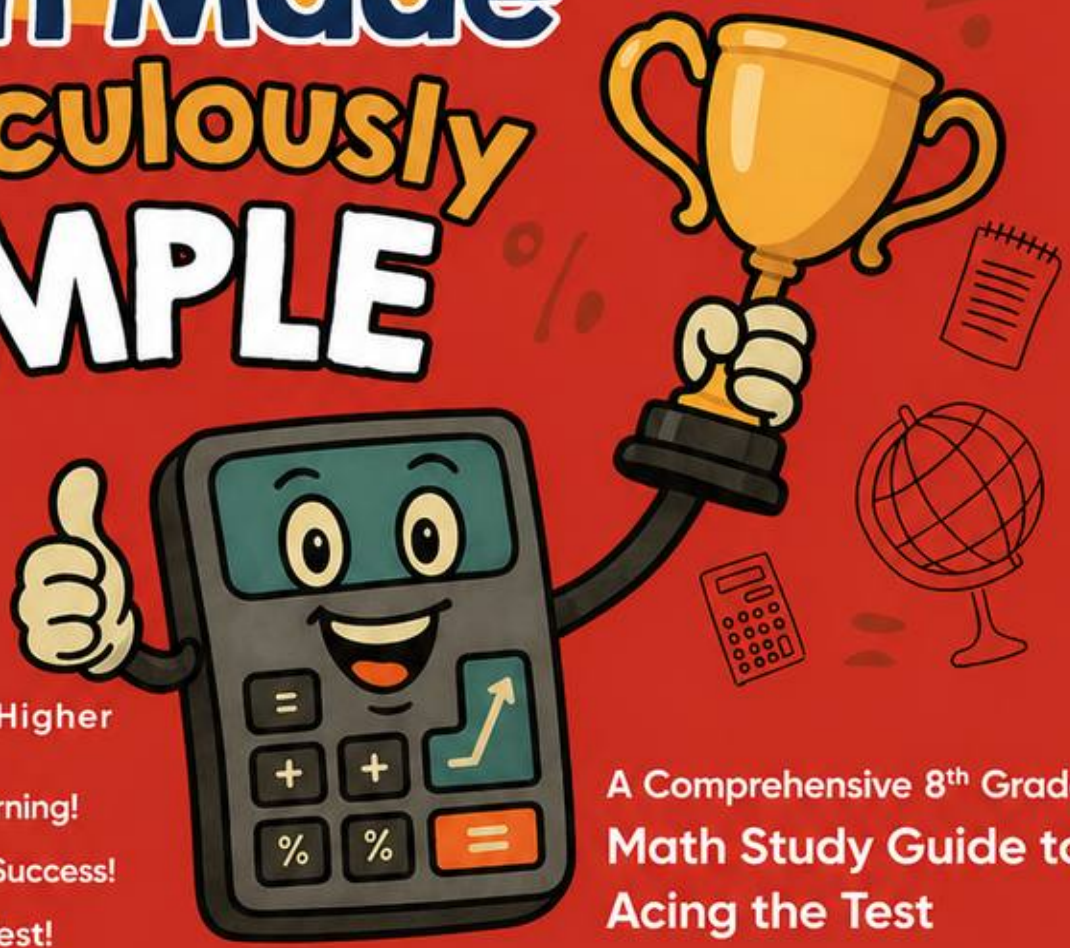
Maine

Through Year Assessment

Grade 8

Math Made Ridiculously SIMPLE



- Smarter Practice. Higher Scores.
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- Your Shortcut to Math Success!
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A Comprehensive 8th Grade Math Study Guide to Acing the Test

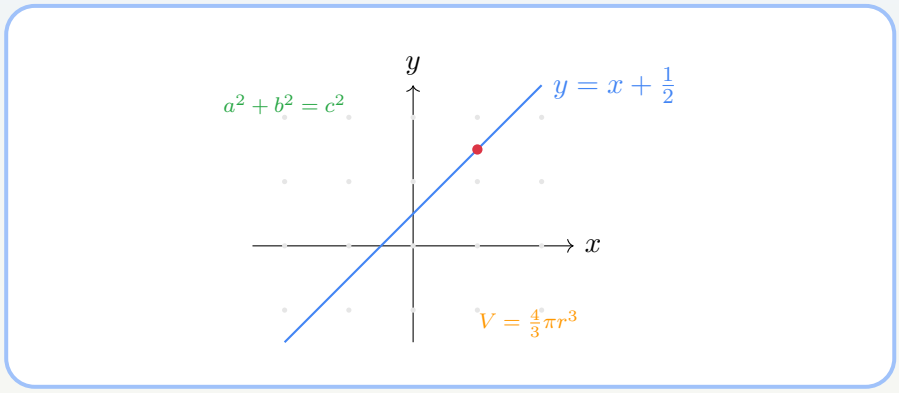
Learn Faster · Understand Deeper · Succeed with Confidence

Maine

Through Year Assessment Grade 8 Math

Made Ridiculously Simple

A Comprehensive 8th Grade Math Study Guide to Acing the Through Year Assessment



Reza Nazari

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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

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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.

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

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Examples

① Write $0.\overline{7}$ as a fraction.

Set $x = 0.7777\ldots$ (let the decimal be your variable). Since one digit repeats, multiply both sides by 10: $10x = 7.7777\ldots$ Now here's the magic—subtract the original from this new equation: $10x - x = 7.7777\ldots - 0.7777\ldots$. The repeating parts cancel! This gives $9x = 7$, so $x = \frac{7}{9}$. See how the repeating tail disappeared?

Answer: $\frac{7}{9}$

② Write $0.\overline{36}$ as a fraction in lowest terms.

Let $x = 0.363636\ldots$ and notice that "36" is the repeating block—that's two digits. So multiply by 100: $100x = 36.363636\ldots$ **Subtract the original:** $100x - x = 36.363636\ldots - 0.363636\ldots$, which gives $99x = 36$. **Solve:** $x = \frac{36}{99}$. But wait—we're not done! Simplify by dividing top and bottom by their GCF, which is 9: $\frac{36}{99} = \frac{4}{11}$. Always check your work and reduce to lowest terms!

Answer: $\frac{4}{11}$

Practice Problems

Convert each repeating decimal to a fraction in lowest terms.

1. $0.\overline{5} =$ _____

2. $0.\overline{2} =$ _____

3. $0.\overline{8} =$ _____

4. $0.\overline{9} =$ _____

5. $0.\overline{1} =$ _____

6. $0.\overline{6} =$ _____

7. $0.\overline{45} =$ _____

8. $0.\overline{27} =$ _____

9. $0.\overline{18} =$ _____

10. $0.\overline{63} =$ _____

11. $0.\overline{09} =$ _____

12. $0.\overline{54} =$ _____

13. $0.\overline{142857} =$ _____

14. $0.1\overline{6} =$ _____

15. $0.\overline{3} =$ _____

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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?

_____

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.

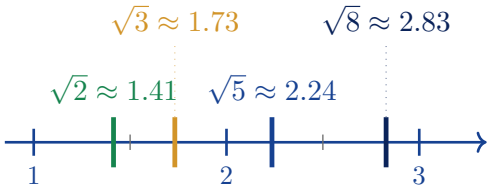
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1.3 Estimating Irrational Numbers

8.NS.A.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 $\Rightarrow$ 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: $4 < \sqrt{20} < 5$