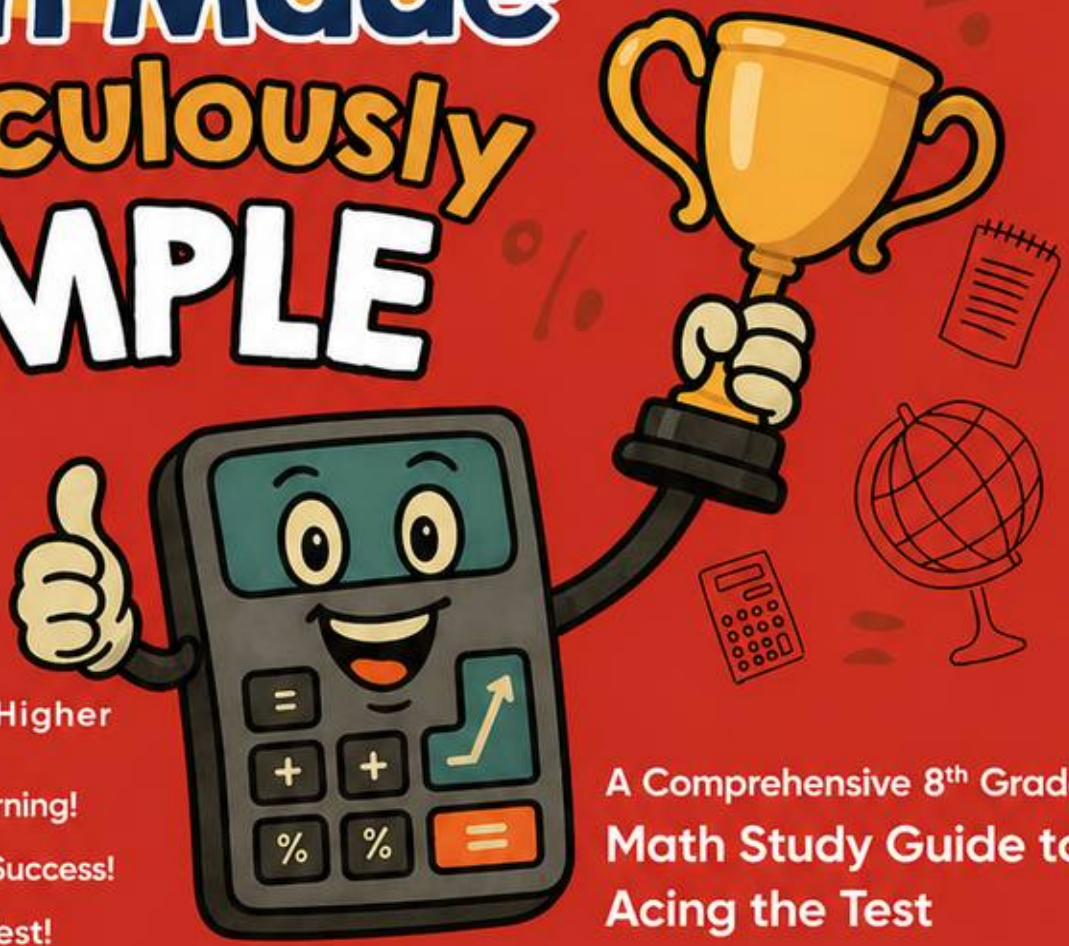
Georgia Milestones Grade 8

Math Made Ridiculously SIMPLE



- Smarter Practice. Higher Scores.
- Fast, Fun, Focused Learning!
- Your Shortcut to Math Success!
- Conquer the Math Test!

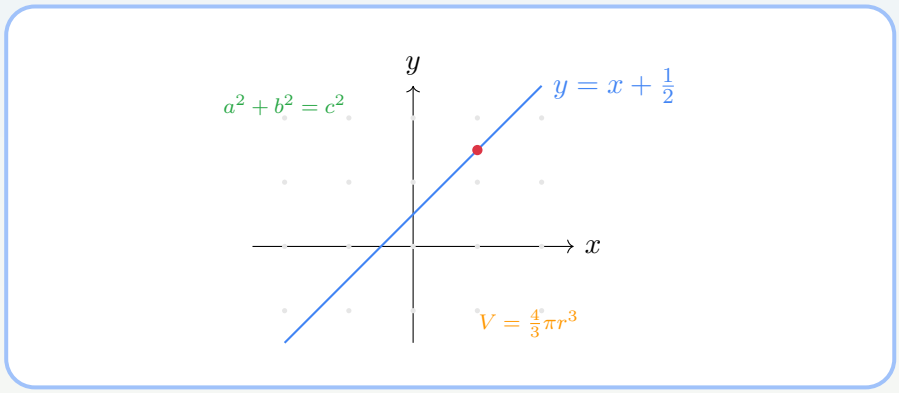
A Comprehensive 8th Grade Math Study Guide to Acing the Test

Learn Faster · Understand Deeper · Succeed with Confidence

Georgia Milestones Grade 8 Math

Made Ridiculously Simple

A Comprehensive 8th Grade Math Study Guide to Acing the Milestones Test



Reza Nazari

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8.GSR | Georgia

Grade 8 expectations grouped under 8.GSR.

