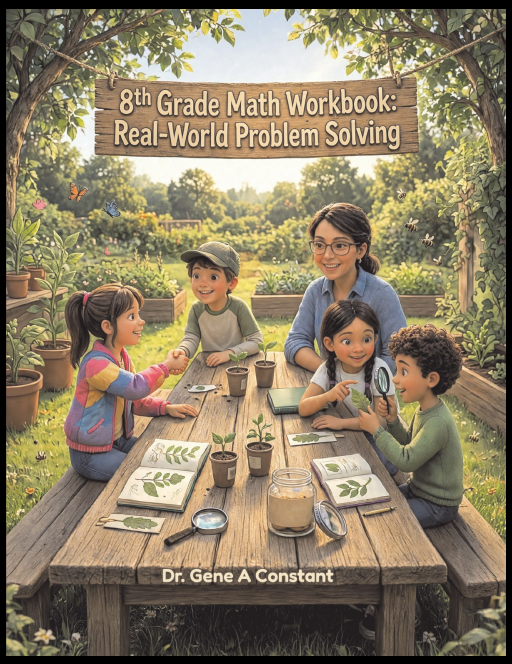
GLOBAL SOVEREIGN UNIVERSITY · HOMESCHOOL — MENTOR'S EDITION

Grade 8 Math

Twelve Free Lesson Plans

One 45-minute lesson for each chapter of the 8th Grade Math Workbook: Real-World Problem Solving, written word for word for the parent or teacher.



Also inside: the GSU campus poster and the free Grade Level Check.

How to Use This Pack

Each plan runs one 45-minute lesson in five steps: The Hook, Work It Together, The Talk, Solo Climb and The Takeaway, with a next-day review. The gold boxes are the lesson, word for word. You do not need to be a math expert: the book and the method do the teaching, and you ask “how do you know?”

What you need: the *8th Grade Math Workbook* (paperback ISBN 979-8-1830-7474-1), this pack, a pencil and paper. Every answer in these plans comes from the book’s own Answer Key.

Free online: the Grade 8 Mathematics class at globalsovereignuniversity.org/grade-8-math-class teaches the same twelve lessons, with Listen and quick self-checks. GENO, GSU’s free tutor, can explain any step another way at globalsovereignuniversity.org/free-tutor.

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GLOBAL SOVEREIGN UNIVERSITY
The Education of the Future is HERE

Grade 8 Math · Lesson 1 — The Precision Report

Real Number System · ages 12 to 15 · 45 minutes · the workbook, one screen, this page, a pencil and paper

At a Glance

- **The book:** 8th Grade Math Workbook: Real-World Problem Solving, Chapter 1 (The Data Scientist), by Dr. Gene A Constant.
- **Free tool:** Math Jeopardy (a quiz game show with a Grade 8 board), free, no login, plays in the browser: globalsovereignuniversity.org/math-jeopardy.
- **Free class:** Lesson 1 of the free Grade 8 Mathematics class: globalsovereignuniversity.org/grade-8-math-class#lesson-1.
- **Ages and time:** Grade 8 · ages 12 to 15 · 45 minutes.
- **Prep (5 min):** read the Teaching Creed and have the workbook open to Chapter 1. Write 0.5, 3/4, 3.14, π and √2 on five slips of paper, and have a calculator handy for checking only.

Why this lesson

Every measurement a data scientist, builder or doctor writes down is either exact or rounded. A child who can tell a rational number from an irrational one, and estimate a square root without a calculator, knows how much to trust a number and how to say so.

What the learner will be able to do

- Distinguish between rational and irrational numbers.
- Locate real numbers on the number line.
- Approximate irrational numbers.
- Perform operations with rational and irrational numbers.
- Turn repeating decimals into fractions.

The 45-Minute Climb

How to read this: the gold box in each step is your lesson, word for word. Run it as written. The notes beneath are optional support. "The group" means your family; "host" means you.

1 · The Hook (5 min)

"Here are four numbers from a sensor: 0.5, 3/4, 3.14 and π. Which ones could you write down exactly, and which ones go on forever?"

Say it like this: let your child do it with real objects if you can, then ask how they know their answer is right before you check it.

2 · Work It Together (15 min)

Open the workbook to the worked example Classifying 0.375 (Section 1.1) together: Check if decimal terminates or repeats: 0.375 terminates Convert to fraction: 0.375 = 375/1000 = 3/8 Since it can be written as a fraction, it is RATIONAL. Then read Approximating √7 (Section 1.2) together: Find perfect squares near 7: 4 < 7 < 9 Take square roots: √4 < √7 < √9, so 2 < √7 < 3 Since 7 is closer to 9 than 4, √7 is closer to 3 than 2 Estimate: √7 ≈ 2.6 (actual: 2.6457…).

Read each step aloud and let your child say the next step before you read it. Then play one round of Math Jeopardy.

3 · The Talk (8 min)

1. Why is 3.14 rational while π is irrational? 2. How can you estimate √50 without a calculator? 3. When should a report use an exact value, and when a rounded one?

You are not fishing for one right answer. You are listening for understanding:

- Q1: 3.14 ends, so it can be written as 314/100. π never ends and never repeats, so no fraction equals it exactly.
- Q2: Find the perfect squares on each side: 49 and 64. √50 is just above 7, about 7.1.
- Q3: Use the exact value for further math, and round for people who must act on it, such as ordering fence.

4 · Solo Climb (12 min)

Five problems on your own, with your work shown.
1. Is √16 rational or irrational? What about √17?
2. Between which two consecutive integers is √30?
3. A square plot of land has area 200 sq ft. Approximate the side length.
4. Is 0.333… + 0.666… rational? Calculate the sum as a fraction.
5. Convert 0.636363… to a fraction.

Why solo: a test, a job and real life ask you to work alone. Five problems rehearse exactly that. The answers are at the end of this plan.

Keep It Fresh (5 min, the next day)

Two review problems from the book's Extra Practice.
1. Order from least to greatest: √12, 3.5, √15, 4
2. Between which integers is √85?

Ready to move on? Four of the five Solo Climb problems right, with work shown, means this skill is solid. If not, reread the worked examples together and try two more problems from the chapter before the next lesson. Short review of old skills keeps them from fading.

5 · The Takeaway (5 min)

Some numbers end or repeat and can be written as a fraction. The rest go on forever; we estimate them, and we say how close we are. · Homework: Find three measurements at home on a label or a ruler. Decide which are exact and which are rounded, and say how many decimal places you would trust.

The badge moment: finishing all five steps earns the Bronze ring of this lesson's badge, The Precise Counter. Mark it on the Climber's Passport now; the homework is how Silver and Gold are earned during the week.

Common Mistakes to Watch For

- Calling 3.14 irrational. It ends, so it is rational; only π itself never ends.
- Thinking every square root is irrational. √16 = 4 and √49 = 7 are whole numbers.
- Guessing a square root without checking: find the two perfect squares it sits between first.

The Teaching Creed

You are not the expert; the book and the method are. Your job is to ask "how do you know?" one more time than feels natural, and to celebrate wrong answers out loud. In here, a wrong answer is where the lesson lives.

GENO, GSU's free tutor, can explain any step a second way, any hour, in 83 languages, with no login: globalsovereignuniversity.org/free-tutor. A prompt for the host: Ask GENO: "Explain why √20 is irrational but √25 is not, then give me one to try."

Adapt It and Measure It

Differentiation

- Struggling: place each number on a paper number line before classifying it.
- Ahead: find three square roots between 10 and 11 without a calculator and check them.
- Large co-op: give each team a mixed list of numbers to sort into a family tree.
- Reluctant: let the child measure things at home and decide which measurements are exact.

Evidence of learning (no exam)

Look for three things. Tried: finished all five Solo Climb problems with work shown. Noticed: can name the mistake in Common Mistakes that they almost made. Changed: the next day, solves one new problem from the same chapter without help. Those three words are the whole rubric, and they match the badge tiers below.

Gamify It — The Campus Climb

Every GSU lesson is one badge on the Climber's Passport, earned at four depths: Bronze, Silver, Gold and Platinum.

LESSON 1 BADGE — The Precise Counter · Bronze — The Climb: finished the 45-minute lesson, all five steps. · Silver — The Try: did the homework and explained it to the host. · Gold — The Proof: completed the chapter's Action Report in the workbook with every answer checked against the Answer Key. · Platinum — The Teacher: ran this lesson as host for someone else. The harvest of a teacher is teachers.

Answers for the Host

1. √16 = 4, rational (perfect square); √17 ≈ 4.123, irrational
2. 5 and 6 (25 < 30 < 36)
3. √200 ≈ 14.1 ft
4. Yes: 1/3 + 2/3 = 1 (= 1/1), rational
5. 63/99 = 7/11

Keep It Fresh: 1. √12 (3.46), 3.5, √15 (3.87), 4 · 2. 9 and 10

Every answer above comes from the workbook's own Answer Key. The book behind this lesson: 8th Grade Math Workbook: Real-World Problem Solving, Chapter 1 (The Data Scientist).

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Grade 8 Math · Lesson 2 — The Tank Report

Exponents and Radicals · ages 12 to 15 · 45 minutes · the workbook, one screen, this page, a pencil and paper

At a Glance

- **The book:** 8th Grade Math Workbook: Real-World Problem Solving, Chapter 2 (The Engineer), by Dr. Gene A Constant.
- **Free tool:** Math Jeopardy (a quiz game show with a Grade 8 board), free, no login, plays in the browser: globalsovereignuniversity.org/math-jeopardy.
- **Free class:** Lesson 2 of the free Grade 8 Mathematics class: globalsovereignuniversity.org/grade-8-math-class#lesson-2.
- **Ages and time:** Grade 8 · ages 12 to 15 · 45 minutes.
- **Prep (5 min):** read the Teaching Creed and have the workbook open to Chapter 2. Have one sheet of paper ready to fold in half five times.

Why this lesson

Exponents are how engineers, programmers and bankers write very large and very small quantities without mistakes. The rules are short, but children who only memorize them mix up adding and multiplying exponents. Folding paper makes the doubling real.

What the learner will be able to do

- Apply properties of integer exponents.
- Evaluate expressions with zero and negative exponents.
- Simplify square roots and cube roots.
- Add, subtract, and multiply radical expressions.

The 45-Minute Climb

How to read this: the gold box in each step is your lesson, word for word. Run it as written. The notes beneath are optional support. "The group" means your family; "host" means you.

