

7. 5 pts

What would happen to your heart rate and your recovery if you jogged and played actively most days for a whole year?

ANSWER KEY

1. A Finnish distance runner, “the Flying Finn,” who won nine Olympic gold medals in 1920, 1924 and 1928. He carried a stopwatch to check his pace lap by lap so he could run at an even, planned pace.
2. If you start too fast, your heart and lungs cannot deliver oxygen fast enough, your muscles tire and you slow down or must stop. At an even pace your heart and lungs keep up and you use your energy wisely to the finish.
3. You breathe air into your lungs; oxygen passes from the air sacs into the blood; the heart pumps the blood through blood vessels to the leg muscle, which uses the oxygen.
4. $1:30 - 1:10 = 20$ seconds. He started too fast and slowed down; he should start a little slower so his laps are more even.
5. He used a special watch that ran for one minute to count the pulse, and wrote *The Physician's Pulse-Watch*. Before that, doctors felt the pulse but did not count it exactly; he made counting the pulse a regular part of a doctor's work.
6. $21 \times 4 = 84$ bpm at rest; $38 \times 4 = 152$ bpm after jumping jacks; $152 - 84 = 68$ bpm higher.
7. Your heart would grow stronger and pump more blood with each beat, so your resting heart rate might be a little lower, exercise would feel easier, and your heart rate would come back down faster after exercise (quicker recovery). Your endurance would grow.

UNIT CHALLENGE: HEART-RATE CHART AND FAMILY FITNESS DAY

Make a neat heart-rate chart from your two tests in Lesson 5.2, and add your best stopwatch splits from Lesson 5.1. Then plan and lead your family fitness day: a schedule, station signs, a water table, a three-fuel snack you helped make, a walk-jog lap with splits, and heart-rate checks for everyone before and after. Retest your home fitness check from Lesson 1.2 and show your quarter's before-and-after numbers. Finish with a page of photos or drawings from the day and a paragraph about what you learned this quarter and what habit you will keep.

LOOK FOR	WHAT IT MEANS
Careful measurements	Heart-rate counts shown with their multiplication, a labeled bar graph, and splits recorded for both lap tests.
A well-planned day	A written schedule with a warm-up, stations, water, a snack, a walk-jog and a cool-down, ready before the day.
Leadership and kindness	The student led the family through each part, explained form cues, and helped everyone join at his or her own pace.
Quarter reflection	Before-and-after fitness-check numbers and a paragraph naming what improved and one habit to keep. Effort and faithfulness count, not the size of the numbers.

5.1 PAAVO NURMI AND THE STOPWATCH

OBJECTIVES

- Tell how the Finnish runner Paavo Nurmi used a stopwatch to keep an even pace and won nine Olympic gold medals.
- Explain how the heart and lungs work together to bring oxygen to working muscles, and what endurance is.
- Run or walk-jog a paced lap test with a timer, record your lap times (splits), and try to make them more even.

Warm-up. Pacing warm-up: walk slowly for 30 seconds, briskly for 30 seconds, jog easily for 30 seconds, then walk again for 30 seconds. Do 10 skips, 10 heel raises and 10 arm swings. Put a hand on your chest after the jog and again after the walk. Think about it: why does your heart speed up when you jog and slow down when you walk?

WATCH

9 x Gold in 1 Games! Finland's Middle Distance Runner Paavo Nurmi | The Olympics On The Record

Olympic Games · 4:27

<https://www.youtube.com/watch?v=dITLuUDynZg>

WHEN TO WATCH

After the story paragraph. Watch for Nurmi's stopwatch and his training diary.

Note: From the Olympics' official channel, with old film of the 1920s races and simple animations. Runners wear the vests and shorts of the time. It ends with a short sponsor logo.

BACKUP VIDEO

Paavo Nurmi, the nine-time Olympic champ you've probably never heard of! 🏆

Olympic Games · 1:35

<https://www.youtube.com/watch?v=V205baoboGU>

A short summary of Nurmi's career, with film from Antwerp in 1920 and Paris in 1924.

KEY TERMS

pace

How fast you are moving, often measured as the time it takes to run one lap or one mile.

even pace

Running every part of a race at about the same speed instead of starting fast and slowing down.

split

The time for one part of a race, such as one lap.

heart

The muscle in your chest that pumps blood through your body, beating about 70 to 100 times a minute at rest in children your age.

lungs

Two spongy organs in your chest that take oxygen from the air into your blood and breathe out carbon dioxide.

