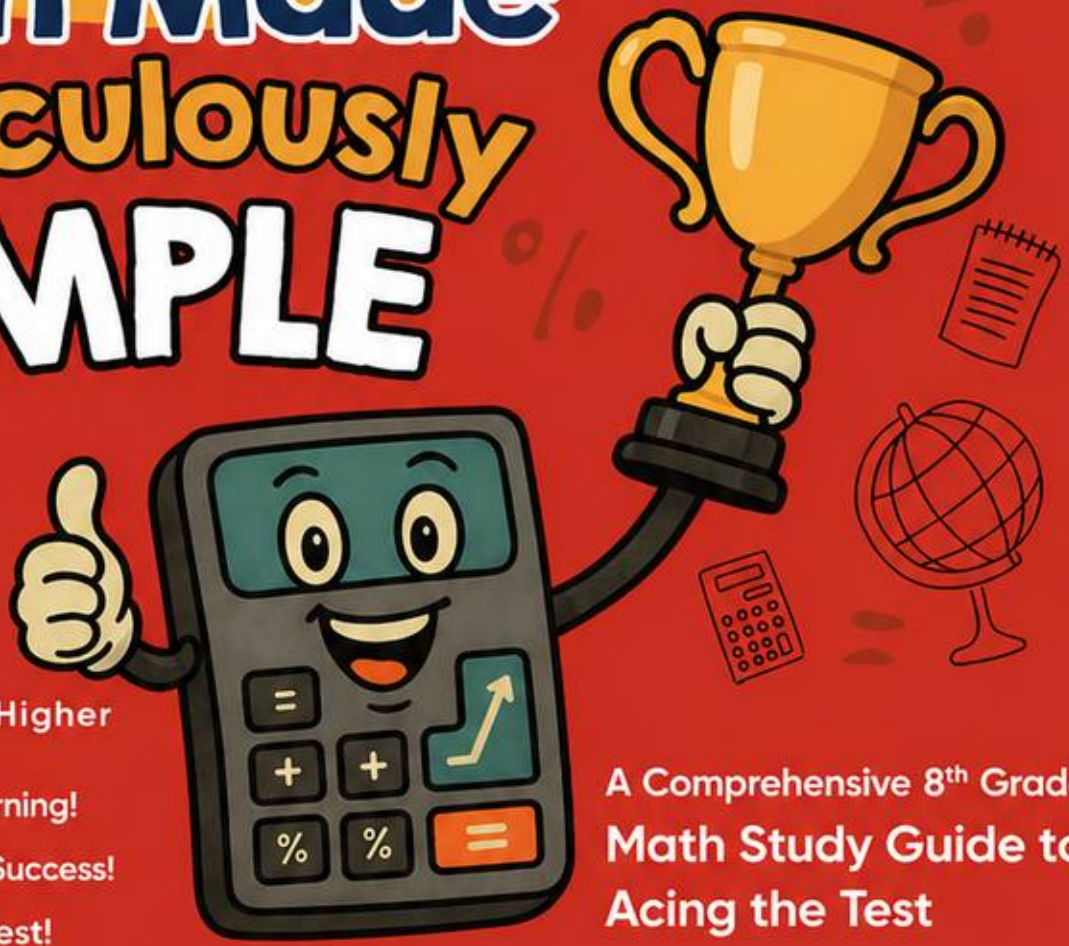
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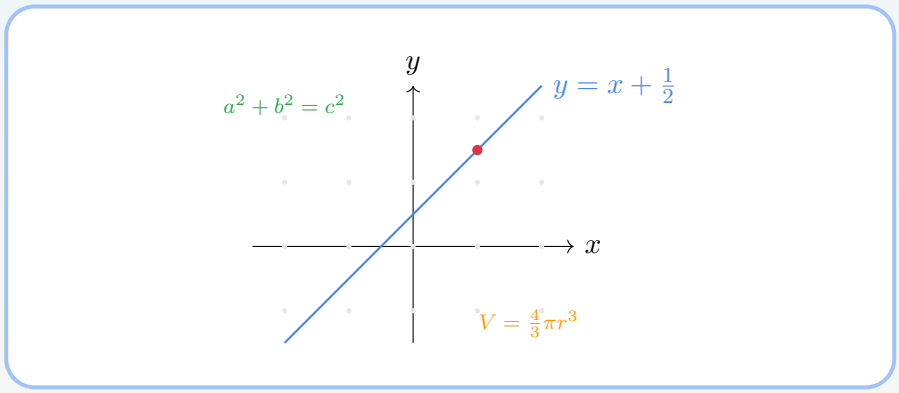
A Comprehensive 8th Grade Math Study Guide to Acing the Test

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Indiana ILEARN Grade 8 Math

Made Ridiculously Simple

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



Reza Nazari

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8.GM.1	Explore dilations, translations, rotations, and reflections on two-dimensional figures in the coordinate plane. (E)
8.GM.2	Solve real-world and other mathematical problems involving volume of cones, spheres, and pyramids and surface area of spheres. (E)
8.GM.3	Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and other mathematical problems in two dimensions. (E)

8.NS | Indiana

Grade 8 expectations grouped under 8.NS.

