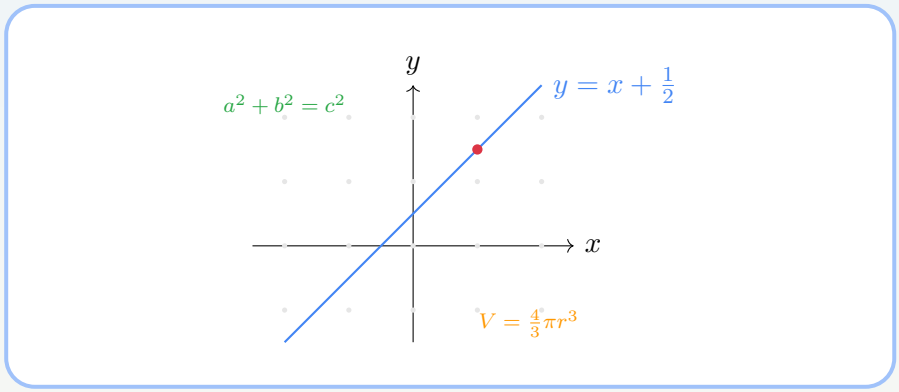
Georgia Milestones

8th Grade Math Workbook

Comprehensive Practice, Challenging Exercises, and Strategic Guidance for Complete Test-Day Confidence



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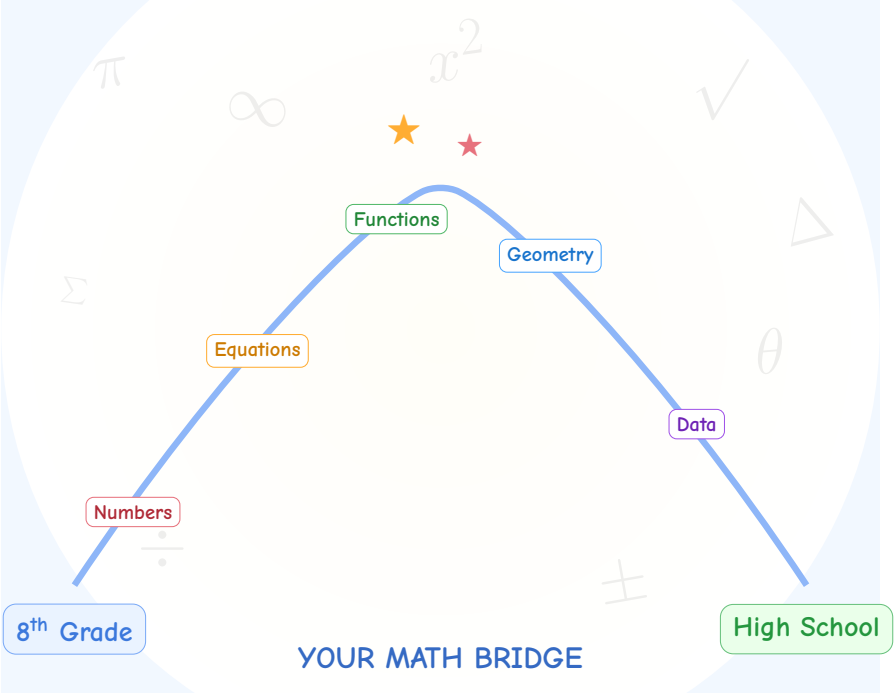
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Welcome, 8th Grader!

The Bridge Between Middle School and High School Starts Here



Dear Eighth Grader,

Welcome! This is *your* year. Everything you have built so far — working with fractions, decimals, ratios, and basic geometry — has been preparing you for this moment. Eighth-grade math is where all of those skills come together and open the door to high school and beyond.

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

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

1.4 Estimating Expressions with Irrational Numbers

8.FGR.5.6, 8.NR.1.2, 8.PAR.3.1

Quick Review and Helpful Hints

Useful approximations: $\sqrt{2} \approx 1.41$, $\sqrt{3} \approx 1.73$, $\sqrt{5} \approx 2.24$, $\pi \approx 3.14$

Strategy: Substitute ⇒ Simplify ⇒ Round to the required number of decimal places.

Bounding: Computing both a *lower bound* (using smaller approximations) and an *upper bound* (using larger ones) confirms how accurate the estimate is.

Example: Estimate π^2 to two decimal places.

Use $\pi \approx 3.14$. Then $\pi^2 \approx 3.14 \times 3.14$. Compute: $3 \times 3.14 = 9.42$ and $0.14 \times 3.14 = 0.4396$, so $\pi^2 \approx 9.42 + 0.44 = 9.86$. (The actual value is $9.8696\ldots$, confirming our estimate is close.)

