# Grade 7 Math · Lesson 2 — The Shed Estimate

*Multiplying and Dividing Rational Numbers · 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 2 (The Carpenter), by Dr. Gene A Constant.
- **Free tool:** Fraction Action (visual fractions, including dividing fractions), free, no login, plays in the browser: globalsovereignuniversity.org/fraction-action.
- **Free class:** Lesson 2 of the free Grade 7 Mathematics class: globalsovereignuniversity.org/grade-7-math-class#lesson-2.
- **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 2. Cut a strip of paper 15¾ inches long and have a ruler and pencil ready.

## Why this lesson

Carpenters, cooks and builders multiply and divide fractions and decimals all day. The sign rules and the flip-and-multiply rule are short, but children who only memorize them mix them up. Doing it with a real strip of paper makes the rule stick.

## What the learner will be able to do

- Use the sign rules to multiply and divide integers
- Multiply and divide fractions and mixed numbers
- Multiply and divide decimals
- Decide when to round down to whole pieces
- Read a negative rate as a loss over time

# 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)

**"Take a strip of paper 15¾ inches long and mark off pieces 1½ inches long. How many whole pieces do you get, and what is left over?"**

*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 Rate Over Time (Section 2.1) together: The shop heater breaks. The temperature changes at −2.5°F every hour. After 6 hours, multiply the rate by the time: −2.5 × 6. 2.5 × 6 = 15, and a negative times a positive is negative. The temperature has changed by −15°F. Then read Sharing a Loss (Section 2.2) together: A storm ruins a delivery, and the crew loses $450. Write the loss as −450. Three partners split it equally: −450 ÷ 3. 450 ÷ 3 = 150, and a negative divided by a positive is negative. Each partner's share is −$150.**

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

## 3 · The Talk (8 min)

**1. Why is a negative times a negative a positive? 2. Why do we flip the second fraction when we divide? 3. When should you round down instead of rounding to the nearest whole number?**

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

- Q1: Each negative flips the direction. Flipping twice brings you back to positive, the way losing a debt is a gain.
- Q2: Dividing asks how many of one amount fit into another. Multiplying by the reciprocal answers the same question in one step.
- Q3: When the answer counts whole things you need, like braces, frames or posts. Half a brace cannot be used.

## 4 · Solo Climb (12 min)

**Five problems on your own, with your work shown.**
**1. A carpenter on a heavy framing job drinks 3.5 liters of water a day. How much water should the crew pack for one carpenter on a 14-day job?**
**2. Fifteen crew members pay equally into a $105.75 tool fund. How much does each person pay?**
**3. A jar holds 5¼ ounces of wood glue. Each joint uses ⅜ ounce. How many joints can be glued?**
**4. A solar panel on the shop roof makes 2.25 kilowatt-hours each hour of full sun. How much does it make in 6.5 hours?**
**5. A water tank holds 1,200 gallons. The client wants ⅔ of it pumped to the garden. How many gallons is that?**

*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: −14 + 9 − (−6)**
**2. Which is greater, |−12| or |9|? By how much?**

*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 signs make a positive; different signs make a negative. To divide by a fraction, flip it and multiply." · Homework: Measure a real board, shelf or table with a tape measure to the nearest quarter inch. Work out how many 1½-inch blocks could be cut from it, and how much would be left over.**

*The badge moment: finishing all five steps earns the Bronze ring of this lesson's badge, The Steady Hand. 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 the sign rule: a negative times a positive is negative.
- Dividing by a fraction without flipping it to its reciprocal.
- Rounding up when you need whole pieces. Half a brace is not a brace, so round down.

## 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 does not understand why dividing by ¾ gives a bigger answer. Show them with a picture instead of giving the answer."

## Adapt It and Measure It

### Differentiation

- Struggling: cut real strips of paper for each fraction problem before computing.
- Ahead: estimate how many boards a real shelf or fence at home would take.
- Large co-op: each team prices one part of a shed and the group adds the totals.
- Reluctant: let the child measure and cut something real, such as craft sticks or paper strips.

### 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 Steady Hand · 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. 49 liters (3.5 × 14)
2. $7.05 (105.75 ÷ 15)
3. 14 joints (5¼ ÷ ⅜ = 21/4 × 8/3 = 14)
4. 14.625 kilowatt-hours (2.25 × 6.5)
5. 800 gallons (1,200 × ⅔)

Keep It Fresh: 1. 1 · 2. |−12| = 12 is greater by 3

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 2 (The Carpenter).

*Global Sovereign University: Different by Design. Better by Mission.*

The Foundation for Global Instruction · a 501(c)(3) nonprofit · Eugene, Oregon · globalsovereignuniversity.org · FREE TO KEEP · FREE TO SHARE