CORE IDEAS

The story. Paavo Nurmi was born in 1897 in the city of Turku in Finland. His family was poor, and as a boy he worked to help them, but he loved to run, and he trained on the roads and forest trails around his city in all kinds of weather. He became one of the greatest distance runners who ever lived. At the Olympic Games of 1920, 1924 and 1928, he won nine gold medals and three silver medals, and he set 22 official world records at distances from 1,500 meters to 20 kilometers. Newspapers called him “the Flying Finn.” At the Paris Olympics in 1924 he won five gold medals; two of them, the 1,500 meters and the 5,000 meters, he won on the same afternoon, with only a short rest between the races.

How they figured it out. Nurmi was famous for something unusual: he often carried a stopwatch in his hand while he trained and raced. He checked it lap after lap to make sure he was running at the pace he had planned. He knew that a runner who starts too fast tires early and slows down, while a runner who keeps an **even pace** uses his energy wisely all the way to the finish. He also kept careful notes of his training. Today almost every coach teaches what Nurmi practiced: plan your pace, check your **splits**, and save some energy for the end. As Hebrews says, we should “run with patience.”

How your body works. Your muscles need oxygen to keep working for a long time. Your **lungs** breathe in air, and oxygen passes from tiny air sacs in your lungs into your blood. Your **heart**, a muscle about the size of your fist, pumps that blood through blood vessels to your muscles. When you run, your muscles use oxygen faster, so your heart beats faster and you breathe harder. If you go so fast that your heart and lungs cannot keep up, your muscles tire quickly and burn, and you have to slow down. At an even pace, your heart and lungs can keep up, and you can keep going much longer. This ability is called **endurance**. When you exercise often, your heart grows stronger and pumps more blood with each beat, so your endurance grows.

Try it. This week you will be your own Nurmi. You will measure a loop, run or walk-jog four laps with a timer, record each lap's split, and see how even your pace was. Then you will try again and aim for more even splits.

PICTURE STUDY



*Paavo Nurmi at the Paris Olympic Games, Unknown photographer, 1924 · Photograph · Paris, France
(Stade de Colombes)*

Image: [Wikimedia Commons](#), public domain

This photograph was taken at the 1924 Olympic Games in Paris, where Nurmi won five gold medals. He stands calmly by the track holding his jacket and his shoes, perhaps just after one of his races. He was known for his serious face and quiet manner: he let his running do the talking.

Look closely

- Find Nurmi's race number and the badge on his shirt. What country does the cross stand for?
- Look at his face and the way he stands. Does he look nervous, tired or calm?
- Look at the crowd in the grandstand. How many people do you think were watching?
- Find his running shoes. Why might he have taken them off after racing? How are his shoes and clothes different from running gear today?

Talk about it

1. Why would carrying a stopwatch help a runner keep an even pace?
2. What do you think Nurmi did in the months before these Games to get ready?
3. Is it harder for you to start slow or to keep going at the end? Why?

Safety first. Run or walk-jog with an adult on a safe, flat loop away from traffic (a park path, a track or a quiet yard), in good shoes, with water nearby. Warm up first and cool down by walking. Walking is always allowed. Stop and tell an adult right away if you feel chest pain, dizziness, faintness or trouble breathing.

ACTIVITY

The Stopwatch Lap Test

Nurmi checked his stopwatch every lap. You will do the same: run or walk-jog four laps, record your splits, and see how even you can make them.

You will need

- A measured loop: a school track (400 meters), or a loop in a park or yard about 100 to 200 yards around, marked with chalk or cones
- A stopwatch or phone timer with a lap button, and a helper
- Fitness journal with a split table: Lap 1, Lap 2, Lap 3, Lap 4, Total, Difference between fastest and slowest lap
- A water bottle

