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Study Guide and Intervention

7NS2.4

Square Roots

The square root of a number is one of two equal factors. The radical sign $\sqrt{\ }$ is used to indicate the positive square root.

Examples **Find each square root.**

1. $\sqrt{1}$ Since $1 \cdot 1 = 1$, $\sqrt{1} = 1$.
2. $-\sqrt{16}$ Since $4 \cdot 4 = 16$, $-\sqrt{16} = -4$.
3. $\sqrt{0.25}$ Since $0.5 \cdot 0.5 = 0.25$, $\sqrt{0.25} = 0.5$.
4. $\sqrt{\frac{25}{36}}$ Since $\frac{5}{6} \cdot \frac{5}{6} = \frac{25}{36}$, $\sqrt{\frac{25}{36}} = \frac{5}{6}$.

Example 5 **Solve $a^2 = \frac{4}{9}$.**

$a^2 = \frac{4}{9}$ Write the equation.

$\sqrt{a^2} = \sqrt{\frac{4}{9}}$ Take the square root of each side.

$a = \frac{2}{3}$ or $-\frac{2}{3}$ Notice that $\frac{2}{3} \cdot \frac{2}{3} = \frac{4}{9}$ and $\left(-\frac{2}{3}\right)\left(-\frac{2}{3}\right) = \frac{4}{9}$.

The equation has two solutions, $\frac{2}{3}$ and $-\frac{2}{3}$.

Exercises

Find each square root.

1. $\sqrt{4}$ 2
2. $\sqrt{9}$ 3
3. $-\sqrt{49}$ −7
4. $-\sqrt{25}$ −5
5. $\sqrt{0.01}$ 0.1
6. $-\sqrt{0.64}$ −0.8
7. $\sqrt{\frac{9}{16}}$ $\frac{3}{4}$
8. $-\sqrt{\frac{1}{25}}$ $-\frac{1}{5}$

ALGEBRA Solve each equation.

9. $x^2 = 121$ 11 or −11
10. $a^2 = 3{,}600$ 60 or −60
11. $p^2 = \frac{81}{100}$ $\frac{9}{10}$ or $-\frac{9}{10}$
12. $t^2 = \frac{121}{196}$ $\frac{11}{14}$ or $-\frac{11}{14}$

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7NS2

Estimating Square Roots

Most numbers are not perfect squares. You can estimate square roots for these numbers.

Example 1 **Estimate $\sqrt{204}$ to the nearest whole number.**

- The first perfect square less than 204 is 14.
- The first perfect square greater than 204 is 15.

$196 < 204 < 225$ Write an inequality.

$14^2 < 204 < 15^2$ $196 = 14^2$ and $225 = 15^2$

$14 < \sqrt{204} < 15$ Take the square root of each number.

So, $\sqrt{204}$ is between 14 and 15. Since 204 is closer to 196 than 225, the best whole number estimate for $\sqrt{204}$ is 14.

Example 2 **Estimate $\sqrt{79.3}$ to the nearest whole number.**

- The first perfect square less than 79.3 is 64.
- The first perfect square greater than 79.3 is 81.

$64 < 79.3 < 81$ Write an inequality.

$8^2 < 79.3 < 9^2$ $64 = 8^2$ and $81 = 9^2$

$8 < \sqrt{79.3} < 9$ Take the square root of each number.

So, $\sqrt{79.3}$ is between 8 and 9. Since 79.3 is closer to 81 than 64, the best whole number estimate for $\sqrt{79.3}$ is 9.

Exercises

Estimate to the nearest whole number.

1. $\sqrt{8}$ 3

2. $\sqrt{37}$ 6

3. $\sqrt{14}$ 4

4. $\sqrt{26}$ 5

5. $\sqrt{62}$ 8

6. $\sqrt{48}$ 7

7. $\sqrt{103}$ 10

8. $\sqrt{141}$ 12

9. $\sqrt{14.3}$ 4

10. $\sqrt{51.2}$ 7

11. $\sqrt{82.7}$ 9

12. $\sqrt{175.2}$ 13