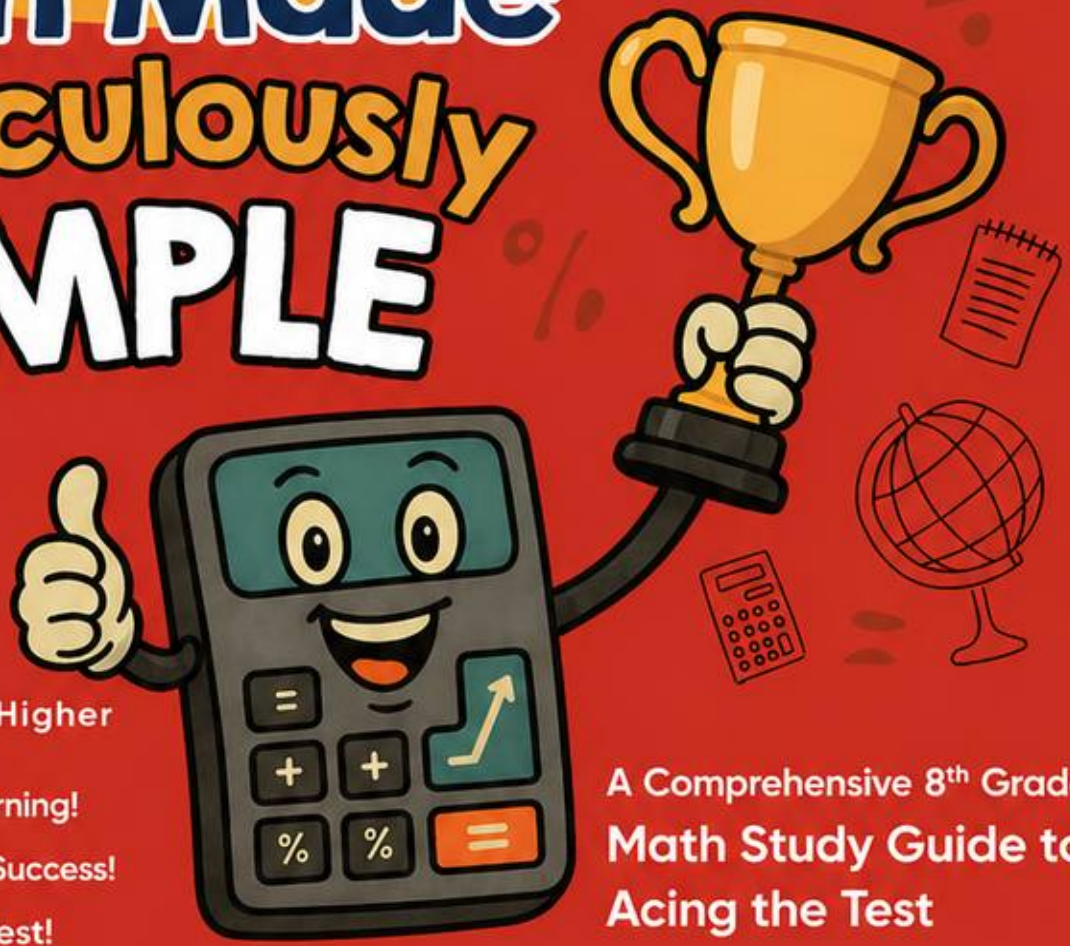
# Oregon OSAS Grade 8

# Math Made Ridiculously SIMPLE



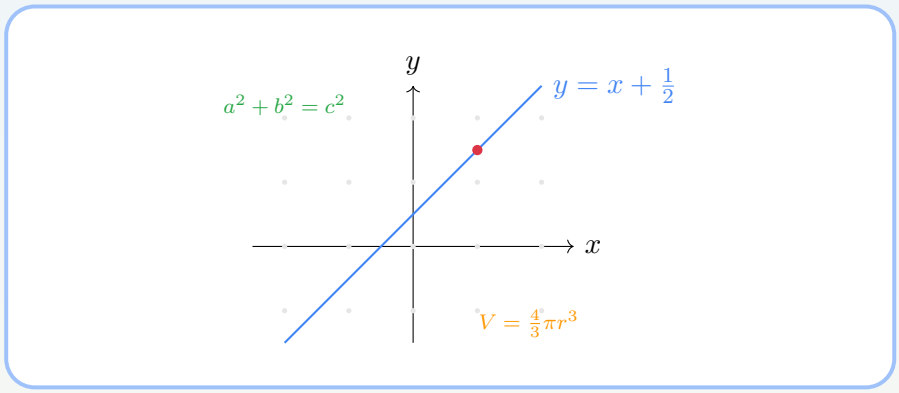
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A Comprehensive 8th Grade Math Study Guide to Acing the Test

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# Oregon OSAS Grade 8 Math
## Made Ridiculously Simple

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




**Reza Nazari**

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| | |
|---|---|
| 8.DR.C | Analyze, summarize, and describe data |
| 8.DR.C.3 | Analyze patterns of association between two quantitative or categorical variables and reason about distributions to compare groups |
| 8.DR.D | Interpret data and answer investigative questions |
| 8.DR.D.4 | Interpret scatter plots for bivariate quantitative data to investigate patterns of association between two quantities to answer investigative questions |

## 8.GM | Geometric Reasoning and Measurement

*Geometric Reasoning and Measurement*

| | |
|---|---|
| 8.GM.A | Understand congruence and similarity using physical models, transparencies, or geometry software |
| 8.GM.A.1 | Verify experimentally the properties of rotations, reflections, and translations |
| 8.GM.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 |
| 8.GM.A.3 | Describe the effect of dilations, translations, rotations and reflections on two-dimensional figures using coordinates |
| 8.GM.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/or dilations |
| 8.GM.A.5 | Use informal arguments to establish facts about interior and exterior angles of triangles and angles formed by parallel lines cut with a transversal |
| 8.GM.B | Understand and apply the Pythagorean Theorem |
| 8.GM.B.6 | Distinguish between applications of the Pythagorean Theorem and its Converse in authentic contexts |
| 8.GM.B.7 | Apply the Pythagorean Theorem in authentic contexts to determine unknown side lengths in right triangles |
| 8.GM.B.8 | Apply the Pythagorean Theorem to find the distance between two points in a coordinate system |
| 8.GM.C | Solve mathematical problems in authentic contexts involving volume of cylinders, cones, and spheres |

| | |
|---|---|
| 8.GM.C.9 | Choose and use the appropriate formula for the volume of cones, cylinders, and spheres to solve problems in authentic contexts |

## 8.NS | Numeric Reasoning: Number Systems

*Numeric Reasoning: Number Systems*

| | |
|---|---|
| 8.NS.A | Know that there are numbers that are not rational, and approximate them by rational numbers |
| 8.NS.A.1 | Know that real numbers that are not rational are called irrational |
| 8.NS.A.2 | Use rational approximations of irrational numbers to compare size and locate on a number line |

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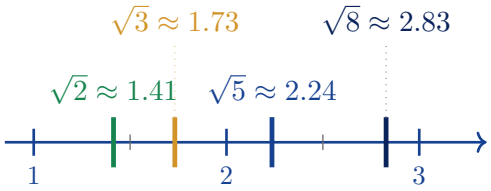
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## 1.3 Estimating Irrational Numbers

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:** $4 < \sqrt{20} < 5$

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!



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## ✍ 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?

_____