Steps

1. **Measure your loop.** With a parent, measure or estimate the distance around your loop (count steps, or use a track). Write it down.
2. **Warm up (5 minutes):** the pacing warm-up above, then one easy lap of walking.
3. **Plan your pace.** Choose a pace you could keep for all four laps: an easy jog, or jog-and-walk. Write your plan, for example “jog the straight parts, walk the turns.”
4. **Test 1 (Session 2).** Your helper starts the timer and presses “lap” (or writes down the time) each time you pass the start line. Do 4 laps without stopping; walking is fine.
5. **Record** each lap’s split and the total. Subtract your fastest lap from your slowest lap. The smaller that difference, the more even your pace.
6. **Cool down:** walk one slow lap, then gentle stretches for your calves, thighs and hips. Drink water. Feel your heartbeat slowing.
7. **Session 3: Test 2.** Warm up the same way. Look at your splits from Test 1. If your first lap was much faster than your last, start more slowly. Try to make all four splits within 10 seconds of each other. Record your splits and your total. Did your pace become more even? Did your total time improve?

Tips

- The first lap always feels easy. Hold back a little; you will be glad on lap 4.
- Breathe in a steady rhythm. If you cannot say a short sentence, slow down a little.
- Let your arms swing forward and back, relaxed, with your hands loose.

Check your work

- ☐ I can tell how Paavo Nurmi used a stopwatch to keep an even pace.
- ☐ I can explain how my heart and lungs bring oxygen to my muscles.
- ☐ I recorded my splits on two tests and worked to make them more even.

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1. Copy your split tables for both tests. Circle your fastest and slowest lap each time.
2. Make a bar graph with one bar for each lap, for both tests side by side. Which test has bars more nearly the same height?
3. Draw the path of oxygen: air into the lungs, into the blood, pumped by the heart to a leg muscle. Label each part.
4. Write two sentences: How did starting slower change your last lap? What will you try next time?

From history. Finland honored Nurmi with a bronze statue showing him running, made by the sculptor Wäinö Aaltonen; copies stand in Helsinki and in his hometown of Turku. At the 1952 Olympic Games in Helsinki, the 55-year-old Nurmi surprised the crowd by carrying the Olympic torch into the stadium and lighting the flame.

COMMON MISTAKES

- Sprinting the first lap and then having to walk the rest. Start at a pace you can keep.
- Holding your breath or breathing in short gasps. Breathe deeply and steadily.
- Stopping suddenly at the finish. Keep walking to cool down so your heart can slow gradually.
- Comparing your splits with someone else's. Your goal is your own even pace.

Make it a game • Stopwatch Lap Duel. Time one lap around the room or yard with a stopwatch or kitchen timer. Do three laps, aiming for the same time each lap like Paavo Nurmi. Write your three splits. The smallest gap between slowest and fastest wins. Explain how heart and lungs bring oxygen to muscles. Try again to even your pace.

Scripture. “let us run with patience the race that is set before us” (Hebrews 12:1, KJV)

A wise runner keeps a steady pace to the end. The Christian life is like that too: faithful, patient effort day after day, not a quick dash and then giving up.

5.2 HEART RATE BEFORE AND AFTER

OBJECTIVES

- Tell how Sir John Floyer became the first doctor to count the pulse with a special watch in 1707.
- Find your pulse at your wrist and neck and work out your heart rate in beats per minute.
- Measure your heart rate at rest, after different activities and during recovery, and show it in a bar graph.
- Plan and lead a family fitness day.

Warm-up. Heartbeat warm-up: sit quietly for 1 minute and feel your pulse. Then march for 1 minute, do 10 jumping jacks and 10 squats, and feel your pulse again. Think about it: how did it change? How fast do you think it is beating?

WATCH

How to Feel Your Heart Beat

SciShow Kids · 3:35

<https://www.youtube.com/watch?v=tF9-jLZNM10>

WHEN TO WATCH

Before the activity. Practice finding your pulse at your wrist and neck along with the video.

Note: SciShow Kids explains the heartbeat and how to take your pulse, with simple animations.

BACKUP VIDEO

Science for kids - Measuring Heart Rate | Body Parts | Experiments for kids | Operation Ouch

Operation Ouch · 4:29

<https://www.youtube.com/watch?v=RiWr69OzfPo>

For a fun look at how a heart-rate monitor shows the heart speeding up and slowing down.

KEY TERMS

pulse

The beat you can feel in an artery each time your heart pumps blood, as at your wrist or the side of your neck.

heart rate

How many times your heart beats in one minute (beats per minute, or bpm).

resting heart rate

Your heart rate when you have been sitting quietly for a few minutes.

recovery

How quickly your heart rate comes back down after exercise. A fitter heart recovers faster.

