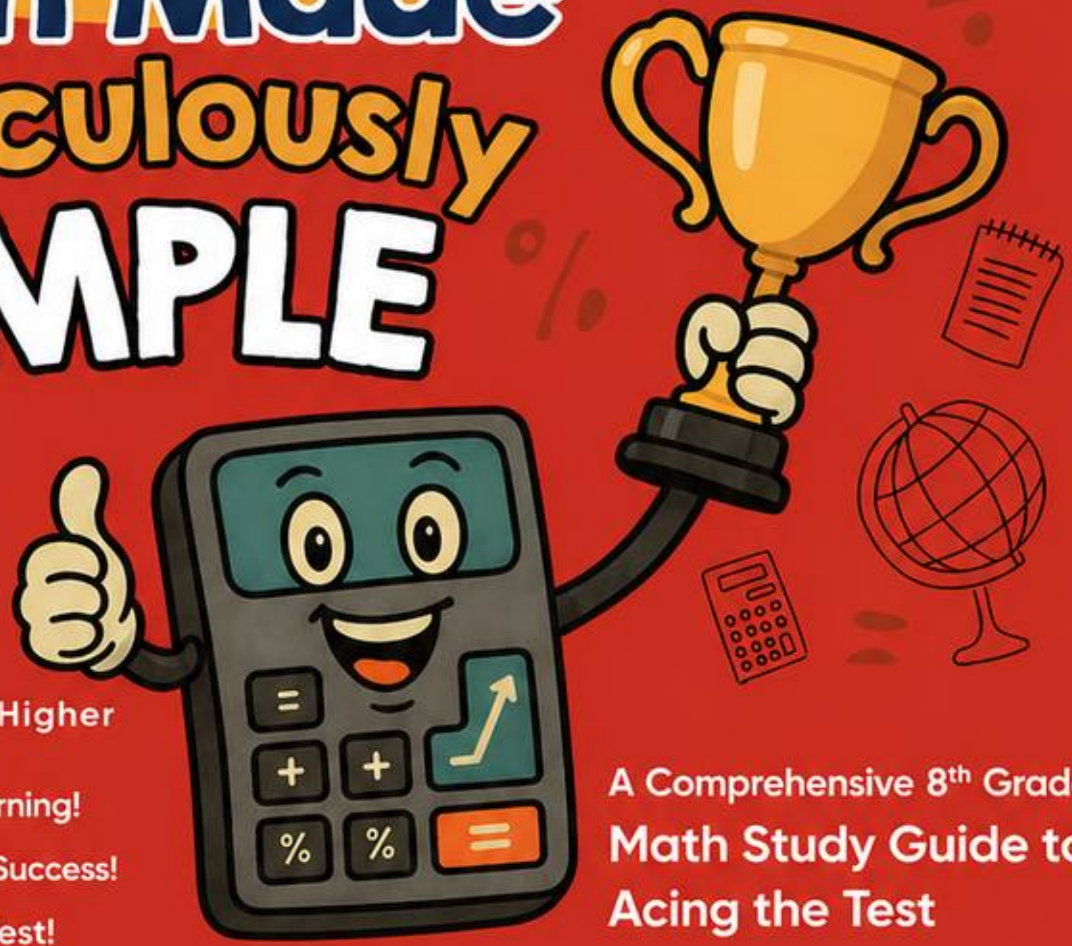
District of Columbia

DC CAPE Grade 8

Math Made Ridiculously SIMPLE



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

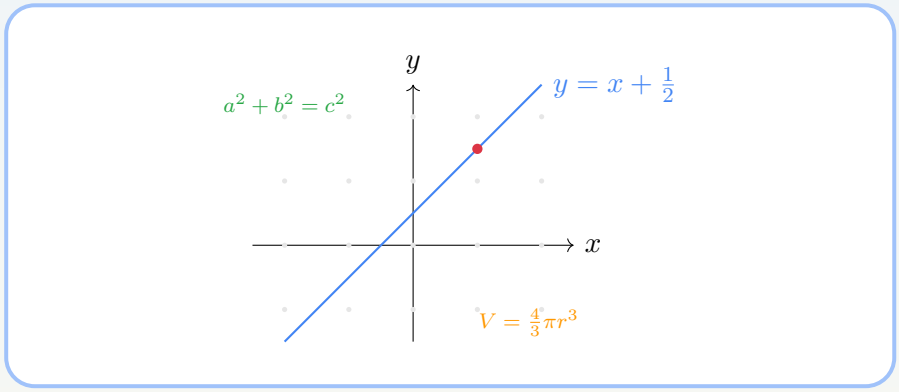
A Comprehensive 8th Grade Math Study Guide to Acing the Test

Learn Faster · Understand Deeper · Succeed with Confidence

District of Columbia DC CAPE Grade 8 Math

Made Ridiculously Simple

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



Reza Nazari

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8.G.1 Verify experimentally the properties of rotations, reflections, and translations:

8.G.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.3 Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates

8.G.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.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.6 Explain a proof of the Pythagorean Theorem and its converse

8.G.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.8 Apply the Pythagorean Theorem to find the distance between two points in a coordinate system

8.G.9 Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems

8.NS | The Number System

Understand and apply concepts of rational and irrational numbers

8.NS.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

8.NS.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., π^2)