8.GSR.8	Solve geometric problems involving the Pythagorean Theorem and the volume of geometric figures to explain real phenomena
8.GSR.8.1	Explain a proof of the Pythagorean Theorem and its converse using visual models
8.GSR.8.2	Apply the Pythagorean Theorem to determine unknown side lengths in right triangles within authentic, mathematical problems in two and three dimensions
8.GSR.8.3	Apply the Pythagorean Theorem to find the distance between two points in a coordinate system in practical, mathematical problems
8.GSR.8.4	Apply the formulas for the volume of cones, cylinders, and spheres and use them to solve in relevant problems

8.NR | Georgia

Grade 8 expectations grouped under 8.NR.

8.NR.1	Solve problems involving irrational numbers and rational approximations of irrational numbers to explain realistic applications
8.NR.1.1	Distinguish between rational and irrational numbers using decimal expansion. Convert a decimal expansion which repeats eventually into a rational number
8.NR.1.2	Approximate irrational numbers to compare the size of irrational numbers, locate them approximately on a number line, and estimate the value of expressions
8.NR.2	Solve problems involving radicals and integer exponents including relevant application situations; apply place value understanding with scientific notation and use scientific notation to explain real phenomena
8.NR.2.1	Apply the properties of integer exponents to generate equivalent numerical expressions
8.NR.2.2	Use square root and cube root symbols to represent solutions to equations. Recognize that $x^2 = p$ (where p is a positive rational number and $\|x\| \leq 25$) has two solutions and $x^3 = p$ (where p is a negative or positive rational number and $\|x\| \leq 10$) has one solution. Evaluate square roots of perfect squares ≤ 625 and cube roots of perfect cubes $\geq$ -1,000 and $\leq$ 1,000

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8.NR.2.3	Use numbers expressed in scientific notation to estimate very large or very small quantities, and to express how many times as much one is than the other
8.NR.2.4	Add, subtract, multiply and divide numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Interpret scientific notation that has been generated by technology (e.g., calculators or online technology tools)

8.PAR | Georgia

Grade 8 expectations grouped under 8.PAR.

8.PAR.3	Create and interpret expressions within relevant situations. Create, interpret, and solve linear equations and linear inequalities in one variable to model and explain real phenomena
8.PAR.3.1	Interpret expressions and parts of an expression, in context, by utilizing formulas or expressions with multiple terms and/or factors
8.PAR.3.2	Describe and solve linear equations in one variable with one solution (x=a), infinitely many solutions (a=a), or no solutions (a=b). Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form x = a, a = a, or a = b results (where a and b are different numbers)
8.PAR.3.3	Create and solve linear equations and inequalities in one variable within a relevant application
8.PAR.3.4	Using algebraic properties and the properties of real numbers, justify the steps of a one-solution equation or inequality
8.PAR.3.5	Solve linear equations and inequalities in one variable with coefficients represented by letters and explain the solution based on the contextual, mathematical situation
8.PAR.3.6	Use algebraic reasoning to fluently manipulate linear and literal equations expressed in various forms to solve relevant, mathematical problems
8.PAR.4	Show and explain the connections between proportional and non-proportional relationships, lines, and linear equations; create and interpret graphical mathematical models and use the graphical, mathematical model to explain real phenomena represented in the graph

8.PAR.4.1 Use the equation y = mx(proportional) for a line through the origin to derive the equation y = mx+b(non-proportional) for a line intersecting the vertical axis at b

8.PAR.4.2 Show and explain that the graph of an equation representing an applicable situation in two variables is the set of all its solutions plotted in the coordinate plane

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Study Tips

- **Here's a pattern:** the denominator always has as many 9s as there are digits in the repeating block. 1-digit repeating → 9 in denominator; 2-digit → 99; 3-digit → 999. Easy!
- **Mind-blower:** $0.\overline{9} = 1$ exactly (not an approximation!). Try it yourself with the subtraction method: $10x = 9.\overline{9}$, subtract to get $9x = 9$, so $x = 1$.
- For mixed decimals like $0.1\overline{6}$ (with a non-repeating part), shift the non-repeating part first by multiplying by 10: $10x = 1.\overline{6}$. Then convert to $1\frac{2}{3}$ and divide by 10 to undo the shift.

Word Problems

16. A factory machine cuts wire into pieces whose length in metres is $0.\overline{3}$. If a full spool holds exactly 12 metres of wire, how many complete pieces can be cut from one spool?