CORE IDEAS

The story. For thousands of years, doctors felt their patients' pulses. They described them as strong or weak, fast or slow, but they had no way to count them exactly, because ordinary clocks and watches did not show seconds clearly. Sir John Floyer was an English doctor in the town of Lichfield. He had a special watch made that ran for exactly one minute, and he counted how many times a patient's pulse beat in that minute. In 1707 he wrote a book about it called *The Physician's Pulse-Watch*. He was the first doctor to make counting the pulse a regular part of his work.

How they figured it out. Floyer counted pulses again and again, in healthy people and sick people, and he wrote down what he found. He noticed that the pulse changed with exercise, meals, sleep, heat and cold, and with sickness and fever. Slowly, other doctors began to count pulses too, and in time every doctor and nurse learned to count the pulse with a watch with a second hand. Today a nurse checks your heart rate at every checkup, just as Floyer did more than 300 years ago.

How your body works. Each time your heart squeezes, it pushes a wave of blood through your arteries. You can feel that wave as your **pulse**: on the thumb side of your wrist, or on the side of your neck just beside your windpipe. Use two fingers, not your thumb (your thumb has a pulse of its own). Count the beats for 15 seconds and multiply by 4 to find your **heart rate** in beats per minute. At rest, children your age usually have a heart rate of about 70 to 100. When you exercise, your muscles need more oxygen, so your heart beats faster to deliver more blood. When you stop, your heart rate slowly comes back down; this is **recovery**. As you grow fitter, your

heart grows stronger and pumps more blood with each beat, so your heart rate recovers faster after exercise.

Try it. This week you will measure your heart rate at rest and after three activities of different strength, then watch it recover, and make a bar graph. At the end of the week you will plan and lead a family fitness day.

PICTURE STUDY



The Skating Minister (Reverend Robert Walker Skating on Duddingston Loch), Sir Henry Raeburn, About 1795 · Oil on canvas · Scottish National Gallery, Edinburgh

Image: [Wikimedia Commons](#), public domain

Robert Walker was a minister of the Church of Scotland in Edinburgh and a member of one of the world's first skating clubs. Sir Henry Raeburn, a famous Scottish portrait painter, showed him gliding across a frozen loch (a Scottish lake) near the city. It has become one of the best-loved paintings in Scotland.

Look closely

- Look at the minister's legs. Which leg is pushing and which is gliding? How does he keep his balance?
- Look at his arms, folded across his chest. Why might a good skater be able to skate without using his arms?
- Look at the lines on the ice. What made them?
- Look at his face. Does he look tired, worried or calm?

Talk about it

1. If you could feel this skater's pulse after a long glide around the loch, would it be faster or slower than when he sat in church? Why?
2. Skating, walking, swimming and cycling are all steady, long activities. Why are they good for the heart?

3. What steady activity could your whole family do together on your family fitness day?

Safety first. Do the activities on a flat, non-slip surface with good shoes and space around you; if you use stairs, hold the rail. Rest when you need to and drink water. Stop and tell an adult right away at chest pain, dizziness, a pounding heartbeat that does not slow down with rest, or trouble breathing. On the family fitness day, everyone moves at his or her own pace.

ACTIVITY

My Heart-Rate Graph and the Family Fitness Day

Like Sir John Floyer, you will count pulses carefully and write down what you find. Then you will put together everything you learned this quarter and lead your family in a fitness day.

You will need

- A timer or watch with a second hand, and a helper
- Fitness journal with a heart-rate table: Activity, Beats in 15 seconds, $\times 4 =$ beats per minute
- Graph paper and colored pencils
- For the family day: your station signs from Unit 4, water and cups, a healthy snack, and your fitness-check table from Lesson 1.2