1 · The Hook (5 min)

"Fold a sheet of paper in half, then in half again, five times. How many layers is that? Write it as a power of 2."

Say it like this: let your child do it with real objects if you can, then ask how they know their answer is right before you check it.

2 · Work It Together (15 min)

Open the workbook to the worked example Simplify $2^4 \times 2^3$ (Section 2.1) together: Apply product rule: add exponents with same base $2^4 \times 2^3 = 2^{4+3} = 2^7$ Calculate: $2^7 = 128$. Then read Simplify $5^6 \div 5^2$ (Section 2.1) together: Apply quotient rule: subtract exponents $5^6 \div 5^2 = 5^{6-2} = 5^4$ Calculate: $5^4 = 625$.

Read each step aloud and let your child say the next step before you read it. Then play one round of Math Jeopardy.

3 · The Talk (8 min)

1. Why do you add the exponents when you multiply $2^3 \times 2^4$? 2. What does a negative exponent mean? 3. Why can you add $3\sqrt{5} + 7\sqrt{5}$ but not $\sqrt{2} + \sqrt{3}$?

You are not fishing for one right answer. You are listening for understanding:

- Q1: 2^3 is three 2s multiplied and 2^4 is four more, so there are seven 2s in all.
- Q2: It means the reciprocal: $5^{-2} = 1/5^2 = 1/25$. It is not a negative number.
- Q3: Like terms: the first two share the same root, like 3 apples plus 7 apples. $\sqrt{2}$ and $\sqrt{3}$ are different roots.

4 · Solo Climb (12 min)

Five problems on your own, with your work shown.
1. Simplify: $7^8 \div 7^3$
2. Simplify: $2^5 \times 2^{-3}$
3. $\sqrt{144}$ = ___
4. Simplify: $\sqrt{128}$ = ___
5. Simplify: $\sqrt{5} \times \sqrt{20}$ = ___

Why solo: a test, a job and real life ask you to work alone. Five problems rehearse exactly that. The answers are at the end of this plan.

Keep It Fresh (5 min, the next day)

Two review problems from the book's Extra Practice.
1. Simplify: $\sqrt{180}$
2. Evaluate: $2^{-3} + 4^{-1}$

Ready to move on? Four of the five Solo Climb problems right, with work shown, means this skill is solid. If not, reread the worked examples together and try two more problems from the chapter before the next lesson. Short review of old skills keeps them from fading.

5 · The Takeaway (5 min)

Same base: add exponents to multiply, subtract to divide. A negative exponent means the reciprocal. · Homework: Find something at home that doubles or halves, such as a recipe, a phone battery or folded paper. Write each step as a power of 2.

The badge moment: finishing all five steps earns the Bronze ring of this lesson's badge, The Power Builder. Mark it on the Climber's Passport now; the homework is how Silver and Gold are earned during the week.

Common Mistakes to Watch For

- Multiplying the exponents when the bases are multiplied: $2^3 \times 2^4$ is 2^7, not 2^{12}.
- Reading a negative exponent as a negative number: 5^{-2} is 1/25, not −25.
- Adding square roots that do not match: $\sqrt{2} + \sqrt{3}$ is not $\sqrt{5}$.

The Teaching Creed

You are not the expert; the book and the method are. Your job is to ask "how do you know?" one more time than feels natural, and to celebrate wrong answers out loud. In here, a wrong answer is where the lesson lives.

GENO, GSU's free tutor, can explain any step a second way, any hour, in 83 languages, with no login: globalsovereignuniversity.org/free-tutor. A prompt for the host: Ask GENO: "Show me why any number to the zero power is 1, using a pattern, not a rule."

Adapt It and Measure It

Differentiation

- Struggling: write out every factor (2 × 2 × 2) before using a rule.
- Ahead: find how many folds it would take to reach 1,000 layers.
- Large co-op: each team builds one exponent rule from examples and teaches it.
- Reluctant: start with folding paper and counting layers before any symbols.

Evidence of learning (no exam)

Look for three things. Tried: finished all five Solo Climb problems with work shown. Noticed: can name the mistake in Common Mistakes that they almost made. Changed: the next day, solves one new problem from the same chapter without help. Those three words are the whole rubric, and they match the badge tiers below.

Gamify It — The Campus Climb

Every GSU lesson is one badge on the Climber's Passport, earned at four depths: Bronze, Silver, Gold and Platinum.

LESSON 2 BADGE — The Power Builder · Bronze — The Climb: finished the 45-minute lesson, all five steps. · Silver — The Try: did the homework and explained it to the host. · Gold — The Proof: completed the chapter's Action Report in the workbook with every answer checked against the Answer Key. · Platinum — The Teacher: ran this lesson as host for someone else. The harvest of a teacher is teachers.

Answers for the Host

1. $7^5 = 16{,}807$
2. $2^2 = 4$
3. 12
4. $8\sqrt{2}$
5. $\sqrt{100} = 10$

Keep It Fresh: 1. $6\sqrt{5}$ · 2. 1/8 + 1/4 = 3/8

Every answer above comes from the workbook's own Answer Key. The book behind this lesson: 8th Grade Math Workbook: Real-World Problem Solving, Chapter 2 (The Engineer).

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Grade 8 Math · Lesson 3 — The Mission Briefing

Scientific Notation Applications · ages 12 to 15 · 45 minutes · the workbook, one screen, this page, a pencil and paper

At a Glance

- **The book:** 8th Grade Math Workbook: Real-World Problem Solving, Chapter 3 (The Space Scientist), by Dr. Gene A Constant.
- **Free tool:** Math Jeopardy (a quiz game show with a Grade 8 board), free, no login, plays in the browser: globalsovereignuniversity.org/math-jeopardy.
- **Free class:** Lesson 3 of the free Grade 8 Mathematics class: globalsovereignuniversity.org/grade-8-math-class#lesson-3.
- **Ages and time:** Grade 8 · ages 12 to 15 · 45 minutes.
- **Prep (5 min):** read the Teaching Creed and have the workbook open to Chapter 3. Look up the distance to the Moon (about 384,000 km) and set a grain of sand or salt on a dark sheet of paper.

Why this lesson

Science, medicine and computing all run on numbers too big or too small to write out. Scientific notation lets a child compare a planet and a virus on the same line, and it is the bridge from arithmetic to the sciences.

What the learner will be able to do

- Write numbers in scientific notation.
- Convert between standard form and scientific notation.
- Perform operations with numbers in scientific notation.
- Compare very large and very small numbers.

The 45-Minute Climb

How to read this: the gold box in each step is your lesson, word for word. Run it as written. The notes beneath are optional support. "The group" means your family; "host" means you.

1 · The Hook (5 min)

"The Moon is about 384,000 km away. A grain of sand is about 0.0005 m wide. Write both so a scientist could compare them in one glance."

Say it like this: let your child do it with real objects if you can, then ask how they know their answer is right before you check it.

2 · Work It Together (15 min)

Open the workbook to the worked example Write 93,000,000 in scientific notation (Section 3.1) together: Move decimal until you have a number between 1 and 10: 9.3 Count places moved: 7 places to the left Write: 9.3×10^{7}. Then read Write 0.00045 in scientific notation (Section 3.1) together: Move decimal until you have a number between 1 and 10: 4.5 Count places moved: 4 places to the right Since original number is small, exponent is negative: 4.5×10^{-4}.

Read each step aloud and let your child say the next step before you read it. Then play one round of Math Jeopardy.

3 · The Talk (8 min)

1. Why must the first number in scientific notation be between 1 and 10? 2. How do you know whether the exponent is positive or negative? 3. Why must the exponents match before you add?

You are not fishing for one right answer. You are listening for understanding:

- Q1: So every number has one standard form, and so you can compare sizes by looking at the exponent first.
- Q2: Large numbers get a positive exponent; numbers smaller than 1 get a negative one.
- Q3: Adding needs like units: $6.5 \times 10^{6} + 2.3 \times 10^{6}$ is 6.5 million plus 2.3 million.

4 · Solo Climb (12 min)

Five problems on your own, with your work shown.
1. Write in scientific notation: 0.00067 = ___
2. $(4 \times 10^{5}) \times (3 \times 10^{2})$ = ___
3. A spacecraft travels 4.8×10^{12} km in 8×10^{4} hours. Speed?
4. $(8.4 \times 10^{5}) - (3.2 \times 10^{4})$ = ___
5. Which is larger: 3.5×10^{8} or 9.2×10^{7}?

Why solo: a test, a job and real life ask you to work alone. Five problems rehearse exactly that. The answers are at the end of this plan.

Keep It Fresh (5 min, the next day)

Two review problems from the book's Extra Practice.
1. $(2.4 \times 10^{6}) \times (5 \times 10^{-3})$ = ___
2. $(9.6 \times 10^{8}) \div (3.2 \times 10^{5})$ = ___

Ready to move on? Four of the five Solo Climb problems right, with work shown, means this skill is solid. If not, reread the worked examples together and try two more problems from the chapter before the next lesson. Short review of old skills keeps them from fading.

5 · The Takeaway (5 min)

Scientific notation is a number from 1 to 10 times a power of ten. Multiply the numbers, then add the exponents. · Homework: Look up one very large and one very small number that matters to you, such as the distance to a city or the size of a cell, and write both in scientific notation.

The badge moment: finishing all five steps earns the Bronze ring of this lesson's badge, The Mission Planner. Mark it on the Climber's Passport now; the homework is how Silver and Gold are earned during the week.

Common Mistakes to Watch For

- Leaving the first number outside 1 to 10: 45×10^6 must become 4.5×10^7.
- Moving the decimal the wrong way for a small number: 0.0045 is 4.5×10^{-3}.
- Adding exponents when adding numbers. You add exponents only when you multiply.

The Teaching Creed

You are not the expert; the book and the method are. Your job is to ask "how do you know?" one more time than feels natural, and to celebrate wrong answers out loud. In here, a wrong answer is where the lesson lives.

GENO, GSU's free tutor, can explain any step a second way, any hour, in 83 languages, with no login: globalsovereignuniversity.org/free-tutor. A prompt for the host: Ask GENO: "Check my scientific notation for 0.00067 and tell me which way I moved the decimal point."

Adapt It and Measure It

Differentiation

- Struggling: count the decimal moves with a pencil tap for each place.
- Ahead: compare the mass of Earth with the mass of a grain of sand.
- Large co-op: each team sorts ten real distances from smallest to largest.
- Reluctant: let the child choose a favorite planet or animal fact to write in scientific notation.

