Grade 6 Math · Lesson 6 — Shrinking the World

Scale drawings and scale factors · ages 10 to 13 · 45 minutes · the workbook, one screen, this page, a pencil and paper

At a Glance

- **The book:** 6th Grade Math Workbook: Real-World Problem Solving, Chapter 6 (The Map Maker), by Dr. Gene A Constant.
- **Free tool:** Measurement Master (reading a tape measure and ruler accurately), free, no login, plays in the browser: globalsovereignuniversity.org/measurement-master.
- **Ages and time:** Grade 6 · ages 10 to 13 · 45 minutes.
- **Prep (5 min):** read the Teaching Creed and have the workbook open to Chapter 6. Have a ruler, a tape measure, graph paper and a road map or a printed map.

Why this lesson

Maps, blueprints, model trains and enlarged photos all depend on one idea: every length is multiplied by the same number. Children who draw their own room to scale understand it in an afternoon, and they also discover the surprise of this chapter: double the lengths and the area goes up four times.

What the learner will be able to do

- Use a map scale to find real distances and map distances.
- Find a scale factor between similar figures.
- Find a missing side of a similar figure.
- Explain why area grows by the scale factor times itself.

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)

"On this map, how far is it from our town to the next town? The map says 1 inch is 25 miles. Measure it."

Say it like this: Let your child measure with a ruler and multiply. Then check the real distance on a phone map if you have one.

2 · Work It Together (15 min)

Open the workbook to Two Cities on a Map and read it aloud: 3.5 × 25 = 87.5 miles. Then read An Enlarged Rectangle: 12 ÷ 8 = 1.5, and 6 × 1.5 = 9. Finish with Doubling a Square, and draw it on graph paper: a 2-by-2 square doubled is 4-by-4, and four of the small squares fit inside.

Measure one room at home with the tape measure and draw it on graph paper at 1 square = 1 foot. Then try one level of Measurement Master.

3 · The Talk (8 min)

1. Why does doubling the sides of a square make the area four times as big? 2. A scale says 1:50,000. Why are there no units? 3. How can you tell two rectangles are similar?

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

- Q1: Both the length and the width double, and 2 × 2 = 4.
- Q2: The same unit is used on both sides: 1 centimeter on the map is 50,000 centimeters on the ground.
- Q3: Every side of one is the same multiple of the matching side of the other.

4 · Solo Climb (12 min)

Five problems on your own, with your work shown.
1. Scale: 1 in : 10 mi. The map distance is 4.5 in. Find the actual distance.
2. A 600-mile flight path is 4 inches long on a map. What is the map's scale?
3. A triangle has sides 3, 4 and 5. A similar triangle's shortest side is 9. Find its other two sides.
4. A 4 cm × 6 cm rectangle (24 sq cm) is enlarged by a scale factor of 3. Find the new area.
5. Blueprint scale: 1 in : 20 ft. A house is 60 ft × 40 ft. What are its blueprint dimensions?

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 earlier chapters.
1. Find the MAD: 10, 12, 14, 16, 18.
2. How many ¼-cup servings are in 3 cups?

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)

“Every length is multiplied by the same scale factor. Area is multiplied by that factor twice.” · Homework: Draw your bedroom or kitchen to scale on graph paper, with a scale written in the corner.

The badge moment: finishing all five steps earns the Bronze ring of this lesson’s badge, The Cartographer. 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 when you should multiply: map to real means multiply by the scale.
- Multiplying area by the scale factor once instead of twice.
- Mixing units, such as inches on one side and feet on the other.

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 says doubling a 3 × 3 square gives an area of 18. Help them see why that is not right, using graph paper.”

Adapt It and Measure It

Differentiation

- Struggling: use 1 square = 1 foot and whole numbers only.
- Ahead: build a 1:24 scale model of a piece of furniture.
- Large co-op: teams map the meeting place and compare scales.
- Reluctant: let the child map a favorite park or game field.

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 Cartographer · 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. 45 miles
2. 1 in : 150 mi
3. 12 and 15
4. 216 sq cm
5. 3 in × 2 in

Keep It Fresh: 1. 2.4 · 2. 12 servings

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

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