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

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 how to choose between substitution and elimination for 3x + 2y = 16 and 3x − 2y = 8."

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

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

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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