Evidence of learning (no exam)

Look for three things. Tried: finished all five Solo Climb problems with work shown. Noticed: can name the mistake in Common Mistakes that they almost made. Changed: the next day, solves one new problem from the same chapter without help. Those three words are the whole rubric, and they match the badge tiers below.

Gamify It — The Campus Climb

Every GSU lesson is one badge on the Climber's Passport, earned at four depths: Bronze, Silver, Gold and Platinum.

LESSON 3 BADGE — The Mission Planner · Bronze — The Climb: finished the 45-minute lesson, all five steps. · Silver — The Try: did the homework and explained it to the host. · Gold — The Proof: completed the chapter's Action Report in the workbook with every answer checked against the Answer Key. · Platinum — The Teacher: ran this lesson as host for someone else. The harvest of a teacher is teachers.

Answers for the Host

1. 6.7×10^{-4}
2. $12 \times 10^{7} = 1.2 \times 10^{8}$
3. 6×10^{7} km/h
4. 8.08×10^{5}
5. 3.5×10^{8}

Keep It Fresh: 1. 1.2×10^{4} · 2. 3×10^{3}

Every answer above comes from the workbook's own Answer Key. The book behind this lesson: 8th Grade Math Workbook: Real-World Problem Solving, Chapter 3 (The Space Scientist).

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Grade 8 Math · Lesson 4 — The Break-Even Report

Multi-Step Equations · ages 12 to 15 · 45 minutes · the workbook, one screen, this page, a pencil and paper

At a Glance

- **The book:** 8th Grade Math Workbook: Real-World Problem Solving, Chapter 4 (The Entrepreneur), by Dr. Gene A Constant.
- **Free tool:** Equation Explorer (solve for x, one step at a time), free, no login, plays in the browser: globalsovereignuniversity.org/equation-explorer.
- **Free class:** Lesson 4 of the free Grade 8 Mathematics class: globalsovereignuniversity.org/grade-8-math-class#lesson-4.
- **Ages and time:** Grade 8 · ages 12 to 15 · 45 minutes.
- **Prep (5 min):** read the Teaching Creed and have the workbook open to Chapter 4. Write two price offers on a card: a taxi at $5 plus $2 a mile and a ride app at $3 plus $2.50 a mile.

Why this lesson

Every business question about breaking even, comparing two offers or setting a fair price comes down to an equation with the variable on both sides. Solving them in order, and knowing when an equation has no answer, is the core habit of algebra.

What the learner will be able to do

- Solve equations with variables on both sides.
- Solve equations with parentheses and distribution.
- Identify equations with one, none, or infinite solutions.
- Write and solve equations from word problems.

The 45-Minute Climb

How to read this: the gold box in each step is your lesson, word for word. Run it as written. The notes beneath are optional support. "The group" means your family; "host" means you.

1 · The Hook (5 min)

"A taxi charges $5 plus $2 a mile. A ride app charges $3 plus $2.50 a mile. Which is cheaper for a 3-mile ride? For a 6-mile ride?"

Say it like this: let your child do it with real objects if you can, then ask how they know their answer is right before you check it.

2 · Work It Together (15 min)

Open the workbook to the worked example Solve 5x + 3 = 2x + 15 (Section 4.1) together: Subtract 2x from both sides: 5x - 2x + 3 = 15 Simplify: 3x + 3 = 15 Subtract 3 from both sides: 3x = 12 Divide by 3: x = 4. Then read Solve 3(x + 4) = 2(x - 1) + 17 (Section 4.2) together: Distribute: 3x + 12 = 2x - 2 + 17 Simplify right side: 3x + 12 = 2x + 15 Subtract 2x: x + 12 = 15 Subtract 12: x = 3.

Read each step aloud and let your child say the next step before you read it. Then play one round of Equation Explorer.

3 · The Talk (8 min)

1. Why collect the variables on one side first? 2. What does it mean when the variables cancel and you get 6 = 8? 3. How do you check your answer?

You are not fishing for one right answer. You are listening for understanding:

- Q1: So there is only one unknown term left to undo, step by step.
- Q2: No value of x can make the equation true: it has no solution.
- Q3: Put it back into the original equation and see whether both sides match.

4 · Solo Climb (12 min)

Five problems on your own, with your work shown.
1. Solve: 9x - 5 = 4x + 15
2. Solve: 8x - 12 = 5x + 6
3. Solve: 2(3x + 5) = 4(x + 6)
4. A phone plan costs $40 + $5(g - 2) for g GB. Another costs $23 + $8(g - 1). When are they equal?
5. Solve: 5x + 10 = 5(x + 2). How many solutions?

Why solo: a test, a job and real life ask you to work alone. Five problems rehearse exactly that. The answers are at the end of this plan.

Keep It Fresh (5 min, the next day)

Two review problems from the book’s Extra Practice.
1. Solve: 8x - 5 = 3x + 20
2. Cell plan A: $45 + $0.05/text. Plan B: $30 + $0.08/text. When equal?

Ready to move on? Four of the five Solo Climb problems right, with work shown, means this skill is solid. If not, reread the worked examples together and try two more problems from the chapter before the next lesson. Short review of old skills keeps them from fading.

5 · The Takeaway (5 min)

Get the variable on one side, undo the steps in reverse order, and check the answer in the original equation. · Homework: Compare two real prices with a fixed fee and a per-use cost, such as two phone plans or two gyms. Find where they cost the same.

The badge moment: finishing all five steps earns the Bronze ring of this lesson's badge, The Break-Even Finder. Mark it on the Climber's Passport now; the homework is how Silver and Gold are earned during the week.

Common Mistakes to Watch For

- Forgetting to distribute to every term: 3(x + 4) is 3x + 12, not 3x + 4.
- Moving a term without changing its sign.
- Stopping at 0 = 5 or 4 = 4 without saying what it means: no solution, or infinitely many.

The Teaching Creed

You are not the expert; the book and the method are. Your job is to ask "how do you know?" one more time than feels natural, and to celebrate wrong answers out loud. In here, a wrong answer is where the lesson lives.

GENO, GSU's free tutor, can explain any step a second way, any hour, in 83 languages, with no login: globalsovereignuniversity.org/free-tutor. A prompt for the host: Ask GENO: "Walk me through 2(x + 3) = 2x + 6 and tell me why it has infinitely many solutions."

Adapt It and Measure It

Differentiation

- Struggling: keep a balance-scale drawing beside each step.
- Ahead: write an equation with no solution and one with infinitely many, and explain each.
- Large co-op: each team prices two real offers and finds their break-even point.
- Reluctant: use a real price comparison the child cares about, such as two game subscriptions.

Evidence of learning (no exam)

Look for three things. Tried: finished all five Solo Climb problems with work shown. Noticed: can name the mistake in Common Mistakes that they almost made. Changed: the next day, solves one new problem from the same chapter without help. Those three words are the whole rubric, and they match the badge tiers below.

Gamify It — The Campus Climb

Every GSU lesson is one badge on the Climber's Passport, earned at four depths: Bronze, Silver, Gold and Platinum.

LESSON 4 BADGE — The Break-Even Finder · Bronze — The Climb: finished the 45-minute lesson, all five steps. · Silver — The Try: did the homework and explained it to the host. · Gold — The Proof: completed the chapter's Action Report in the workbook with every answer checked against the Answer Key. · Platinum — The Teacher: ran this lesson as host for someone else. The harvest of a teacher is teachers.

Answers for the Host

1. x = 4
2. x = 6
3. x = 7
4. At 5 GB (both cost $55)
5. 10 = 10 is true: infinite solutions

Keep It Fresh: 1. x = 5 · 2. At 500 texts

Every answer above comes from the workbook's own Answer Key. The book behind this lesson: 8th Grade Math Workbook: Real-World Problem Solving, Chapter 4 (The Entrepreneur).

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Grade 8 Math · Lesson 5 — The Project Forecast

Functions and Linear Relationships · ages 12 to 15 · 45 minutes · the workbook, one screen, this page, a pencil and paper

At a Glance

- **The book:** 8th Grade Math Workbook: Real-World Problem Solving, Chapter 5 (The Project Manager), by Dr. Gene A Constant.
- **Free tool:** Equation Explorer (solve for x, one step at a time), free, no login, plays in the browser: globalsovereignuniversity.org/equation-explorer.
- **Free class:** Lesson 5 of the free Grade 8 Mathematics class: globalsovereignuniversity.org/grade-8-math-class#lesson-5.
- **Ages and time:** Grade 8 · ages 12 to 15 · 45 minutes.
- **Prep (5 min):** read the Teaching Creed and have the workbook open to Chapter 5. Set out a ruler, graph paper and a small plant or any object you can measure once a day.

Why this lesson

A function is a promise: the same input always gives the same output. Slope and the equation of a line let a project manager forecast progress, a saver plan a goal and a scientist describe a trend. This is the heart of eighth-grade algebra.

What the learner will be able to do

- Understand and identify functions.
- Use function notation.
- Write linear equations in slope-intercept form.
- Graph linear functions and interpret slope and y-intercept.

The 45-Minute Climb

How to read this: the gold box in each step is your lesson, word for word. Run it as written. The notes beneath are optional support. "The group" means your family; "host" means you.

1 · The Hook (5 min)

"A plant grows 2 cm a week and is 5 cm tall now. Make a table for the next four weeks. What rule makes every row?"

Say it like this: let your child do it with real objects if you can, then ask how they know their answer is right before you check it.

2 · Work It Together (15 min)

Open the workbook to the worked example Is {(1, 4), (2, 4), (3, 9)} a function? (Section 5.1) together: List the inputs: 1, 2, 3. No input appears twice Each input has exactly one output (two inputs may share the output 4; that is allowed) Yes, it is a function. Then read If f(x) = 3x - 2, find f(5) (Section 5.2) together: Replace x with 5: f(5) = 3(5) - 2 Calculate: f(5) = 15 - 2 = 13.

Read each step aloud and let your child say the next step before you read it. Then play one round of Equation Explorer.

3 · The Talk (8 min)

1. What makes a relation a function? 2. What do m and b tell you in y = mx + b? 3. How do you find slope from two points?

You are not fishing for one right answer. You are listening for understanding:

- Q1: Each input has exactly one output. Two inputs may share an output, but one input may not have two.
- Q2: m is the rate of change per step, and b is the starting value when x is 0.
- Q3: Divide the change in y by the change in x: rise over run.

