Grade 7 Math · Lesson 3 — Can We Fill the Order?

Ratios, Unit Rates and Proportions · ages 11 to 14 · 45 minutes · the workbook, one screen, this page, a pencil and paper

At a Glance

- **The book:** 7th Grade Math Workbook: Real-World Problem Solving, Chapter 3 (The Farm Manager), by Dr. Gene A Constant.
- **Free tool:** Math Jeopardy (a quiz game show with a Grade 7 board), free, no login, plays in the browser: globalsovereignuniversity.org/math-jeopardy.
- **Free class:** Lesson 3 of the free Grade 7 Mathematics class: globalsovereignuniversity.org/grade-7-math-class#lesson-3.
- **Ages and time:** Grade 7 · ages 11 to 14 · 45 minutes.
- **Prep (5 min):** read the Teaching Creed and have the workbook open to Chapter 3. Have a clock or phone timer and a sheet of paper for writing a name over and over.

Why this lesson

A rate is how the world measures work: gallons per hour, miles per gallon, dollars per pound. Once a child can find the rate for one and scale it, they can plan a farm, a road trip or a grocery list.

What the learner will be able to do

- Write a ratio three ways
- Find a unit rate
- Solve a proportion by unit rate or by cross-multiplication
- Convert units inside a rate problem
- Use rates to predict output and plan supplies

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)

"Time yourself writing your name 10 times. Now use that rate to predict how long 50 times would take, then check."

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 How Fast Does the Filter Work? (Section 3.1) together: The farm's water filter cleans 180 gallons in 4 hours. Divide gallons by hours: 180 ÷ 4. 180 ÷ 4 = 45. The filter cleans 45 gallons per hour. Then read How Long to Pick 14 Pounds? (Section 3.2) together: A picker gathers 3.5 pounds of mushrooms in 2 hours. Find the unit rate: 3.5 ÷ 2 = 1.75 pounds per hour. Divide the goal by the rate: 14 ÷ 1.75 = 8. Check with a proportion: 3.5/2 = 14/h, so 3.5h = 28 and h = 8. It takes 8 hours.

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. What does the word per tell you? 2. Why must the units match before you multiply a rate? 3. How can you check a proportion answer?

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

- Q1: That it is a rate: how much for one of something, such as gallons per hour or miles per gallon.
- Q2: A per-minute rate times hours gives a wrong answer. Change hours to minutes first, or change the rate to per hour.
- Q3: Find the unit rate both ways. If 3.5 pounds take 2 hours and 14 pounds take 8 hours, both give 1.75 pounds per hour.

4 · Solo Climb (12 min)

Five problems on your own, with your work shown.
1. A farmhand lays 120 bricks for a new oven in 1.5 hours. At that rate, how many bricks can he lay in an 8-hour day?
2. A greenhouse with 8 beds grows 320 pounds of tomatoes. The farm builds 5 more identical beds. How many pounds will all 13 beds grow?
3. A runner carries a message 6 miles in 45 minutes. At the same pace, how many minutes will the next 8 miles take?
4. The sawmill gets 45 board feet of lumber from every 2 logs. A new barn needs 315 board feet. How many logs are needed?
5. It takes 12 pounds of fresh fruit to make 8 jars of jam. A tree gives 54 pounds of fruit. How many jars can be made?

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: -3.6×2.5
2. Find: $2\frac{2}{3} \div \frac{1}{3}$

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)

"Find the rate for one, then scale it. Make the units match before you multiply." · Homework: At the store, read the unit price on two sizes of the same food. Check one of them yourself by dividing the price by the amount.

The badge moment: finishing all five steps earns the Bronze ring of this lesson's badge, The Order Filler. 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

- Dividing the wrong way: 180 gallons in 4 hours is 180 ÷ 4, not 4 ÷ 180.
- Mixing units, such as multiplying a per-minute rate by hours.
- Setting up a proportion with the amounts in different places on each side.

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: "My child keeps setting up proportions upside down. Help them check which number goes on top, without giving the answer."

Adapt It and Measure It

Differentiation

- Struggling: build a two-column table (amount and time) and fill in the rate for one first.
- Ahead: compare the unit prices of three sizes of the same product at a store.
- Large co-op: each team times a task and predicts how long the whole group would take.
- Reluctant: let the child time something they enjoy, such as free throws or laps, and predict a bigger number.

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 Order Filler · 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. 640 bricks (120 ÷ 1.5 = 80 per hour; 80 × 8)
2. 520 pounds (320 ÷ 8 = 40 per bed; 40 × 13)
3. 60 minutes (7.5 minutes per mile × 8)
4. 14 logs (22.5 board feet per log; 315 ÷ 22.5)
5. 36 jars (1.5 pounds per jar; 54 ÷ 1.5)

Keep It Fresh: 1. −9 · 2. 8

Every answer above comes from the workbook's own Answer Key. The book behind this lesson: 7th Grade Math Workbook: Real-World Problem Solving, Chapter 3 (The Farm Manager).

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