_____

17. Keiko divides 8 by 11 on her calculator and sees $0.727272\ldots$ on the screen. Her classmate Omar says the exact value is $\frac{8}{11}$, not a repeating decimal. Are both descriptions correct? Explain.

_____

18. A recipe calls for $0.\overline{142857}$ cups of vanilla extract. (a) Convert $0.\overline{142857}$ to a fraction. (b) Simplify the fraction. (c) If the recipe is tripled, how many cups of extract are needed? Express as a fraction.

_____

19. Two students each earn money per hour as a repeating decimal. Student A earns $\$12.\overline{3}$ per hour and Student B earns \$12.75 per hour. (a) Convert $12.\overline{3}$ to a mixed number. (b) Who earns more per hour? (c) How much more does the higher earner make in a 6-hour shift?

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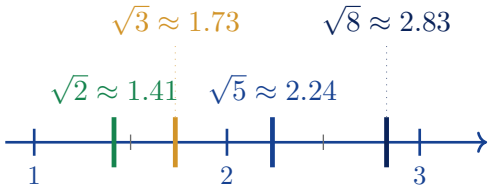
20. A scientist measures the density of a metal sample as $7.\overline{18}$ g/cm^3. (a) Convert $7.\overline{18}$ to a fraction. (b) A block of this metal is 10 cm^3. What is its mass as a fraction? (c) Round the mass to the nearest gram.

_____

1.3 Estimating Irrational Numbers

8.NR.1, 8.NR.1.2

When a square root isn't a perfect square, you can't just write down the exact decimal, but here's the good news: you can estimate it super well! The trick is to squeeze it between two perfect squares. For example, since $36 < 45 < 49$, you immediately know that $6 < \sqrt{45} < 7$—your answer is somewhere in that range. Then test tenths or hundredths to narrow it down even more. **The why behind this:** when you square nearby numbers, they tell you if you're too low or too high. This clever method helps you place irrational numbers on a number line and compare them to regular whole numbers and decimals. You've got a superpower now!



Key Concepts & Quick Review

Squeeze between consecutive integers: Find n and $n+1$ such that $n^2 < x < (n+1)^2$; then $n < \sqrt{x} < n+1$.

Refine to tenths: Try $n.1$, $n.2, \ldots$ until you find $a^2 < x < b^2$; then $a < \sqrt{x} < b$.

Comparing irrationals: $\sqrt{a} < \sqrt{b}$ whenever $a < b$ $(a, b > 0)$, so larger radicand ⇒ larger square root.

Examples

① Between which two consecutive integers does $\sqrt{20}$ lie?

Find two perfect squares that squeeze 20: We have $4^2 = 16 < 20$ and $5^2 = 25 > 20$. So $\sqrt{20}$ must be between 4 and 5—you can be sure of that! **Now here's a helpful hint:** since 20 is closer to 25 than to 16, the square root is closer to 5. In fact, $\sqrt{20} \approx 4.47$—pretty close to 5, right?

Answer: $4 < \sqrt{20} < 5$

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② Estimate $\sqrt{45}$ to one decimal place.

First, squeeze with integers: $6^2 = 36 < 45 < 49 = 7^2$, so $6 < \sqrt{45} < 7$. Now refine to tenths. **Test:** $6.7^2 = 44.89 < 45$ and $6.8^2 = 46.24 > 45$. This tells us $6.7 < \sqrt{45} < 6.8$—we're narrowing it down! Since 45 is much closer to 44.89, we know $\sqrt{45} \approx 6.7$ is our best estimate to one decimal place.

Answer: $\sqrt{45} \approx 6.7$

Practice Problems

Give the two consecutive integers that bound each square root, then estimate to one decimal place where indicated.

1. $\sqrt{10}$ is between _____

2. $\sqrt{18}$ is between _____

3. $\sqrt{35}$ is between _____

4. $\sqrt{50}$ is between _____

5. $\sqrt{72}$ is between _____

6. $\sqrt{90}$ is between _____

7. $\sqrt{6} \approx$ _____ (1 d.p.)

8. $\sqrt{14} \approx$ _____ (1 d.p.)

9. $\sqrt{30} \approx$ _____ (1 d.p.)

10. $\sqrt{52} \approx$ _____ (1 d.p.)

11. Order: $\sqrt{5}$, 2, $\sqrt{3}$ _____

12. Greater: $\sqrt{11}$ or 3.3? _____

Study Tips

- Memorize perfect squares through 169 (13^2). This gives you the power to quickly bracket any square root and know which two integers it falls between. You're building your math toolkit!
- When estimating $\sqrt{x}$ to one decimal place, find the two tenths it falls between, then decide which is closer. If they're equally close, test hundredths for extra accuracy before rounding.
- **Here's a time-saver for comparing irrational numbers:** just compare the radicands directly—no estimation needed! Since $47 < 53$, you know right away that $\sqrt{47} < \sqrt{53}$. Smart thinking!