4 · Solo Climb (12 min)

Five problems on your own, with your work shown.
1. If g(x) = x² - 3x, find g(5).
2. If h(x) = 4x - 1, find h(-2).
3. Find the slope between (-2, 8) and (4, -4).
4. A line passes through (0, 5) with slope 2. Write the equation.
5. Week 2: 11 units complete. Week 5: 26 units complete. Write P(w).

Why solo: a test, a job and real life ask you to work alone. Five problems rehearse exactly that. The answers are at the end of this plan.

Keep It Fresh (5 min, the next day)

Two review problems from the book’s Extra Practice.
1. If f(x) = -3x + 10, find f(-2).
2. Find slope and y-intercept: 4x + 2y = 10

Ready to move on? Four of the five Solo Climb problems right, with work shown, means this skill is solid. If not, reread the worked examples together and try two more problems from the chapter before the next lesson. Short review of old skills keeps them from fading.

5 · The Takeaway (5 min)

A function gives every input one output. A line's rule is y = mx + b: slope m, starting value b. · Homework: Track one thing that changes steadily for a week, such as savings or steps. Write a rule in the form y = mx + b.

The badge moment: finishing all five steps earns the Bronze ring of this lesson's badge, The Forecaster. Mark it on the Climber's Passport now; the homework is how Silver and Gold are earned during the week.

Common Mistakes to Watch For

- Saying a relation is not a function because two inputs share an output. Repeated outputs are fine; repeated inputs are not.
- Flipping rise over run: slope is change in y over change in x.
- Using a point as the y-intercept when x is not 0.

The Teaching Creed

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Adapt It and Measure It

Differentiation

- Struggling: build an input–output table before writing any equation.
- Ahead: track something for a week and write its line of best fit.
- Large co-op: each team forecasts a different project from two data points.
- Reluctant: graph the child's own savings or screen time over a week.

Evidence of learning (no exam)

Look for three things. Tried: finished all five Solo Climb problems with work shown. Noticed: can name the mistake in Common Mistakes that they almost made. Changed: the next day, solves one new problem from the same chapter without help. Those three words are the whole rubric, and they match the badge tiers below.

Gamify It — The Campus Climb

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LESSON 5 BADGE — The Forecaster · Bronze — The Climb: finished the 45-minute lesson, all five steps. · Silver — The Try: did the homework and explained it to the host. · Gold — The Proof: completed the chapter's Action Report in the workbook with every answer checked against the Answer Key. · Platinum — The Teacher: ran this lesson as host for someone else. The harvest of a teacher is teachers.

Answers for the Host

1. 25 - 15 = 10
2. -9
3. -2
4. y = 2x + 5
5. P(w) = 5w + 1

Keep It Fresh: 1. 16 · 2. y = -2x + 5: slope -2, y-intercept 5

Every answer above comes from the workbook's own Answer Key. The book behind this lesson: 8th Grade Math Workbook: Real-World Problem Solving, Chapter 5 (The Project Manager).

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Grade 8 Math · Lesson 6 — The Supplier Decision

Systems of Equations · ages 12 to 15 · 45 minutes · the workbook, one screen, this page, a pencil and paper

At a Glance

- **The book:** 8th Grade Math Workbook: Real-World Problem Solving, Chapter 6 (The Systems Analyst), by Dr. Gene A Constant.
- **Free tool:** Equation Explorer (solve for x, one step at a time), free, no login, plays in the browser: globalsovereignuniversity.org/equation-explorer.
- **Free class:** Lesson 6 of the free Grade 8 Mathematics class: globalsovereignuniversity.org/grade-8-math-class#lesson-6.
- **Ages and time:** Grade 8 · ages 12 to 15 · 45 minutes.
- **Prep (5 min):** read the Teaching Creed and have the workbook open to Chapter 6. Write two phone plans on a card: Plan A $20 plus $5 a gigabyte, Plan B $35 plus $2 a gigabyte. Have graph paper ready.

Why this lesson

Real decisions usually involve two conditions at once: two plans, two prices, two constraints. Systems of equations find the one point where both are true, and that point is often the answer to a real choice.

What the learner will be able to do

- Understand systems of linear equations.
- Solve systems by graphing.
- Solve systems by substitution.
- Solve systems by elimination.

The 45-Minute Climb

How to read this: the gold box in each step is your lesson, word for word. Run it as written. The notes beneath are optional support. "The group" means your family; "host" means you.

1 · The Hook (5 min)

"Two phone plans: Plan A is $20 plus $5 a gigabyte, Plan B is $35 plus $2 a gigabyte. Where do they cross, and what does that point mean?"

Say it like this: let your child do it with real objects if you can, then ask how they know their answer is right before you check it.

2 · Work It Together (15 min)

Open the workbook to the worked example Is (2, 5) a solution of y = 3x - 1 and y = x + 3? (Section 6.1) together: Check the first equation: 3(2) - 1 = 5 ✓ Check the second equation: 2 + 3 = 5 ✓ Both are true, so (2, 5) is the solution. Then read Solve by graphing: y = x + 1 and y = -x + 5 (Section 6.2) together: Graph y = x + 1 (slope 1, y-intercept 1) Graph y = -x + 5 (slope -1, y-intercept 5) Find intersection point: (2, 3) Check: 3 = 2 + 1 ✓ and 3 = -2 + 5 ✓.

Read each step aloud and let your child say the next step before you read it. Then play one round of Equation Explorer.

3 · The Talk (8 min)

1. What does the solution of a system mean in a real problem? 2. When would you choose substitution over elimination? 3. What does it mean if the lines are parallel?

You are not fishing for one right answer. You are listening for understanding:

- Q1: It is the one choice where both conditions are true at once, such as the usage where two plans cost the same.
- Q2: Substitution when one equation is already solved for a variable; elimination when a variable cancels by adding or subtracting.
- Q3: They never meet, so no answer works for both: no solution.

4 · Solo Climb (12 min)

Five problems on your own, with your work shown.
1. Is (4, 7) a solution to: y = 3x - 5 and y = x + 3?
2. Solve by substitution: x = 4y - 7 and 2x + 3y = 8
3. Sum of two numbers is 50. One is 8 more than the other. Find both.
4. Solve by elimination: 4x + y = 14 and 2x + y = 8
5. Solve: 3x + 4y = 24 and 5x - 4y = 8

Why solo: a test, a job and real life ask you to work alone. Five problems rehearse exactly that. The answers are at the end of this plan.

Keep It Fresh (5 min, the next day)

Two review problems from the book's Extra Practice.
1. Solve by substitution: y = 3x - 1 and 2x + y = 14
2. Solve by elimination: 3x + 4y = 18 and 5x - 4y = 6

Ready to move on? Four of the five Solo Climb problems right, with work shown, means this skill is solid. If not, reread the worked examples together and try two more problems from the chapter before the next lesson. Short review of old skills keeps them from fading.

5 · The Takeaway (5 min)

The solution to a system is the point where both rules are true at once. Check it in both equations. · Homework: Make up a two-item problem from a real receipt: the total number of items and the total cost. Solve it as a system.

The badge moment: finishing all five steps earns the Bronze ring of this lesson's badge, The Decision Maker. Mark it on the Climber's Passport now; the homework is how Silver and Gold are earned during the week.

Common Mistakes to Watch For

- Solving for one variable and forgetting the other.
- Adding the equations when the terms need to be subtracted to cancel.
- Calling parallel lines one solution. Same slope with different intercepts means no solution.

The Teaching Creed

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Adapt It and Measure It

Differentiation

- Struggling: graph both lines on graph paper before solving by algebra.
- Ahead: solve one system all three ways and compare the answers.
- Large co-op: each team gets one real decision with two plans and reports the crossing point.
- Reluctant: use two real phone or streaming plans and let the child find the better deal.

Evidence of learning (no exam)

Look for three things. Tried: finished all five Solo Climb problems with work shown. Noticed: can name the mistake in Common Mistakes that they almost made. Changed: the next day, solves one new problem from the same chapter without help. Those three words are the whole rubric, and they match the badge tiers below.

Gamify It — The Campus Climb

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LESSON 6 BADGE — The Decision Maker · Bronze — The Climb: finished the 45-minute lesson, all five steps. · Silver — The Try: did the homework and explained it to the host. · Gold — The Proof: completed the chapter's Action Report in the workbook with every answer checked against the Answer Key. · Platinum — The Teacher: ran this lesson as host for someone else. The harvest of a teacher is teachers.

Answers for the Host

1. Yes: 3(4) - 5 = 7 and 4 + 3 = 7
2. (1, 2)
3. 21 and 29
4. (3, 2)
5. (4, 3)

Keep It Fresh: 1. (3, 8) · 2. x = 3, y = 9/4: (3, 2.25)

Every answer above comes from the workbook's own Answer Key. The book behind this lesson: 8th Grade Math Workbook: Real-World Problem Solving, Chapter 6 (The Systems Analyst).

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Grade 8 Math · Lesson 7 — The Site Survey

Pythagorean Theorem · ages 12 to 15 · 45 minutes · the workbook, one screen, this page, a pencil and paper

At a Glance

- **The book:** 8th Grade Math Workbook: Real-World Problem Solving, Chapter 7 (The Surveyor), by Dr. Gene A Constant.
- **Free tool:** Geometry Quest (distance, area and angles), free, no login, plays in the browser: globalsovereignuniversity.org/geometry-quest.
- **Free class:** Lesson 7 of the free Grade 8 Mathematics class: globalsovereignuniversity.org/grade-8-math-class#lesson-7.
- **Ages and time:** Grade 8 · ages 12 to 15 · 45 minutes.
- **Prep (5 min):** read the Teaching Creed and have the workbook open to Chapter 7. Cut three sticks, straws or strings 3, 4 and 5 hand-widths long, and have a tape measure.

Why this lesson

The Pythagorean theorem is how builders square a corner, how surveyors measure across a pond and how a phone finds a distance on a map. It is three thousand years old and still used on every job site.

What the learner will be able to do

- Understand the Pythagorean theorem.
- Find missing sides of right triangles.
- Determine if a triangle is a right triangle.
- Apply the theorem to real-world problems.

The 45-Minute Climb

How to read this: the gold box in each step is your lesson, word for word. Run it as written. The notes beneath are optional support. "The group" means your family; "host" means you.

1 · The Hook (5 min)

"Lay three sticks or strings 3, 4 and 5 hand-widths long into a triangle. Is the corner square? How could a builder be sure?"

Say it like this: let your child do it with real objects if you can, then ask how they know their answer is right before you check it.

