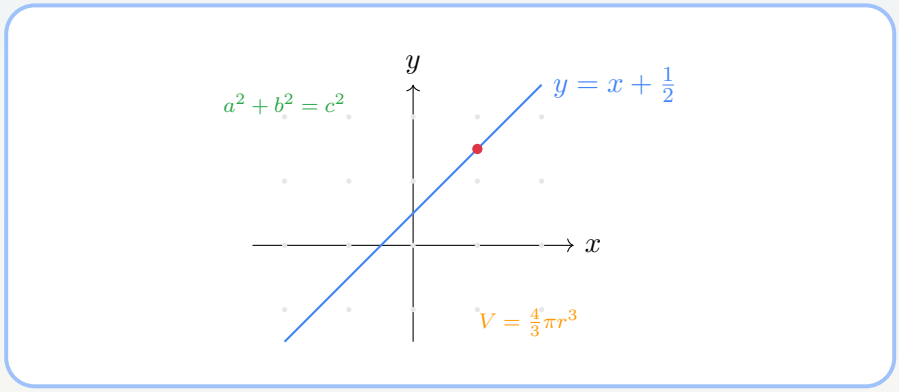
Maine Through Year Assessment

8th Grade Math Workbook

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



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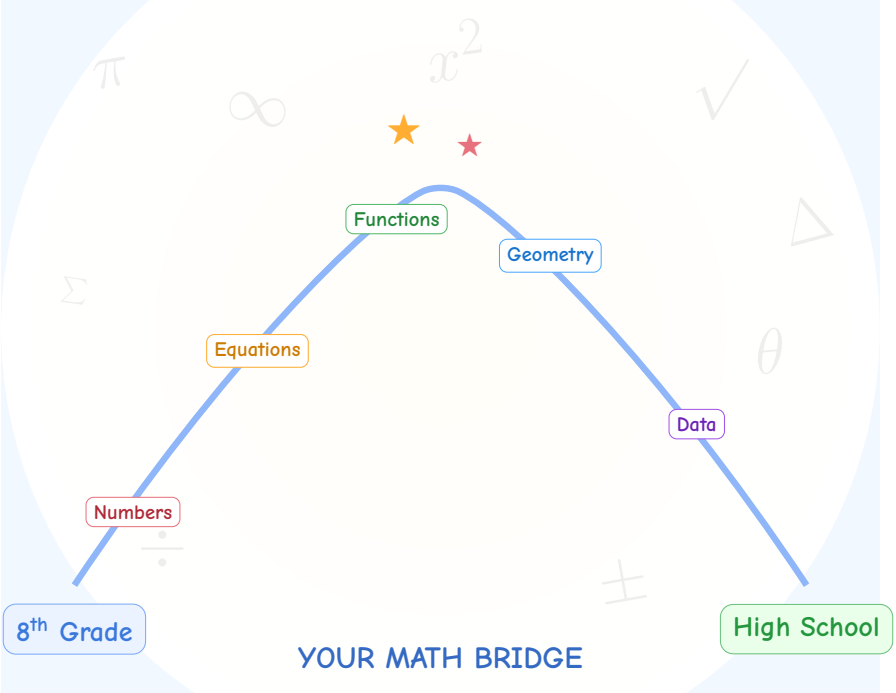
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Welcome, 8th Grader!

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.EE.C.8b Solve systems of two linear equations in two variables algebraically (i.e. by substitution or elimination) and estimate solutions by graphing the equations. Solve simple cases by inspection. For example, $3x + 2y = 5$ and $3x + 2y = 6$ have no solution because $3x + 2y$ cannot simultaneously be 5 and 6

8.EE.C.8c Solve real-world and mathematical problems leading to two linear equations in two variables. For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair

8.F | Maine

Grade 8 expectations grouped under 8.F.

8.F.A.1 Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output

8.F.A.2 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change

8.F.A.3 Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. For example, the function $A = s^2$ giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line

8.F.B.4 Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x,y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values

8.F.B.5 Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally

8.G | Maine

Grade 8 expectations grouped under 8.G.

8.G.A.1	Verify experimentally the properties of rotations, reflections, and translations:
8.G.A.2	Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them
8.G.A.3	Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates
8.G.A.4	Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them
8.G.A.5	Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so
8.G.A.1a	Lines are taken to lines, and line segments to line segments of the same length
8.G.A.1b	Angles are taken to angles of the same measure
8.G.A.1c	Parallel lines are taken to parallel lines
8.G.B.6	Explain a proof of the Pythagorean Theorem and its converse using pictures, diagrams, narratives or models
8.G.B.7	Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions
8.G.B.8	Apply the Pythagorean Theorem to find the distance between two points in a coordinate system

8.GR | Maine

Grade 8 expectations grouped under 8.GR.

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8.GR.EA.3 Understand congruence and similarity using physical models, transparencies, or geometry software

8.GR.EA.4 Understand and apply the Pythagorean Theorem

8.NS | Maine

Grade 8 expectations grouped under 8.NS.

8.NS.A.1 Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansions terminate in 0s or eventually repeats and convert a decimal expansion into a rational number

8.NS.A.2 Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., $\pi 2$). For example, by truncating the decimal expansion of $\sqrt{2}$, show that $\sqrt{2}$ is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations

8.QR.EA.6 Know that there are numbers that are not rational, and approximate them by rational numbers

8.SP | Maine

Grade 8 expectations grouped under 8.SP.

8.SP.A.1 Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association

8.SP.A.2 Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line

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. Which is greater: $\sqrt{11}$ or 3.3? _____

Word Problems

13. A square garden has an area of 75 m^2. The gardener wants to know whether the side length is closer to 8 m or 9 m so she can decide how many fence posts to order. Between which two consecutive integers does the side length fall, and which integer is it closest to? _____

14. Two drones take off from the same point and fly in perpendicular directions. Drone A travels $\sqrt{60}$ km and Drone B travels 7.5 km. Without using a calculator, determine which drone flies farther. _____

15. A square patio has an area of 90 ft^2. (a) Between which two consecutive whole numbers does the side length fall? (b) Estimate the side length to the nearest tenth. (c) If fencing costs \$12 per foot, estimate the total cost to fence all four sides. _____

16. A science lab measures the diagonal of a rectangular table as $\sqrt{113}$ cm. The students must cut a strip of protective tape to cover the diagonal exactly. (a) Between which two whole numbers is $\sqrt{113}$? (b) Estimate $\sqrt{113}$ to the nearest tenth. (c) If tape only comes in whole-centimetre lengths, what is the shortest strip they should cut? _____

17. Two friends are estimating $\sqrt{50}$. Anya says it is about 7.0 because $7^2 = 49$. Ben says it is about 7.1 because $7.1^2 = 50.41$, which is closer to 50 than 49 is. (a) Which estimate is more accurate? (b) Find a better estimate to the nearest hundredth. _____

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1.4 Estimating Expressions with Irrational Numbers

8.NS.A.2

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 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. _____

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