8.NS.1	Give examples of rational and irrational numbers, and explain the difference between them. State decimal equivalents for any number. For rational numbers, show that the decimal equivalent terminates or repeats, and convert a repeating decimal into a rational number
8.NS.2	Use rational approximations of irrational numbers to compare the size of irrational numbers, plot them approximately on a number line, and estimate the value of expressions involving irrational numbers
8.NS.3	Given a numeric expression with common rational number bases and integer exponents, apply the properties of exponents to generate equivalent expressions. (E)
8.NS.4	Solve real-world problems with rational numbers by using multiple operations. (E)

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CHAPTER

1

Real Numbers & Number Sense

1. Rational and Irrational Numbers 8.NS.1
2. Turning Repeating Decimals into Fractions 8.NS.1
3. Estimating Irrational Numbers 8.NS.2
4. Estimating Expressions with Irrational Numbers 8.NS.4

② Estimate $\sqrt{45}$ to one decimal place.

First, squeeze with integers: $6^2 = 36 < 45 < 49 = 7^2$, so $6 < \sqrt{45} < 7$. Now refine to tenths. **Test:** $6.7^2 = 44.89 < 45$ and $6.8^2 = 46.24 > 45$. This tells us $6.7 < \sqrt{45} < 6.8$—we're narrowing it down! Since 45 is much closer to 44.89, we know $\sqrt{45} \approx 6.7$ is our best estimate to one decimal place.

Answer: $\sqrt{45} \approx 6.7$

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. Greater: $\sqrt{11}$ or 3.3? _____

Study Tips

- Memorize perfect squares through 169 (13^2). This gives you the power to quickly bracket any square root and know which two integers it falls between. You're building your math toolkit!
- When estimating $\sqrt{x}$ to one decimal place, find the two tenths it falls between, then decide which is closer. If they're equally close, test hundredths for extra accuracy before rounding.
- **Here's a time-saver for comparing irrational numbers:** just compare the radicands directly—no estimation needed! Since $47 < 53$, you know right away that $\sqrt{47} < \sqrt{53}$. Smart thinking!

✍ 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 park ranger estimates the distance across a circular lake. The lake's area is 200 m^2. (a) The radius satisfies $\pi r^2 = 200$. Find r^2. (b) Estimate r to the nearest tenth. (c) Estimate the diameter to the nearest metre.

_____

16. Between which two consecutive whole numbers does each value lie? (a) $\sqrt{50}$ (b) $\sqrt[3]{100}$ (c) Order from least to greatest: $\sqrt{50}$, $\sqrt[3]{100}$, 7.2

_____

17. A square garden has area 150 ft^2. You need to buy fencing for all four sides. Fencing is sold in whole-foot lengths. (a) Find the exact side length. (b) Estimate the perimeter to the nearest tenth of a foot. (c) How many whole feet of fencing must you buy?

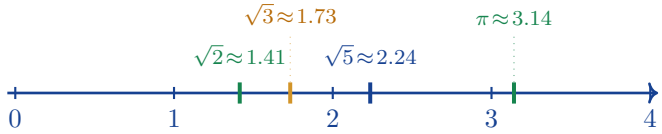
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1.4 Estimating Expressions with Irrational Numbers

8.NS.4

Estimating a *single* irrational number like $\sqrt{45}$ is one thing—you squeeze it between two perfect squares and zero in on the decimal. But what happens when an expression mixes **several** irrational numbers with addition, subtraction, multiplication, or exponents? **Here's how you handle it:** replace each irrational number with its decimal approximation, then carry out the arithmetic step by step. But here's the real secret that saves time and keeps your answer exact—**simplify before you substitute!** For example, $(\sqrt{3})^2 = 3$ exactly (no decimal needed!), and $\sqrt{2} \cdot \sqrt{8} = \sqrt{16} = 4$—the irrational parts cancel out completely. Only use decimal approximations for the parts that *truly* stay irrational. One more important rule: **round at the very end, not in the middle.** Early rounding piles up error and throws off your final answer. The reference line below collects the key approximations you'll need most.



Key Concepts & Quick Review

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.

Examples

① Estimate π^2 to two decimal places.

Start by substituting: use $\pi \approx 3.14$. Then compute $\pi^2 \approx 3.14 \times 3.14$. **Break it into parts:** $3 \times 3.14 = 9.42$ and $0.14 \times 3.14 = 0.4396$. **Add them:** $9.42 + 0.44 = 9.86$ (rounding 0.4396 to 0.44). **Check your work:** the actual value is $9.8696\ldots$, so our estimate of 9.86 is spot-on! That's the power of smart substitution.

Answer: $\pi^2 \approx 9.86$

② Estimate $3\sqrt{5} - 2$ to one decimal place.

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