2 · Work It Together (15 min)

Open the workbook to the worked example Find c when a = 6 and b = 8 (Section 7.1) together: Use Pythagorean theorem: $a^2 + b^2 = c^2$ Substitute: $6^2 + 8^2 = c^2$ Calculate: $36 + 64 = c^2$ Simplify: $100 = c^2$ Take square root: c = 10. Then read Find a when b = 9 and c = 15 (Section 7.2) together: Rearrange: $a^2 = c^2 - b^2$ Substitute: $a^2 = 15^2 - 9^2$ Calculate: $a^2 = 225 - 81 = 144$ Take square root: a = 12.

Read each step aloud and let your child say the next step before you read it. Then play one round of Geometry Quest.

3 · The Talk (8 min)

1. Which side is c in $a^2 + b^2 = c^2$? 2. How can a builder check that a corner is square? 3. How do you find a distance between two points on a grid?

You are not fishing for one right answer. You are listening for understanding:

- Q1: The hypotenuse, the longest side, across from the right angle.
- Q2: Measure 3 along one side, 4 along the other; if the diagonal is 5, the corner is square.
- Q3: Draw the right triangle: the across and up distances are the legs, and the distance is the hypotenuse.

4 · Solo Climb (12 min)

Five problems on your own, with your work shown.
1. Find c: a = 8, b = 15
2. A 17-ft ladder leans against a wall with base 8 ft away. Height reached?
3. Is a triangle with sides 9, 12, 15 a right triangle?
4. Find the missing value for a Pythagorean triple: 9, __, 15
5. A surveyor needs to measure across a pond. She marks 60m and 80m legs. Direct distance?

Why solo: a test, a job and real life ask you to work alone. Five problems rehearse exactly that. The answers are at the end of this plan.

Keep It Fresh (5 min, the next day)

Two review problems from the book's Extra Practice.
1. Find c: a = 15, b = 20
2. Is 9, 40, 41 a Pythagorean triple?

Ready to move on? Four of the five Solo Climb problems right, with work shown, means this skill is solid. If not, reread the worked examples together and try two more problems from the chapter before the next lesson. Short review of old skills keeps them from fading.

5 · The Takeaway (5 min)

In a right triangle $a^2 + b^2 = c^2$, where c is the longest side. The same rule finds distances on a grid. · Homework: Use the 3-4-5 rule with a tape measure to check whether one corner of a table, rug or room is square.

The badge moment: finishing all five steps earns the Bronze ring of this lesson's badge, The True Surveyor. Mark it on the Climber's Passport now; the homework is how Silver and Gold are earned during the week.

Common Mistakes to Watch For

- Adding the sides instead of their squares.
- Putting the hypotenuse in the wrong place: c is always the longest side.
- Forgetting the square root at the end.

The Teaching Creed

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Adapt It and Measure It

Differentiation

- Struggling: draw and label every triangle before computing.
- Ahead: find three Pythagorean triples of your own.
- Large co-op: each team squares a corner of the room or yard with the 3-4-5 rule.
- Reluctant: measure the diagonal of a real screen or table and check it.

Evidence of learning (no exam)

Look for three things. Tried: finished all five Solo Climb problems with work shown. Noticed: can name the mistake in Common Mistakes that they almost made. Changed: the next day, solves one new problem from the same chapter without help. Those three words are the whole rubric, and they match the badge tiers below.

Gamify It — The Campus Climb

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LESSON 7 BADGE — The True Surveyor · Bronze — The Climb: finished the 45-minute lesson, all five steps. · Silver — The Try: did the homework and explained it to the host. · Gold — The Proof: completed the chapter's Action Report in the workbook with every answer checked against the Answer Key. · Platinum — The Teacher: ran this lesson as host for someone else. The harvest of a teacher is teachers.

Answers for the Host

1. c = 17
2. 15 ft
3. Yes: 81 + 144 = 225
4. 12
5. 100 m

Keep It Fresh: 1. 25 · 2. Yes: 81 + 1600 = 1681 = 41^2

Every answer above comes from the workbook's own Answer Key. The book behind this lesson: 8th Grade Math Workbook: Real-World Problem Solving, Chapter 7 (The Surveyor).

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Grade 8 Math · Lesson 8 — The Animation Frame Sheet

Transformations · ages 12 to 15 · 45 minutes · the workbook, one screen, this page, a pencil and paper

At a Glance

- **The book:** 8th Grade Math Workbook: Real-World Problem Solving, Chapter 8 (The Animator), by Dr. Gene A Constant.
- **Free tool:** Geometry Quest (distance, area and angles), free, no login, plays in the browser: globalsovereignuniversity.org/geometry-quest.
- **Free class:** Lesson 8 of the free Grade 8 Mathematics class: globalsovereignuniversity.org/grade-8-math-class#lesson-8.
- **Ages and time:** Grade 8 · ages 12 to 15 · 45 minutes.
- **Prep (5 min):** read the Teaching Creed and have the workbook open to Chapter 8. Draw a coordinate grid on graph paper from −8 to 8 on both axes and set out a coin as a marker.

Why this lesson

Animators, game designers and engineers move shapes with exact rules. Translations, reflections, rotations and dilations teach a child to see geometry as motion, and the coordinate rules make that motion precise.

What the learner will be able to do

- Perform translations, reflections, and rotations.
- Identify and describe transformations.
- Understand dilations and scale factors.
- Compose multiple transformations.

The 45-Minute Climb

How to read this: the gold box in each step is your lesson, word for word. Run it as written. The notes beneath are optional support. "The group" means your family; "host" means you.

1 · The Hook (5 min)

"Put a coin on a grid at (2, 3). Slide it 4 right, flip it over the x-axis, then turn it a quarter turn about the origin. Where does it end up?"

Say it like this: let your child do it with real objects if you can, then ask how they know their answer is right before you check it.

2 · Work It Together (15 min)

Open the workbook to the worked example Translate (3, 5) by (4, -2) (Section 8.1) together: Add horizontal shift: 3 + 4 = 7 Add vertical shift: 5 + (-2) = 3 New point: (7, 3). Then read Reflect (5, 2) over each axis (Section 8.2) together: Over the x-axis, keep x and change the sign of y: (5, -2) Over the y-axis, change the sign of x and keep y: (-5, 2) Each image is the same distance from the mirror line as the original.

Read each step aloud and let your child say the next step before you read it. Then play one round of Geometry Quest.

3 · The Talk (8 min)

1. What changes and what stays the same in a reflection over the x-axis? 2. Which transformations keep a shape the same size? 3. If the area grows by 9, what was the scale factor?

You are not fishing for one right answer. You are listening for understanding:

- Q1: x stays the same and y changes sign.
- Q2: Translations, reflections and rotations. A dilation changes the size.
- Q3: 3, because area grows by the scale factor squared.

4 · Solo Climb (12 min)

Five problems on your own, with your work shown.
1. Translate (-1, 6) by (-3, -4). New coordinates?
2. Reflect (-3, 5) over the y-axis.
3. Rotate (3, 5) 90° counterclockwise about the origin.
4. Dilate (10, 15) by scale factor 0.5 centered at origin.
5. Point (3, 2) becomes (9, 6). What was the scale factor?

Why solo: a test, a job and real life ask you to work alone. Five problems rehearse exactly that. The answers are at the end of this plan.

Keep It Fresh (5 min, the next day)

Two review problems from the book’s Extra Practice.
1. Rotate (5, -3) 90° counterclockwise about origin.
2. Reflect (4, 7) over y = x.

Ready to move on? Four of the five Solo Climb problems right, with work shown, means this skill is solid. If not, reread the worked examples together and try two more problems from the chapter before the next lesson. Short review of old skills keeps them from fading.

5 · The Takeaway (5 min)

Slides, flips and turns keep a shape the same size. A dilation multiplies every coordinate by k. · Homework: Draw a simple shape on graph paper and give someone three moves to make. Check that their final shape matches yours.

The badge moment: finishing all five steps earns the Bronze ring of this lesson's badge, The Frame Builder. Mark it on the Climber's Passport now; the homework is how Silver and Gold are earned during the week.

Common Mistakes to Watch For

- Mixing up the axes when reflecting: over the x-axis, y changes sign.
- Rotating clockwise when the problem says counterclockwise.
- Thinking a dilation keeps the size the same. Only translations, reflections and rotations do.

The Teaching Creed

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Adapt It and Measure It

Differentiation

- Struggling: move a coin on the grid for each step before writing coordinates.
- Ahead: design a three-move animation and give the rules to someone else.
- Large co-op: each team animates one shape and the group checks the frames.
- Reluctant: let the child plot and move a simple drawing of their own.

Evidence of learning (no exam)

Look for three things. Tried: finished all five Solo Climb problems with work shown. Noticed: can name the mistake in Common Mistakes that they almost made. Changed: the next day, solves one new problem from the same chapter without help. Those three words are the whole rubric, and they match the badge tiers below.

Gamify It — The Campus Climb

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LESSON 8 BADGE — The Frame Builder · Bronze — The Climb: finished the 45-minute lesson, all five steps. · Silver — The Try: did the homework and explained it to the host. · Gold — The Proof: completed the chapter's Action Report in the workbook with every answer checked against the Answer Key. · Platinum — The Teacher: ran this lesson as host for someone else. The harvest of a teacher is teachers.

Answers for the Host

1. (-4, 2)
2. (3, 5)
3. (-5, 3)
4. (5, 7.5)
5. k = 3

Keep It Fresh: 1. (3, 5) · 2. (7, 4)

Every answer above comes from the workbook’s own Answer Key. The book behind this lesson: 8th Grade Math Workbook: Real-World Problem Solving, Chapter 8 (The Animator).

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Grade 8 Math · Lesson 9 — The Roof Truss Check

Angle Relationships · ages 12 to 15 · 45 minutes · the workbook, one screen, this page, a pencil and paper

At a Glance

- **The book:** 8th Grade Math Workbook: Real-World Problem Solving, Chapter 9 (The Architect), by Dr. Gene A Constant.
- **Free tool:** Geometry Quest (distance, area and angles), free, no login, plays in the browser: globalsovereignuniversity.org/geometry-quest.
- **Free class:** Lesson 9 of the free Grade 8 Mathematics class: globalsovereignuniversity.org/grade-8-math-class#lesson-9.
- **Ages and time:** Grade 8 · ages 12 to 15 · 45 minutes.
- **Prep (5 min):** read the Teaching Creed and have the workbook open to Chapter 9. Have a paper triangle cut from scrap paper and a ruler; on a sunny day, a tape measure for shadows.

