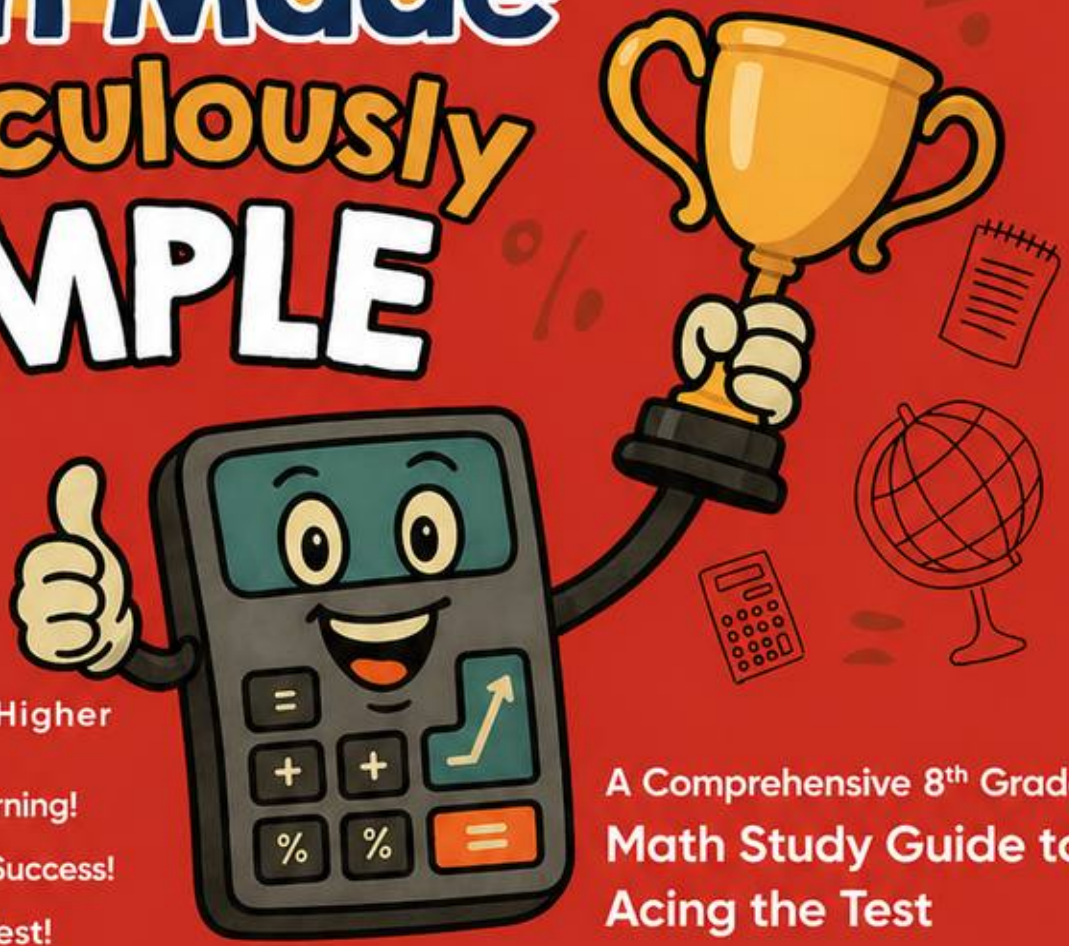
# Wyoming WY-TOPP Grade 8

# Math Made Ridiculously SIMPLE



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

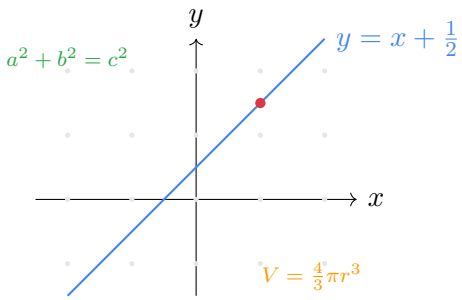
A Comprehensive 8th Grade Math Study Guide to Acing the Test

