Grade 6 Math · Lesson 9 — Above and Below Zero

Absolute value and the coordinate plane · 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 9 (The Climate Scientist), by Dr. Gene A Constant.
- **Free tool:** Math Jeopardy (a quiz game show with a Grade 6 board), free, no login, plays in the browser: globalsovereignuniversity.org/math-jeopardy.
- **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 9. Draw a large coordinate grid on paper from −10 to 10 on each axis. A thermometer helps.

Why this lesson

Weather, oceans and mountains do not stop at zero. Absolute value tells how far a reading is from zero, whatever its direction. The coordinate plane tells exactly where a station sits. Together they let a child read the world the way a scientist does.

What the learner will be able to do

- Find the absolute value of a number.
- Compare and order negative decimals and fractions.
- Plot points and name their quadrants.
- Find the distance between points that share a coordinate.

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)

"Which is colder, −15 degrees or −12 degrees? And which is farther from zero?"

Say it like this: Both answers are −15, and that surprises many children. Colder means less; farther means a bigger absolute value.

2 · Work It Together (15 min)

Open the workbook to A Temperature Drop and read it aloud: |−23| = 23 degrees. Then read Ordering Readings on a number line. Finish with Finding a Quadrant: (−3, 5) is left and up, Quadrant II.

Plot four points on the paper grid together, one in each quadrant, and find the distance between two that share a y-coordinate. Then play one round of Math Jeopardy on the Grade 6 board.

3 · The Talk (8 min)

1. Why can an absolute value never be negative? 2. Why is −1.3 less than −1.25? 3. How do you find the distance between (−4, 3) and (5, 3)?

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

- Q1: It is a distance, and a distance cannot be less than zero.
- Q2: It is farther left on the number line, farther below zero.
- Q3: They share y = 3, so subtract the x-values and take the absolute value: |5 − (−4)| = 9.

4 · Solo Climb (12 min)

Five problems on your own, with your work shown.
1. Find: |5 − 12|
2. Order from least to greatest: 1.5, −2.5, 0.5, −0.5, −1.5.
3. Name the quadrant: (5, −3)
4. Start at (2, 3). Move 5 units left and 7 units down. Where are you now?
5. Two weather stations are at (−7, −2) and (−7, 8). How far apart are they?

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 45% of 80.
2. Write an expression: 'the product of 8 and a number n, minus 5'.

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)

“Absolute value is distance from zero. On the grid, first go left or right, then up or down.” · Homework: Track the morning temperature for a week (or look up a cold city’s). Plot each day as a point: day on the x-axis, temperature on the y-axis.

The badge moment: finishing all five steps earns the Bronze ring of this lesson’s badge, The Field Scientist. 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

- Calling −15 greater than −12 because 15 is bigger than 12.
- Plotting (x, y) as up first, then across.
- Saying a point on an axis is in a quadrant.

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 −1.3 is greater than −1.25. Help them see it on a number line without giving the answer."

Adapt It and Measure It

Differentiation

- Struggling: use only whole numbers and a thermometer drawing.
- Ahead: draw a rectangle from four points and find its perimeter and area.
- Large co-op: play coordinate battleship on paper grids.
- Reluctant: plot the locations of favorite places on a home-made map grid.

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 9 BADGE — The Field Scientist · 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. 7
2. −2.5, −1.5, −0.5, 0.5, 1.5
3. Quadrant IV
4. (−3, −4)
5. 10 units

Keep It Fresh: 1. 36 · 2. 8n − 5

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 9 (The Climate Scientist).

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