Why this lesson

Architects and carpenters check angles every day: parallel beams, roof trusses, braces. Angle rules and similar triangles let a child find a measurement they cannot reach, such as the height of a tree.

What the learner will be able to do

- Identify and calculate angles formed by parallel lines and transversals.
- Apply the triangle angle sum theorem.
- Work with exterior angles of triangles.
- Understand and apply angle-angle similarity.

The 45-Minute Climb

How to read this: the gold box in each step is your lesson, word for word. Run it as written. The notes beneath are optional support. "The group" means your family; "host" means you.

1 · The Hook (5 min)

"Tear the three corners off a paper triangle and lay them side by side. What do they make together?"

Say it like this: let your child do it with real objects if you can, then ask how they know their answer is right before you check it.

2 · Work It Together (15 min)

Open the workbook to the worked example A brace crosses two parallel beams and makes a 110° angle (Section 9.1) together: Its alternate interior angle is equal: 110° Its co-interior angle adds to 180°: 180 - 110 = 70° So every angle at the brace is either 110° or 70°. Then read Find x in a triangle with angles 45°, 60°, and x° (Section 9.2) together: Use angle sum: 45 + 60 + x = 180 Simplify: 105 + x = 180 Solve: x = 75°.

Read each step aloud and let your child say the next step before you read it. Then play one round of Geometry Quest.

3 · The Talk (8 min)

1. Why do the angles of every triangle add to 180°? 2. How is an exterior angle related to the two far inside angles? 3. How can a shadow tell you a tree's height?

You are not fishing for one right answer. You are listening for understanding:

- Q1: Torn off and placed side by side they make a straight line, and a straight line is 180°.
- Q2: It equals their sum.
- Q3: The sun makes similar triangles, so height over shadow is the same for you and the tree.

4 · Solo Climb (12 min)

Five problems on your own, with your work shown.
1. Co-interior angles measure 2x and 3x + 30. Find x and the angle measures.
2. Isosceles triangle: base angles both 55°. Find the vertex angle.
3. Exterior angle is 130°. One remote interior is 55°. Find the other.
4. A 6-ft person casts a 4-ft shadow. A tree casts a 20-ft shadow. Tree height?
5. Triangle sides 5, 12, 13. Similar triangle has shortest side 15. Find other sides.

Why solo: a test, a job and real life ask you to work alone. Five problems rehearse exactly that. The answers are at the end of this plan.

Keep It Fresh (5 min, the next day)

Two review problems from the book's Extra Practice.
1. Parallel lines cut by transversal. One angle = 72°. Find its alternate interior angle.
2. Triangle angles: 2x, 3x, 4x. Find all angles.

Ready to move on? Four of the five Solo Climb problems right, with work shown, means this skill is solid. If not, reread the worked examples together and try two more problems from the chapter before the next lesson. Short review of old skills keeps them from fading.

5 · The Takeaway (5 min)

A triangle's angles add to 180°. Parallel lines make equal angle pairs, and similar triangles let you measure what you cannot reach. · Homework: On a sunny day, measure your shadow and a tree's shadow, then work out the tree's height with similar triangles.

The badge moment: finishing all five steps earns the Bronze ring of this lesson's badge, The Angle Checker. Mark it on the Climber's Passport now; the homework is how Silver and Gold are earned during the week.

Common Mistakes to Watch For

- Mixing up corresponding and co-interior angles: co-interior angles add to 180°.
- Forgetting that an exterior angle equals the two remote interior angles added together.
- Setting up a shadow proportion with heights and shadows in different places.

The Teaching Creed

You are not the expert; the book and the method are. Your job is to ask "how do you know?" one more time than feels natural, and to celebrate wrong answers out loud. In here, a wrong answer is where the lesson lives.

GENO, GSU's free tutor, can explain any step a second way, any hour, in 83 languages, with no login: globalsovereignuniversity.org/free-tutor. A prompt for the host: Ask GENO: "Give me two parallel lines cut by a transversal at 65°, and let me name all eight angles."

Adapt It and Measure It

Differentiation

- Struggling: color matching angles with the same pencil color.
- Ahead: find the height of a building or tree with shadows.
- Large co-op: each team checks the angles of one part of a paper roof truss.
- Reluctant: tear the corners off a paper triangle and let the 180° speak for itself.

Evidence of learning (no exam)

Look for three things. Tried: finished all five Solo Climb problems with work shown. Noticed: can name the mistake in Common Mistakes that they almost made. Changed: the next day, solves one new problem from the same chapter without help. Those three words are the whole rubric, and they match the badge tiers below.

Gamify It — The Campus Climb

Every GSU lesson is one badge on the Climber's Passport, earned at four depths: Bronze, Silver, Gold and Platinum.

LESSON 9 BADGE — The Angle Checker · Bronze — The Climb: finished the 45-minute lesson, all five steps. · Silver — The Try: did the homework and explained it to the host. · Gold — The Proof: completed the chapter's Action Report in the workbook with every answer checked against the Answer Key. · Platinum — The Teacher: ran this lesson as host for someone else. The harvest of a teacher is teachers.

Answers for the Host

1. x = 30; the angles are 60° and 120°
2. 70°
3. 75°
4. 30 ft
5. Scale factor 3: sides 36 and 39

Keep It Fresh: 1. 72° · 2. x = 20: 40°, 60°, 80°

Every answer above comes from the workbook's own Answer Key. The book behind this lesson: 8th Grade Math Workbook: Real-World Problem Solving, Chapter 9 (The Architect).

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Grade 8 Math · Lesson 10 — The Packaging Proposal

Volume of 3D Figures · ages 12 to 15 · 45 minutes · the workbook, one screen, this page, a pencil and paper

At a Glance

- **The book:** 8th Grade Math Workbook: Real-World Problem Solving, Chapter 10 (The Industrial Designer), by Dr. Gene A Constant.
- **Free tool:** Geometry Quest (distance, area and angles), free, no login, plays in the browser: globalsovereignuniversity.org/geometry-quest.
- **Free class:** Lesson 10 of the free Grade 8 Mathematics class: globalsovereignuniversity.org/grade-8-math-class#lesson-10.
- **Ages and time:** Grade 8 · ages 12 to 15 · 45 minutes.
- **Prep (5 min):** read the Teaching Creed and have the workbook open to Chapter 10. Make a paper cone and find a can or cup with the same radius and height, plus a cup of rice or dry beans.

Why this lesson

Every can, cone, tank and ball holds a volume someone had to compute before it was built. Knowing the three formulas, and breaking odd shapes into simple ones, turns packaging and storage into arithmetic a child can check.

What the learner will be able to do

- Calculate volume of cylinders.
- Calculate volume of cones.
- Calculate volume of spheres.
- Solve real-world problems involving volume.

The 45-Minute Climb

How to read this: the gold box in each step is your lesson, word for word. Run it as written. The notes beneath are optional support. "The group" means your family; "host" means you.

1 · The Hook (5 min)

"Fill a paper cone with rice and pour it into a can of the same radius and height. How many cones fill the can?"

Say it like this: let your child do it with real objects if you can, then ask how they know their answer is right before you check it.

2 · Work It Together (15 min)

Open the workbook to the worked example Find volume: cylinder with radius 5 cm, height 12 cm (Section 10.1) together: Use the formula $V = \pi r^2 h$ Substitute: $V = \pi \times 5^2 \times 12$ Calculate: $V = \pi \times 25 \times 12 = 300\pi$ Approximate: $V \approx 942.48$ cm³. Then read Find volume: cone with radius 6 cm, height 9 cm (Section 10.2) together: Use the formula $V = (1/3)\pi r^2 h$ Substitute: $V = (1/3) \times \pi \times 6^2 \times 9$ Calculate: $V = (1/3) \times \pi \times 36 \times 9 = 108\pi$ Approximate: $V \approx 339.29$ cm³.

Read each step aloud and let your child say the next step before you read it. Then play one round of Geometry Quest.

3 · The Talk (8 min)

1. Why does a cone hold one third of a cylinder with the same base and height? 2. What is the most common mistake with these formulas? 3. How do you find the volume of an odd shape?

You are not fishing for one right answer. You are listening for understanding:

- Q1: Three full cones of rice fill the cylinder exactly, and the formula records that: $\frac{1}{3}\pi r^2 h$.
- Q2: Using the diameter where the formula needs the radius.
- Q3: Break it into cylinders, cones and spheres, then add the parts, or subtract a part that is a hole.

4 · Solo Climb (12 min)

Five problems on your own, with your work shown.
1. Find volume: cylinder with diameter 14 cm, height 8 cm.
2. Find volume: cone with diameter 10 cm, height 15 cm.
3. Find volume: sphere with diameter 20 cm.
4. A sphere has volume 36π in³. Find the radius.
5. A cone (r = 4, h = 6) sits on a cylinder (r = 4, h = 10). Total volume?

Why solo: a test, a job and real life ask you to work alone. Five problems rehearse exactly that. The answers are at the end of this plan.

Keep It Fresh (5 min, the next day)

Two review problems from the book's Extra Practice.
1. Volume of cylinder: r = 7, h = 10. (Leave in terms of π)
2. Volume of cone: r = 9, h = 12.

Ready to move on? Four of the five Solo Climb problems right, with work shown, means this skill is solid. If not, reread the worked examples together and try two more problems from the chapter before the next lesson. Short review of old skills keeps them from fading.

5 · The Takeaway (5 min)

Cylinder: πr²h. Cone: ⅓πr²h. Sphere: 4/3πr³. Break odd shapes into these and add or subtract. · Homework: Measure a real can and a ball. Work out each volume and decide which holds more.

The badge moment: finishing all five steps earns the Bronze ring of this lesson's badge, The Package Designer. Mark it on the Climber's Passport now; the homework is how Silver and Gold are earned during the week.

Common Mistakes to Watch For

- Using the diameter where the formula needs the radius.
- Forgetting the ⅓ for a cone.
- Adding a composite figure's parts when one part should be subtracted, such as a hole.

The Teaching Creed

You are not the expert; the book and the method are. Your job is to ask "how do you know?" one more time than feels natural, and to celebrate wrong answers out loud. In here, a wrong answer is where the lesson lives.

GENO, GSU's free tutor, can explain any step a second way, any hour, in 83 languages, with no login: globalsovereignuniversity.org/free-tutor. A prompt for the host: Ask GENO: "Explain why a cone holds one third of a cylinder with the same base and height."