Learn Faster · Understand Deeper · Succeed with Confidence

# Wyoming WY-TOPP Grade 8 Math

## Made Ridiculously Simple

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




**Reza Nazari**

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| | |
|---|---|
| 8.EE.D.8C | Solve simple real-world and mathematical problems leading to two linear equations in two variables giveny=mx+ b form with integer solutions |

## 8.F | Functions

*Define, evaluate, compare, and use functions to model relationships*

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| 8.F.E | Define, evaluate, and compare functions |
| 8.F.E.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.E.2 | Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions) |
| 8.F.E.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 |
| 8.F.F | Use functions to model relationships between quantities |
| 8.F.F.4 | Apply the concepts of linear functions to real-world and mathematical situations |
| 8.F.F.5 | Describe qualitatively the functional relationship between two quantities by analyzing a graph where the function is increasing, decreasing, constant, linear, or nonlinear. Sketch a graph that exhibits the qualitative features of a function that has been described verbally |
| 8.F.F.4A | Understand that the slope is the constant rate of change and they-intercept is the point wherex= 0 |
| 8.F.F.4B | Determine the slope and they-intercept of a linear function given multiple representations, including two points, tables, graphs, equations, and verbal descriptions |
| 8.F.F.4C | Construct a function in slope-intercept form that models a linear relationship between two quantities |
| 8.F.F.4D | Interpret the meaning of the slope and they-intercept of a linear function in the context of the situation |

## 8.G | Geometry

*Understand congruence, similarity, and apply the Pythagorean Theorem*



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| 8.G.G | Understand congruence and similarity using physical models, transparencies, or geometry software |
| 8.G.G.1 | Verify experimentally the properties of rotations, reflections, and translations |
| 8.G.G.2 | Recognize through visual comparison 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.G.3 | Describe the effect of dilations, translations, rotations and reflections on two-dimensional figures using coordinates |
| 8.G.G.4 | Recognize through visual comparison 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.G.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 |
| 8.G.G.1A | Lines are taken to lines, and line segments to line segments of the same length |
| 8.G.G.1B | Angles are taken to angles of the same measure |
| 8.G.G.1C | Parallel lines are taken to parallel lines |
| 8.G.H | Understand and apply the Pythagorean Theorem |
| 8.G.H.6 | Use models or diagrams to explain the Pythagorean Theorem and its converse |
| 8.G.H.7 | Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems |
| 8.G.H.8 | Apply the Pythagorean Theorem to find the distance between two points in a coordinate system |
| 8.G.I | Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres |
| 8.G.I.9 | Given the formulas, solve real-world and mathematical problems involving volume and surface area of cylinders |

## 8.NS | The Number System

*Understand and apply concepts of rational and irrational numbers*

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| 8.NS.A | Know that there are numbers that are not rational, and approximate them by rational numbers |
| 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 expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number. Explore the real number system and its appropriate usage in real-world situations |
| 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 |
| 8.NS.A.1A | Make comparisons between rational and irrational numbers |
| 8.NS.A.1B | Understand that all real numbers have a decimal expansion |
| 8.NS.A.1C | Model the hierarchy of the real number system, including natural, whole, integer, rational, and irrational numbers |
| 8.NS.A.1D | Convert repeating decimals to fractions |

## 8.SP | Statistics and Probability

*Investigate patterns of association in bivariate data*

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|---|---|
| 8.SP.J | Investigate patterns of association in bivariate data |
| 8.SP.J.1 | Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe the association by form (linear/nonlinear), direction (positive/negative), strength (correlation), and unusual features |
| 8.SP.J.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 |
| 8.SP.J.3 | Use an equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept |

## 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.

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**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.

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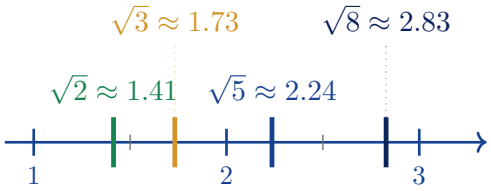


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## 1.3 Estimating Irrational Numbers

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