Answer: $\pi^2 \approx 9.86$

Practice Problems

Estimate each expression to one decimal place. Use $\sqrt{2} \approx 1.41$, $\sqrt{3} \approx 1.73$, $\sqrt{5} \approx 2.24$, $\pi \approx 3.14$.

1. $2\pi \approx$ _____

2. $\pi + 1 \approx$ _____

3. $4\sqrt{2} \approx$ _____

4. $\sqrt{3} + 2 \approx$ _____

5. $3\pi - 5 \approx$ _____

6. $(\sqrt{2})^2 =$ _____

7. $2\sqrt{5} + \sqrt{3} \approx$ _____

8. $\pi^2 - 4 \approx$ _____

9. $5\sqrt{2} - 3\sqrt{3} \approx$ _____

10. $\frac{\pi}{2} + \sqrt{5} \approx$ _____

11. $(\sqrt{3})^2 + (\sqrt{2})^2 =$ _____

12. $\sqrt{2} \cdot \sqrt{3} \approx$ _____

Word Problems

13. A circular fountain has a radius of exactly $\sqrt{3}$ metres. Estimate the area of the fountain to the nearest tenth of a square metre. Use $\pi \approx 3.14$ and $\sqrt{3} \approx 1.732$. _____

14. Rope A has length $\pi + \sqrt{2}$ metres and Rope B has length 4 metres. Which rope is longer, and by approximately how much? Use $\pi \approx 3.14$ and $\sqrt{2} \approx 1.41$. _____

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15. A walking trail runs along two straight segments. The first segment is $\sqrt{20}$ km and the second is π km. (a) Estimate $\sqrt{20}$ to the nearest tenth. (b) Using $\pi \approx 3.14$, estimate the total trail length. (c) If a hiker walks at 5 km/h, about how many minutes will the entire trail take? _____

16. A rectangular picture frame has dimensions $\sqrt{18}$ inches by $(2+\sqrt{5})$ inches. (a) Estimate each dimension to the nearest tenth. (b) Estimate the perimeter of the frame. (c) If framing material costs \$1.50 per inch, estimate the total cost. _____

17. The area of a circular garden is $50\ \text{m}^2$. (a) Using $A = \pi r^2$, solve for r in exact form. (b) Estimate r to the nearest tenth. (c) Estimate the circumference $C = 2\pi r$ to the nearest tenth of a metre. _____

★ Chapter 1 Answer Key ★

Real Numbers & Number Sense

Topic 1 • Rational and Irrational Numbers

1) 3
2) 7
3) -12
4) Rational
5) Irrational
6) Irrational
7) Rational
8) Irrational
9) Rational
10) Irrational
11) Irrational
12) 13
13) Irrational
14) Yes
15) Irrational
16) No
17) Rational; 8 ft
18) 4 rational
19) False

Topic 2 • Turning Repeating Decimals into Fractions

1) $\frac{5}{9}$
2) $\frac{2}{9}$
3) $\frac{8}{9}$
4) 1
5) $\frac{1}{9}$
6) $\frac{2}{3}$
7) $\frac{5}{11}$
8) $\frac{3}{11}$
9) $\frac{2}{11}$
10) $\frac{7}{11}$
11) $\frac{1}{11}$
12) $\frac{6}{11}$
13) $\frac{1}{7}$
14) $\frac{1}{6}$
15) 36 pieces
16) Yes—the repeating decimal *is* the fraction $\frac{8}{11}$
17) $0.\overline{6} = \frac{2}{3}$; total $= \frac{2}{3} \times 5 = \frac{10}{3} = 3\frac{1}{3}$ cups
18) Both fractions are equal, but Eddie's is fully simplified: $\frac{5}{11}$
19) $\frac{1}{3} + \frac{2}{3} + \frac{5}{9} = \frac{14}{9} = 1\frac{5}{9}$ minutes

Topic 3 • Estimating Irrational Numbers

1) 3 and 4
2) 4 and 5
3) 5 and 6
4) 7 and 8
5) 8 and 9
6) 9 and 10
7) ≈ 2.4
8) ≈ 3.7
9) ≈ 5.5
10) ≈ 7.2
11) $\sqrt{3}$, 2, $\sqrt{5}$
12) $\sqrt{11}$
13) $8 < \sqrt{75} < 9$; closer to 9 since $\sqrt{75} \approx 8.66$
14) Drone A; $\sqrt{60} \approx 7.75 > 7.5$
15) Side ≈ 9.5 ft; fencing $\approx 4(9.5)(\$12) = \$456$
16) $\sqrt{113} \approx 10.6$ cm; need an 11 cm strip
17) 7.07 is more accurate; $7.07^2 = 49.9849 \approx 50$

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