Adapt It and Measure It

Differentiation

- Struggling: label r and h on a drawing before using a formula.
- Ahead: design a package that holds a given volume with the least material.
- Large co-op: each team measures and computes one container, then the group ranks them.
- Reluctant: measure a favorite cup or ball and find what it holds.

Evidence of learning (no exam)

Look for three things. Tried: finished all five Solo Climb problems with work shown. Noticed: can name the mistake in Common Mistakes that they almost made. Changed: the next day, solves one new problem from the same chapter without help. Those three words are the whole rubric, and they match the badge tiers below.

Gamify It — The Campus Climb

Every GSU lesson is one badge on the Climber's Passport, earned at four depths: Bronze, Silver, Gold and Platinum.

LESSON 10 BADGE — The Package Designer · Bronze — The Climb: finished the 45-minute lesson, all five steps. · Silver — The Try: did the homework and explained it to the host. · Gold — The Proof: completed the chapter's Action Report in the workbook with every answer checked against the Answer Key. · Platinum — The Teacher: ran this lesson as host for someone else. The harvest of a teacher is teachers.

Answers for the Host

1. $392\pi \approx 1{,}231.5$ cm³
2. $125\pi \approx 392.7$ cm³
3. $4000\pi/3 \approx 4{,}188.8$ cm³
4. $r = 3$ in
5. $32\pi + 160\pi = 192\pi \approx 603.2$

Keep It Fresh: 1. 490π · 2. $324\pi \approx 1{,}017.9$

Every answer above comes from the workbook's own Answer Key. The book behind this lesson: 8th Grade Math Workbook: Real-World Problem Solving, Chapter 10 (The Industrial Designer).

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Grade 8 Math · Lesson 11 — The Market Research Memo

Data Analysis & Scatter Plots · ages 12 to 15 · 45 minutes · the workbook, one screen, this page, a pencil and paper

At a Glance

- **The book:** 8th Grade Math Workbook: Real-World Problem Solving, Chapter 11 (The Market Researcher), by Dr. Gene A Constant.
- **Free tool:** Statistics Skeptic (how numbers can mislead, as a game), free, no login, plays in the browser: globalsovereignuniversity.org/statistics-skeptic.
- **Free class:** Lesson 11 of the free Grade 8 Mathematics class: globalsovereignuniversity.org/grade-8-math-class#lesson-11.
- **Ages and time:** Grade 8 · ages 12 to 15 · 45 minutes.
- **Prep (5 min):** read the Teaching Creed and have the workbook open to Chapter 11. Ask five people for their height and shoe size, or use the family, and have graph paper ready.

Why this lesson

Market researchers, doctors and voters all read scatter plots and trend lines. A child who can describe a correlation, make a fair prediction and say why correlation is not cause is harder to fool for life.

What the learner will be able to do

- Construct and interpret scatter plots.
- Identify correlation (positive, negative, none).
- Draw and use lines of best fit.
- Use two-way tables to analyze categorical data.

The 45-Minute Climb

How to read this: the gold box in each step is your lesson, word for word. Run it as written. The notes beneath are optional support. "The group" means your family; "host" means you.

1 · The Hook (5 min)

"Do taller people have bigger shoe sizes? Ask five people for both and plot the pairs. What do you see?"

Say it like this: let your child do it with real objects if you can, then ask how they know their answer is right before you check it.

2 · Work It Together (15 min)

Open the workbook to the worked example Hours of practice vs free throws made: (1, 4), (2, 6), (3, 7), (4, 9) (Section 11.1) together: Look at the x-values: they increase from 1 to 4 Look at the y-values: they increase too, from 4 to 9 As x goes up, y tends to go up: POSITIVE correlation. Then read Data suggests trend line y = 2x + 1. Predict y when x = 10. (Section 11.2) together: Substitute x = 10 into equation: y = 2(10) + 1 Calculate: y = 21.

Read each step aloud and let your child say the next step before you read it. Then play one round of Statistics Skeptic.

3 · The Talk (8 min)

1. What does a positive correlation look like? 2. Why is it risky to predict far outside the data? 3. Why is correlation not cause?

You are not fishing for one right answer. You are listening for understanding:

- Q1: The points rise from left to right: as one quantity grows, the other tends to grow.
- Q2: The trend may not continue there; the line only describes the data you have.
- Q3: A third thing can drive both, such as summer heat raising both ice cream sales and sunburns.

4 · Solo Climb (12 min)

Five problems on your own, with your work shown.
1. Temperature vs ice cream sales: Positive, negative, or no correlation?
2. Shoe size vs IQ: Positive, negative, or no correlation?
3. Data points: (2, 9), (4, 15), (6, 21), (8, 27). Find a line of best fit.
4. Using your line from the previous problem, predict y when x = 12.
5. A savings jar holds S = 200 - 5w dollars after w weeks. Starting amount? Rate of change? Amount after 10 weeks?

Why solo: a test, a job and real life ask you to work alone. Five problems rehearse exactly that. The answers are at the end of this plan.

Keep It Fresh (5 min, the next day)

Two review problems from the book's Extra Practice.
1. Line of best fit: y = 2.5x + 8. Predict y when x = 12.
2. Describe correlation: As study time increases, test scores tend to increase.

Ready to move on? Four of the five Solo Climb problems right, with work shown, means this skill is solid. If not, reread the worked examples together and try two more problems from the chapter before the next lesson. Short review of old skills keeps them from fading.

5 · The Takeaway (5 min)

A scatter plot shows a trend; a line of best fit predicts. Slope is the change per unit, and correlation is not cause. · Homework: Collect ten pairs of numbers you care about, such as hours of sleep and mood, plot them and describe the trend.

The badge moment: finishing all five steps earns the Bronze ring of this lesson's badge, The Honest Analyst. Mark it on the Climber's Passport now; the homework is how Silver and Gold are earned during the week.

Common Mistakes to Watch For

- Reading correlation as cause.
- Predicting far outside the data the line was built from.
- Mixing up the percent of a row with the percent of a column in a two-way table.

The Teaching Creed

You are not the expert; the book and the method are. Your job is to ask "how do you know?" one more time than feels natural, and to celebrate wrong answers out loud. In here, a wrong answer is where the lesson lives.

GENO, GSU's free tutor, can explain any step a second way, any hour, in 83 languages, with no login: globalsovereignuniversity.org/free-tutor. A prompt for the host: Ask GENO: "Help me tell whether a news claim confuses correlation with causation."

Adapt It and Measure It

Differentiation

- Struggling: plot each point with a finger on the grid before marking it.
- Ahead: find a news claim that confuses correlation with cause and explain the flaw.
- Large co-op: each team surveys a different question and plots the results.
- Reluctant: plot data the child cares about, such as game scores and practice time.

Evidence of learning (no exam)

Look for three things. Tried: finished all five Solo Climb problems with work shown. Noticed: can name the mistake in Common Mistakes that they almost made. Changed: the next day, solves one new problem from the same chapter without help. Those three words are the whole rubric, and they match the badge tiers below.

Gamify It — The Campus Climb

Every GSU lesson is one badge on the Climber's Passport, earned at four depths: Bronze, Silver, Gold and Platinum.

LESSON 11 BADGE — The Honest Analyst · Bronze — The Climb: finished the 45-minute lesson, all five steps. · Silver — The Try: did the homework and explained it to the host. · Gold — The Proof: completed the chapter's Action Report in the workbook with every answer checked against the Answer Key. · Platinum — The Teacher: ran this lesson as host for someone else. The harvest of a teacher is teachers.

Answers for the Host

1. Positive
2. No correlation
3. y = 3x + 3 (the points lie exactly on it)
4. 39
5. $200 to start; it drops $5 per week; $150 after 10 weeks

Keep It Fresh: 1. 38 · 2. Positive

Every answer above comes from the workbook's own Answer Key. The book behind this lesson: 8th Grade Math Workbook: Real-World Problem Solving, Chapter 11 (The Market Researcher).

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Grade 8 Math · Lesson 12 — The Reliability Report

Probability · ages 12 to 15 · 45 minutes · the workbook, one screen, this page, a pencil and paper

At a Glance

- **The book:** 8th Grade Math Workbook: Real-World Problem Solving, Chapter 12 (The Risk Analyst), by Dr. Gene A Constant.
- **Free tool:** Math Jeopardy (a quiz game show with a Grade 8 board), free, no login, plays in the browser: globalsovereignuniversity.org/math-jeopardy.
- **Free class:** Lesson 12 of the free Grade 8 Mathematics class: globalsovereignuniversity.org/grade-8-math-class#lesson-12.
- **Ages and time:** Grade 8 · ages 12 to 15 · 45 minutes.
- **Prep (5 min):** read the Teaching Creed and have the workbook open to Chapter 12. Have two coins and one die ready, and a sheet of paper for tallies.

Why this lesson

Insurance, medicine, games and safety engineering all run on probability. Knowing when to multiply chances, and how drawing without replacement changes them, is how a risk analyst keeps people safe.

What the learner will be able to do

- Calculate theoretical and experimental probability.
- Use sample spaces and organized lists.
- Calculate compound probability (independent and dependent events).
- Use simulations to estimate probability.

The 45-Minute Climb

How to read this: the gold box in each step is your lesson, word for word. Run it as written. The notes beneath are optional support. "The group" means your family; "host" means you.

1 · The Hook (5 min)

"Flip a coin 20 times and count heads. Is it exactly 10? Flip 20 more. What happens as you keep going?"

Say it like this: let your child do it with real objects if you can, then ask how they know their answer is right before you check it.

2 · Work It Together (15 min)

Open the workbook to the worked example A standard die is rolled. What is P(a number greater than 4)? (Section 12.1) together: Favorable outcomes: 5 and 6, so 2 outcomes Total outcomes: 1, 2, 3, 4, 5, 6, so 6 outcomes P = 2/6 = 1/3, about 33%. Then read Two coins are flipped. P(both heads)? (Section 12.2) together: Events are independent P(head on first) = 1/2 P(head on second) = 1/2 P(both heads) = 1/2 × 1/2 = 1/4.

Read each step aloud and let your child say the next step before you read it. Then play one round of Math Jeopardy.

3 · The Talk (8 min)

1. When do you multiply probabilities? 2. How does drawing without replacement change the second probability? 3. Why might 20 coin flips not give exactly 10 heads?