8.SP | Statistics and Probability

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Investigate patterns of association in bivariate data

8.SP.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.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.3 Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept

8.SP.4 Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables

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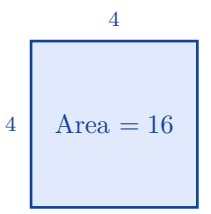
22. Simplify each expression. Write with positive exponents only. (a) $\dfrac{x^4 \cdot x^{-2}}{x^3}$ (b) $(2y^{-3})^2$ (c) $\dfrac{5^0 \cdot m^6}{m^{-1}}$

23. A computer's memory doubles with each upgrade. After 8 upgrades from an initial 2^4 MB, the total memory is $2^4 \cdot 2^8$ MB. (a) Simplify using exponent rules. (b) Convert to gigabytes (1 GB $= 2^{10}$ MB). (c) How many more upgrades to reach 2^{16} MB?

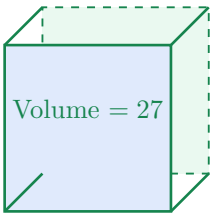
1.3 Square Roots and Cube Roots

8.EE.2

Think of a square root like asking a geometry question: "If a square has area p, what's the side length?" The square root $\sqrt{p}$ finds that number. For example, $\sqrt{16} = 4$ because a square of area 16 has side 4 (and $4^2 = 16$). A cube root $\sqrt[3]{p}$ answers the same question for a cube: "If a cube has volume p, what is the edge length?" For instance, $\sqrt[3]{27} = 3$ because $3^3 = 27$ (a $3 \times 3 \times 3$ cube has volume 27). **Here's a cool difference:** square roots of negatives aren't real numbers (you can't have negative area!), but cube roots *can* be negative—since $(-2)^3 = -8$, we have $\sqrt[3]{-8} = -2$. **Pro tip:** memorize the first fifteen perfect squares $(1, 4, 9, 16, \ldots, 225)$ and the first five perfect cubes $(1, 8, 27, 64, 125)$. Recognizing them instantly will speed up your work and boost your confidence!



side $= \sqrt{16} = 4$



edge $= \sqrt[3]{27} = 3$

n	n^2	$\sqrt{n^2}$	n	n^3	$\sqrt[3]{n^3}$
1	1	1	1	1	1
2	4	2	2	8	2
3	9	3	3	27	3
4	16	4	4	64	4
5	25	5	5	125	5
6	36	6			
7	49	7			
8	64	8			
9	81	9			
10	100	10			

Key Concepts & Quick Review

Square root: $\sqrt{p} = x \iff x^2 = p \ (x \geq 0,\ p \geq 0)$

Cube root: $\sqrt[3]{p} = x \iff x^3 = p \ (x, p \in \mathbb{R})$

Solving equations: $x^2 = p \ \Rightarrow \ x = \pm\sqrt{p}$ $\quad x^3 = p \ \Rightarrow \ x = \sqrt[3]{p}$ (Note: $\sqrt{2}$ is irrational.)

Examples

① Solve $x^2 = 144$.

Here's the key insight: both $(+12)^2$ and $(-12)^2$ equal 144! So when we take the square root of both sides, we get two solutions: $x = \sqrt{144}$ or $x = -\sqrt{144}$. Since $12^2 = 144$, we have $\sqrt{144} = 12$. Therefore, $x = 12$ or $x = -12$. **Always remember:** square root equations give two answers!

Answer: $x = 12$ *or* $x = -12$

② Solve $x^3 = -125$.

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Take the cube root of both sides: $x = \sqrt[3]{-125}$. **Here's the insight:** a negative number cubed stays negative. Since $5^3 = 125$, we know $(-5)^3 = -125$. So $\sqrt[3]{-125} = -5$. Notice that cube root equations have exactly one solution—much simpler than square roots! You've got this!

Answer: $x = -5$

Practice Problems

Evaluate each root or solve each equation.

1. $\sqrt{25} =$ _____
2. $\sqrt{81} =$ _____
3. $\sqrt[3]{8} =$ _____
4. $\sqrt[3]{27} =$ _____
5. $-\sqrt{100} =$ _____
6. $\sqrt[3]{-64} =$ _____
7. $\sqrt[3]{125} =$ _____
8. $\sqrt{169} =$ _____
9. $x^2 = 49;\ x =$ _____
10. $x^3 = 1000;\ x =$ _____
11. $x^2 = 121;\ x = \pm$ _____
12. $x^3 = -27;\ x =$ _____
13. $\sqrt[3]{-125} =$ _____
14. $\sqrt{225} =$ _____
15. $x^2 = \frac{1}{4};\ x =$ _____
16. $x^3 = \frac{1}{8};\ x =$ _____

Study Tips

- Square root equations always yield **two** solutions ($\pm$) because both 5^2 and $(-5)^2$ equal 25. Cube root equations yield exactly **one** solution because only one number cubed gives any result.
- The symbol $\sqrt{n}$ always means the *positive* root. When you solve $x^2 = n$, write $x = \pm\sqrt{n}$ to capture both the positive and negative solutions.
- Some square roots like $\sqrt{2}$ are irrational—you can't write them as fractions and their decimal never ends or repeats. This is totally normal and shows how rich the number system is!

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