

Solving With Square and Cube Roots

Grade 8 math · Worksheet Answer Key · Standards: 8.EE.A.2

Each solution shows the perfect square or cube behind the root, both solutions for squared equations, and the final answer in bold. When an estimate is requested, the bounding squares or cubes are listed so the rounding can be checked.

Standards: 8.EE.A.2 · **Level:** Grade 8

Problem 1 Evaluate square roots

(a) $8^2 = 64$. (b) $11^2 = 121$. (c) $0.3^2 = 0.09$. (d) $\frac{2}{5}$ squared is $\frac{4}{25}$.

(a) 8 (b) 11 (c) 0.3 (d) $\frac{2}{5}$

Problem 2 Evaluate cube roots

(a) $3^3 = 27$. (b) $5^3 = 125$. (c) $(-2)^3 = -8$. (d) $(\frac{1}{2})^3 = \frac{1}{8}$.

(a) 3 (b) 5 (c) -2 (d) $\frac{1}{2}$

Problem 3 Spot the perfect squares

$9^2 = 81$, $10^2 = 100$ and $14^2 = 196$. The number 48 is between 36 and 49, and 150 is between 144 and 169.

81, 100 and 196

Problem 4 Spot the perfect cubes

$4^3 = 64$, $6^3 = 216$ and $10^3 = 1,000$. The number 9 is between 8 and 27, and 100 is between 64 and 125.

64, 216 and 1,000

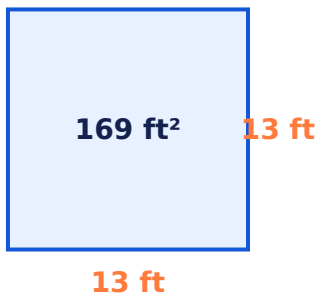
Problem 5 Two small equations

(a) Both 7 and -7 square to 49. (b) Only 5 cubes to 125.

(a) $x = 7$ or $x = -7$ (b) $x = 5$

Problem 6 Patio side length

Side = $\sqrt{169}$. Since $13 \cdot 13 = 169$, the side is 13 feet.



Labeled patio.

13 feet

Problem 7 Fractions and decimals

(a) $\frac{9}{10}$ squared is $\frac{81}{100}$, so $x = \pm\frac{9}{10}$. (b) $0.4^2 = 0.16$, so $x = \pm 0.4$.

(a) $\pm\frac{9}{10}$ (b) ± 0.4

Problem 8 Negative and fractional cubes

(a) $(-4)^3 = -64$. (b) $343 = 7^3$ and $27 = 3^3$, so $x = \frac{3}{7}$.

(a) $x = -4$ (b) $x = \frac{3}{7}$

Problem 9 A root that is not whole

$x = \pm\sqrt{50}$. Since $7^2 = 49$, $\sqrt{50}$ is just above 7. Testing $7.07^2 = 49.9849$ and $7.08^2 = 50.1264$, so $\sqrt{50} \approx 7.07$.

$x = \pm\sqrt{50} \approx \pm 7.07$

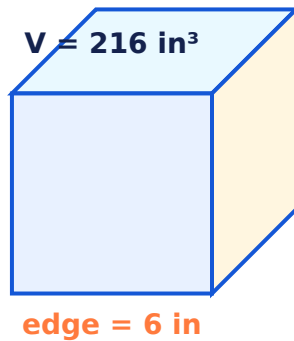
Problem 10 A cube root estimate

$x = \sqrt[3]{30}$. Since $3^3 = 27$ and $4^3 = 64$, the root is between 3 and 4, and very near 3. Testing $3.1^3 = 29.791$ and $3.2^3 = 32.768$, so $\sqrt[3]{30} \approx 3.1$.

$x = \sqrt[3]{30} \approx 3.1$

Problem 11 Cube-shaped box

Edge = $\sqrt[3]{216}$. Since $6 \cdot 6 \cdot 6 = 216$, the edge is 6 inches.



Labeled box.

6 inches

Problem 12 Two-step equations

(a) Divide by 2: $x^2 = 49$, so $x = \pm 7$. (b) Subtract 5: $x^3 = 64$, so $x = 4$.

(a) $x = \pm 7$ (b) $x = 4$

Problem 13 Estimate two roots

(a) $14^2 = 196$ and $15^2 = 225$. Then $14.1^2 = 198.81$ and $14.2^2 = 201.64$, so $\sqrt{200} \approx 14.1$. (b) $4^3 = 64$ and $5^3 = 125$. Then $4.6^3 = 97.336$ and $4.7^3 = 103.823$, so $\sqrt[3]{100} \approx 4.6$.

(a) 14.1 (b) 4.6

Problem 14 Solutions on a number line

The solutions are $x = \pm\sqrt{20}$. Since $4^2 = 16$ and $5^2 = 25$, they sit between 4 and 5 on each side of zero. $4.4^2 = 19.36$ and $4.5^2 = 20.25$, so $\sqrt{20} \approx 4.5$.

$\pm\sqrt{20} \approx \pm 4.5$

Problem 15 Mural frame

Side = $\sqrt{289} = 17$ ft because $17^2 = 289$. Perimeter = $4 \cdot 17 = 68$ ft. Cost = $68 \cdot \$3.25 = \$221.00$.

17 ft; 68 ft; \$221.00

Problem 16 Storage cube surface

Edge = $\sqrt[3]{343} = 7$ cm, since $7^3 = 343$. A cube has 6 faces of area $7^2 = 49$ cm². Surface area = $6 \cdot 49 = 294$ cm².

Edge 7 cm; surface area 294 cm²

Problem 17 Garden fence

Side = $\sqrt{90}$. Since $9^2 = 81$ and $10^2 = 100$, and $9.5^2 = 90.25$, the side is just under 9.5: $\sqrt{90} \approx 9.487$. Perimeter = $4 \cdot 9.487 \approx 37.9$ ft.

About 37.9 feet

Problem 18 Why is $\sqrt{2}$ irrational?

$1.41^2 = 1.9881$ and $1.42^2 = 2.0164$, and $1.9881 < 2 < 2.0164$, so $1.41 < \sqrt{2} < 1.42$. Every finer decimal also misses 2 exactly, because $\sqrt{2}$ has a decimal that never ends and never repeats, so no fraction of integers squares to 2.

$1.41 < \sqrt{2} < 1.42$; $\sqrt{2}$ is irrational.

Problem 19 Two cubes

Cube B has edge $\sqrt[3]{300}$. Since $6^3 = 216$ and $7^3 = 343$, the edge is between 6 and 7. $6.7^3 = 300.763$, so $\sqrt[3]{300} \approx 6.7$. Difference: $6.7 - 6 = 0.7$.

Cube B, by about 0.7 inch

Problem 20 Check a claim

For $x^3 = -64$: $(-4)^3 = -64$, so -4 works. For $x^2 = -16$: $(-4)^2 = 16$, not -16 , and a square of a real number is never negative. So there is no real solution.

Right for $x^3 = -64$; wrong for $x^2 = -16$ (no real solution).