Steps

1. **Find your pulse.** Practice with the video until you can feel your pulse at your wrist and your neck. Use two fingers and press gently.
2. **Resting heart rate.** Sit quietly for 3 minutes. Count your pulse for 15 seconds while your helper times it, and multiply by 4. Write it down.
3. **Activity 1: Walking.** Walk briskly around the room or yard for 2 minutes. Immediately count your pulse for 15 seconds and work out beats per minute. Rest until your heart rate is close to resting again.
4. **Activity 2: Jumping jacks.** Do jumping jacks at a steady pace for 1 minute. Count and record. Rest again.
5. **Activity 3: Jogging or step-ups.** Jog in place, or step up and down on the bottom stair while holding the rail, for 2 minutes. Count and record.
6. **Recovery.** Sit down and count your pulse again at 1 minute and at 2 minutes after Activity 3. How quickly does it come down?
7. **Graph it.** Make a bar graph with one bar for each measurement: Rest, Walk, Jumping jacks, Jog or step-ups, 1 minute after, 2 minutes after. Label the bars with the numbers.

8. **Session 3: Repeat** the same test in the same way on another day. Compare your two graphs. Is your resting rate about the same? Did your heart recover a little faster?
9. **The family fitness day.** Plan a 45- to 60-minute family fitness day and lead it: (1) the Olympic warm-up from Lesson 1.1; (2) your six-station circuit from Lesson 4.2, at an easy pace for everyone; (3) a water table with cups, and your color chart on display; (4) a family walk-jog lap with each person's splits; (5) a heart-rate check for everyone before and after; (6) a cool-down; (7) a healthy three-fuel snack that you helped make. Before the day, retest your home fitness check from Lesson 1.2, and share your before-and-after numbers with your family.

Tips

- If you lose count, start the 15 seconds over. A careful count is better than a guess.
- Count the first beat as “one,” not “zero.”
- On the family day, make it easy for little brothers and sisters and grandparents to join: walking counts, and so does cheering.

Check your work

- ☐ I can tell how Sir John Floyer began counting the pulse with a watch.
- ☐ I can find my pulse and work out my heart rate in beats per minute.
- ☐ I measured and graphed my heart rate before and after exercise and during recovery.
- ☐ I planned and led a family fitness day.

FITNESS JOURNAL

1. Copy your heart-rate table and show your multiplication for each count (for example, $22 \times 4 = 88$ beats per minute).
2. Glue in or copy your bar graph. Write a sentence about what happened to your heart rate during recovery.
3. Write the plan for your family fitness day: the schedule, the stations, the snack and who brought what.
4. After the family day, write a paragraph: What did your family enjoy most? What are you most thankful for from this quarter?

From history. Floyer's pulse-watch was made at a time when most watches had no second hand at all. Over the following century, watches with second hands became common, and in the 1800s doctors also began to measure temperature and blood pressure, but counting the pulse with a watch has stayed one of the simplest and most useful checks a doctor or nurse can make.

COMMON MISTAKES

- Taking your pulse with your thumb. Your thumb has its own pulse; use two fingers.
- Pressing too hard on your neck. Press gently, and only on one side at a time.
- Waiting too long after exercise to count. Count right away, or your heart rate will already be coming down.
- Thinking a fast heartbeat during exercise is bad. It is your heart doing its job; it should slow down again when you rest.

Make it a game • Heart Rate Graph Race. Find your pulse at your wrist and count for fifteen seconds, then multiply by four. Jog in place for a minute and count again. Rest and count a third time. Make a quick bar graph of the three numbers. Tell Sir John Floyer's story. Beat your recovery by resting a little faster.

UNIT 5

AEROBIC TRAINING

Your heart and lungs work together to bring oxygen to your muscles, and they grow stronger when you use them. In this unit you will meet Paavo Nurmi, the Finnish runner who carried a stopwatch to keep an even pace and won nine Olympic gold medals. You will learn how the heart and lungs work, measure a loop, and run a stopwatch lap test, trying to make your splits more even.

Then you will meet Sir John Floyer, the English doctor who in 1707 first counted the pulse with a special watch. You will find your own pulse, measure your heart rate at rest, after exercise and during recovery, make a bar graph, and end the quarter by planning and leading a family fitness day.

PREREQUISITES

- Can multiply by 4 and make a bar graph
- Knows the warm-up, cool-down and water plan from earlier units
- Has the fitness-check table from Lesson 1.2 and the circuit from Lesson 4.2

MASTERY CHECKLIST

- ☐ I can tell how Paavo Nurmi used a stopwatch and why an even pace helps.
- ☐ I can explain how my heart and lungs bring oxygen to my muscles.
- ☐ I can record splits and work to make my pace more even.
- ☐ I can find my pulse and work out my heart rate in beats per minute.
- ☐ I can explain what happens to my heart rate during exercise and recovery, and why a fitter heart recovers faster.

