Grade 8 Math · Lesson 1 — The Precision Report

Real Number System · 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 1 (The Data Scientist), by Dr. Gene A Constant.
- **Free tool:** Math Jeopardy (a quiz game show with a Grade 8 board), free, no login, plays in the browser: globalsovereignuniversity.org/math-jeopardy.
- **Free class:** Lesson 1 of the free Grade 8 Mathematics class: globalsovereignuniversity.org/grade-8-math-class#lesson-1.
- **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 1. Write 0.5, 3/4, 3.14, π and √2 on five slips of paper, and have a calculator handy for checking only.

Why this lesson

Every measurement a data scientist, builder or doctor writes down is either exact or rounded. A child who can tell a rational number from an irrational one, and estimate a square root without a calculator, knows how much to trust a number and how to say so.

What the learner will be able to do

- Distinguish between rational and irrational numbers.
- Locate real numbers on the number line.
- Approximate irrational numbers.
- Perform operations with rational and irrational numbers.
- Turn repeating decimals into fractions.

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)

"Here are four numbers from a sensor: 0.5, 3/4, 3.14 and π. Which ones could you write down exactly, and which ones go on forever?"

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 Classifying 0.375 (Section 1.1) together: Check if decimal terminates or repeats: 0.375 terminates Convert to fraction: 0.375 = 375/1000 = 3/8 Since it can be written as a fraction, it is RATIONAL. Then read Approximating √7 (Section 1.2) together: Find perfect squares near 7: 4 < 7 < 9 Take square roots: √4 < √7 < √9, so 2 < √7 < 3 Since 7 is closer to 9 than 4, √7 is closer to 3 than 2 Estimate: √7 ≈ 2.6 (actual: 2.6457…).

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. Why is 3.14 rational while π is irrational? 2. How can you estimate √50 without a calculator? 3. When should a report use an exact value, and when a rounded one?

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

- Q1: 3.14 ends, so it can be written as 314/100. π never ends and never repeats, so no fraction equals it exactly.
- Q2: Find the perfect squares on each side: 49 and 64. √50 is just above 7, about 7.1.
- Q3: Use the exact value for further math, and round for people who must act on it, such as ordering fence.

4 · Solo Climb (12 min)

Five problems on your own, with your work shown.
1. Is √16 rational or irrational? What about √17?
2. Between which two consecutive integers is √30?
3. A square plot of land has area 200 sq ft. Approximate the side length.
4. Is 0.333… + 0.666… rational? Calculate the sum as a fraction.
5. Convert 0.636363… to a fraction.

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. Order from least to greatest: √12, 3.5, √15, 4
2. Between which integers is √85?

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)

Some numbers end or repeat and can be written as a fraction. The rest go on forever; we estimate them, and we say how close we are. · Homework: Find three measurements at home on a label or a ruler. Decide which are exact and which are rounded, and say how many decimal places you would trust.

The badge moment: finishing all five steps earns the Bronze ring of this lesson's badge, The Precise Counter. 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 3.14 irrational. It ends, so it is rational; only π itself never ends.
- Thinking every square root is irrational. √16 = 4 and √49 = 7 are whole numbers.
- Guessing a square root without checking: find the two perfect squares it sits between first.

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: "Explain why √20 is irrational but √25 is not, then give me one to try."

Adapt It and Measure It

Differentiation

- Struggling: place each number on a paper number line before classifying it.
- Ahead: find three square roots between 10 and 11 without a calculator and check them.
- Large co-op: give each team a mixed list of numbers to sort into a family tree.
- Reluctant: let the child measure things at home and decide which measurements are exact.

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 1 BADGE — The Precise Counter · 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. √16 = 4, rational (perfect square); √17 ≈ 4.123, irrational
2. 5 and 6 (25 < 30 < 36)
3. √200 ≈ 14.1 ft
4. Yes: 1/3 + 2/3 = 1 (= 1/1), rational
5. 63/99 = 7/11

Keep It Fresh: 1. √12 (3.46), 3.5, √15 (3.87), 4 · 2. 9 and 10

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 1 (The Data Scientist).

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