You are not fishing for one right answer. You are listening for understanding:

- Q1: When two events must both happen and they are independent, or when you adjust the second chance after the first.
- Q2: There is one fewer item, and possibly one fewer of the kind you want.
- Q3: Probability describes the long run; short runs vary.

4 · Solo Climb (12 min)

Five problems on your own, with your work shown.
1. A standard die is rolled. P(rolling even)?
2. A card is drawn from a standard 52-card deck. P(heart)?
3. Spinner A: 3 sections (1,2,3). Spinner B: 4 sections (1,2,3,4). P(both show 2)?
4. Bag: 6 red, 4 blue. Draw 2 without replacement. P(first red, then blue)?
5. A simulation runs 1000 trials of an event. 230 successes. Estimated P(success)?

Why solo: a test, a job and real life ask you to work alone. Five problems rehearse exactly that. The answers are at the end of this plan.

Keep It Fresh (5 min, the next day)

Two review problems from the book's Extra Practice.
1. P(rolling two dice and getting sum of 9)?
2. Bag: 7 red, 5 blue. Draw 2 without replacement. P(both blue)?

Ready to move on? Four of the five Solo Climb problems right, with work shown, means this skill is solid. If not, reread the worked examples together and try two more problems from the chapter before the next lesson. Short review of old skills keeps them from fading.

5 · The Takeaway (5 min)

Probability is favorable over possible. Multiply for independent events, and adjust the second chance when you do not replace. · Homework: Run a small simulation at home with a coin or a die, 30 trials, and compare your result with the theoretical probability.

The badge moment: finishing all five steps earns the Bronze ring of this lesson's badge, The Reliability Expert. Mark it on the Climber's Passport now; the homework is how Silver and Gold are earned during the week.

Common Mistakes to Watch For

- Adding probabilities when both events must happen. For "and", multiply.
- Forgetting that the second draw changes when you do not put the first one back.
- Expecting a short run of trials to match the theoretical probability exactly.

The Teaching Creed

You are not the expert; the book and the method are. Your job is to ask "how do you know?" one more time than feels natural, and to celebrate wrong answers out loud. In here, a wrong answer is where the lesson lives.

GENO, GSU's free tutor, can explain any step a second way, any hour, in 83 languages, with no login: globalsovereignuniversity.org/free-tutor. A prompt for the host: Ask GENO: "Explain the difference between drawing with and without replacement, and give me one of each to solve."

Adapt It and Measure It

Differentiation

- Struggling: list every outcome before writing a fraction.
- Ahead: run a 100-trial simulation and compare it with the theoretical probability.
- Large co-op: each team tests one game of chance and reports whether it is fair.
- Reluctant: let the child design a simple game and work out its odds.

Evidence of learning (no exam)

Look for three things. Tried: finished all five Solo Climb problems with work shown. Noticed: can name the mistake in Common Mistakes that they almost made. Changed: the next day, solves one new problem from the same chapter without help. Those three words are the whole rubric, and they match the badge tiers below.

Gamify It — The Campus Climb

Every GSU lesson is one badge on the Climber's Passport, earned at four depths: Bronze, Silver, Gold and Platinum.

LESSON 12 BADGE — The Reliability Expert · Bronze — The Climb: finished the 45-minute lesson, all five steps. · Silver — The Try: did the homework and explained it to the host. · Gold — The Proof: completed the chapter's Action Report in the workbook with every answer checked against the Answer Key. · Platinum — The Teacher: ran this lesson as host for someone else. The harvest of a teacher is teachers.

Answers for the Host

1. 3/6 = 1/2
2. 13/52 = 1/4
3. 1/3 × 1/4 = 1/12
4. 6/10 × 4/9 = 4/15
5. 230/1000 = 0.23

Keep It Fresh: 1. 4/36 = 1/9 · 2. 5/12 × 4/11 = 5/33

Every answer above comes from the workbook's own Answer Key. The book behind this lesson: 8th Grade Math Workbook: Real-World Problem Solving, Chapter 12 (The Risk Analyst).

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THE GRADE LEVEL CHECK

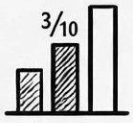
Ninety percent of parents believe their child is on grade level. About thirty percent are.



THE DATA GAP

~9 in 10
parents believe
their child is on grade level

~3 in 10
proficient
in reading & math — NAEP



Something in the middle is translating one into the other.
Researchers have a name for it: B-flation.

Sources: national parent survey research · NAEP, the Nation's Report Card

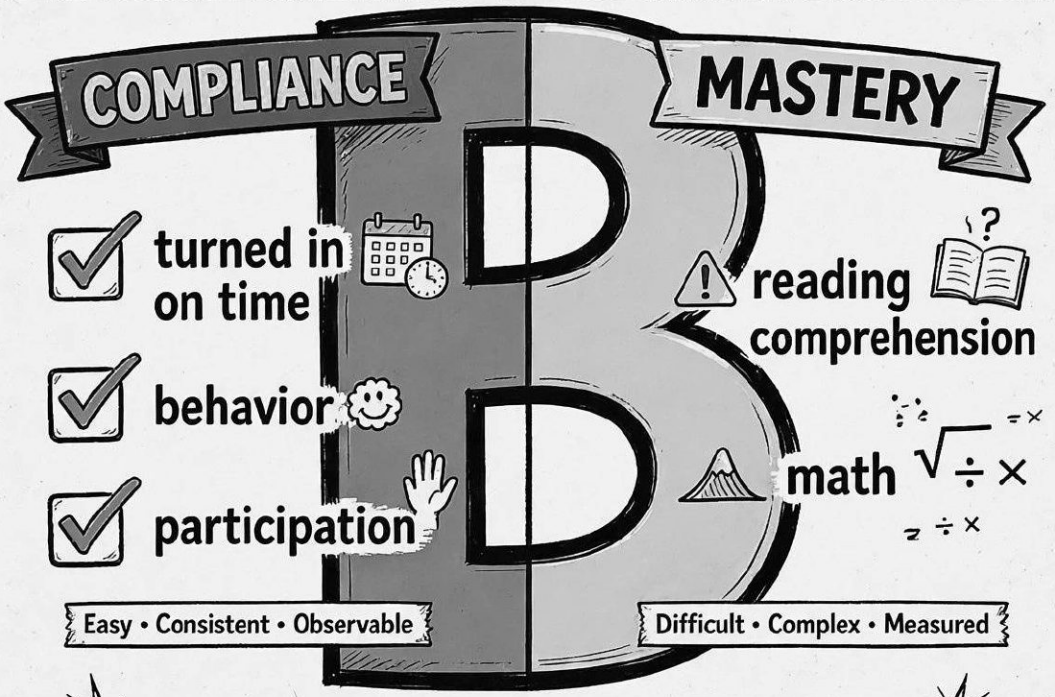
HOW A REPORT CARD CAN BE HONEST AND STILL BE WRONG

Middle school grades blend two different things.

One is understanding, the other is compliance.
Both matter but the second is easier.

Understanding

Compliance



In Oregon, the bar moved.

Since 2020, students have not had to prove reading and writing proficiency to graduate.

A student who is organized, polite, punctual and cannot read a chapter will earn B's for years.

Every B is true about compliance • and false about mastery.

The report card is not lying. It is answering a different question.

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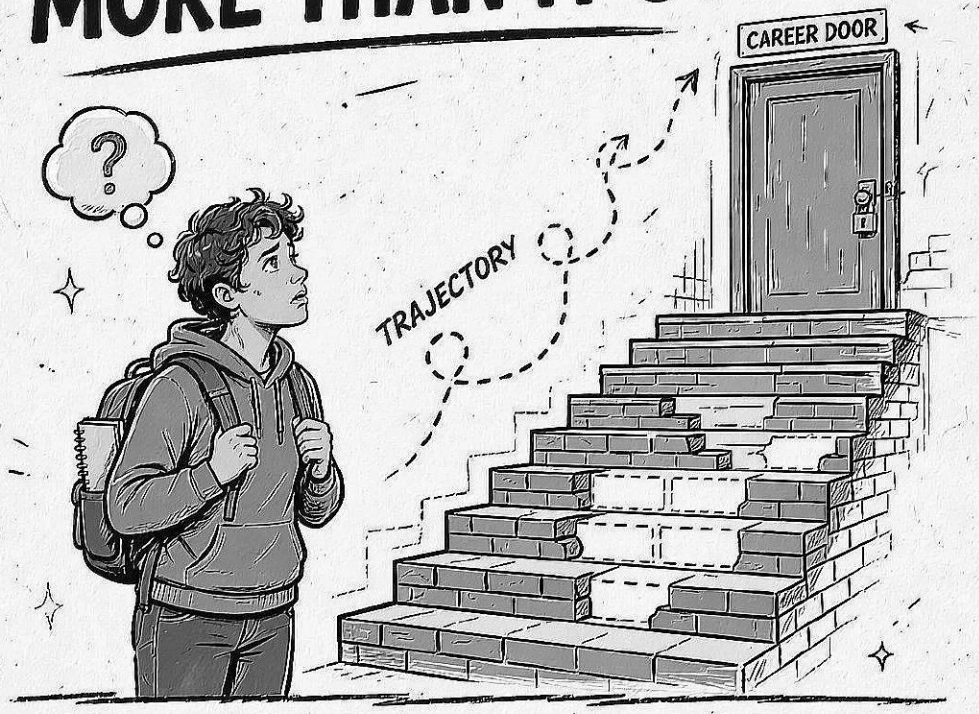
PAGE 3

WHY THIS MATTERS MORE THAN IT SOUNDS



WHAT HAPPENS

- A gap you know about is a problem.
- A gap you don't know about is a trajectory.
- The student moves to the next grade on material they never secured.
- **By the time it surfaces, it is a failed placement exam, a repeated course, a career door that quietly does not open.**
- **And the person concludes they are not smart, because nobody ever showed them the actual measurement.**

Scan the code on page 4 to check, privately.

SO HERE IS THE MEASUREMENT.

FREE, AND NOBODY IS WATCHING.



This check gives you a straight answer about reading and math — the highest grade level where answers hold up.

READING
15 questions
grade 4–8 passages → harder

MATHEMATICS
15 questions
grade 4–8 ladder

WRITING
one prompt
scoring guide you apply

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SCAN TO CHECK PRIVATELY

Free • Private • In Your Browser

Disclaimer: It is a screener, not a standardized test, not norm-referenced, not psychometrically validated. Does not satisfy state homeschool assessment. This is a signal, not a diagnosis.