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

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 points and let me find the equation of the line, then check my slope."

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

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

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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