OPTIONAL BOOKS AND GEAR FOR THIS UNIT

- **“Your Heart & Circulatory System” (Nemours KidsHealth):** Free. A clear kids’ article on how the heart and blood vessels work, for Lessons 5.1 and 5.2.
- **A jump rope:** Optional. A good extra station for the family fitness day and a fine way to raise your heart rate.
- **A stopwatch with a lap button:** Optional. A phone timer works just as well for splits and pulse counts.

Not required. Every activity in this unit works without them. School Launch has no ties to these authors, publishers or companies.

LESSONS IN THIS UNIT

5.1 Paavo Nurmi and the Stopwatch

3 sessions of 30–40 minutes

5.2 Heart Rate Before and After

3 sessions of 30–40 minutes

UNIT 5 REVIEW

Answer each question. Show your work for the calculations. The review is worth 30 points.

1. **4 pts**

Who was Paavo Nurmi, and why did he carry a stopwatch?

2. **4 pts**

Why does an even pace usually work better than starting very fast?

3. **4 pts**

Describe the path of oxygen from the air to a leg muscle.

4. **4 pts**

Leo’s four lap splits were 1:10, 1:15, 1:25 and 1:30. What is the difference between his fastest and slowest lap? What advice would you give him?

5. **4 pts**

What did Sir John Floyer do in 1707, and why was it new?

6. 5 pts

Ava counts 21 beats in 15 seconds at rest and 38 beats in 15 seconds after jumping jacks. What are her two heart rates in beats per minute? How much did her heart rate go up?

7. 5 pts

What would happen to your heart rate and your recovery if you jogged and played actively most days for a whole year?

ANSWER KEY

1. A Finnish distance runner, “the Flying Finn,” who won nine Olympic gold medals in 1920, 1924 and 1928. He carried a stopwatch to check his pace lap by lap so he could run at an even, planned pace.
2. If you start too fast, your heart and lungs cannot deliver oxygen fast enough, your muscles tire and you slow down or must stop. At an even pace your heart and lungs keep up and you use your energy wisely to the finish.
3. You breathe air into your lungs; oxygen passes from the air sacs into the blood; the heart pumps the blood through blood vessels to the leg muscle, which uses the oxygen.
4. $1:30 - 1:10 = 20$ seconds. He started too fast and slowed down; he should start a little slower so his laps are more even.
5. He used a special watch that ran for one minute to count the pulse, and wrote *The Physician’s Pulse-Watch*. Before that, doctors felt the pulse but did not count it exactly; he made counting the pulse a regular part of a doctor’s work.
6. $21 \times 4 = 84$ bpm at rest; $38 \times 4 = 152$ bpm after jumping jacks; $152 - 84 = 68$ bpm higher.
7. Your heart would grow stronger and pump more blood with each beat, so your resting heart rate might be a little lower, exercise would feel easier, and your heart rate would come back down faster after exercise (quicker recovery). Your endurance would grow.

UNIT CHALLENGE: HEART-RATE CHART AND FAMILY FITNESS DAY

Make a neat heart-rate chart from your two tests in Lesson 5.2, and add your best stopwatch splits from Lesson 5.1. Then plan and lead your family fitness day: a schedule, station signs, a water table, a three-fuel snack you helped make, a walk-jog lap with splits, and heart-rate checks for everyone before and after. Retest your home fitness check from Lesson 1.2 and show your quarter's before-and-after numbers. Finish with a page of photos or drawings from the day and a paragraph about what you learned this quarter and what habit you will keep.

LOOK FOR	WHAT IT MEANS
Careful measurements	Heart-rate counts shown with their multiplication, a labeled bar graph, and splits recorded for both lap tests.
A well-planned day	A written schedule with a warm-up, stations, water, a snack, a walk-jog and a cool-down, ready before the day.
Leadership and kindness	The student led the family through each part, explained form cues, and helped everyone join at his or her own pace.
Quarter reflection	Before-and-after fitness-check numbers and a paragraph naming what improved and one habit to keep. Effort and faithfulness count, not the size of the numbers.