

Square Roots (Pages 357–361)

The **square root** of a number is one of its two equal factors. The symbol $\sqrt{\quad}$, called a **radical sign**, is used to indicate the square root. For example, $\sqrt{25}$ indicates the positive square root of 25 and $-\sqrt{25}$ indicates the negative square root of 25. A **radical expression** is an expression that contains a square root. You can simplify a radical expression like $\sqrt{676}$ by using prime numbers. A **prime number** is a whole number that has exactly two factors, the number itself and 1. A **composite number** is a whole number that has more than two factors. Every composite number can be written as the product of prime numbers. When a number is expressed as a product of prime factors, the expression is called the **prime factorization** of the number. You can use the following properties to simplify radicals.

Product Property of Square Roots	The square root of a product is equal to the product of each square root. $\sqrt{ab} = \sqrt{a} \cdot \sqrt{b}$
Quotient Property of Square Roots	The square root of a quotient is equal to the quotient of each square root. $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$

EXAMPLES

A Simplify $\sqrt{676}$.

$$\begin{aligned}\sqrt{676} &= \sqrt{2 \cdot 2 \cdot 13 \cdot 13} && \text{Prime Factorization} \\ &= \sqrt{4 \cdot 169} && 2 \times 2 = 4, 13 \times 13 = 169 \\ &= \sqrt{4} \cdot \sqrt{169} && \text{Product Property} \\ &= 2 \cdot 13 \text{ or } 26\end{aligned}$$

B Simplify $\sqrt{\frac{25}{36}}$.

$$\begin{aligned}\sqrt{\frac{25}{36}} &= \frac{\sqrt{25}}{\sqrt{36}} && \text{Quotient Property} \\ &= \frac{5}{6}\end{aligned}$$

PRACTICE

Simplify.

1. $\sqrt{\frac{9}{16}}$

2. $\sqrt{441}$

3. $-\sqrt{\frac{121}{196}}$

4. $-\sqrt{961}$

5. $\sqrt{324}$

6. $-\sqrt{144}$

7. $\sqrt{1296}$

8. $-\sqrt{484}$

9. $\sqrt{0.09}$

10. $\sqrt{0.0064}$

11. $-\sqrt{\frac{49}{81}}$

12. $\sqrt{\frac{196}{625}}$



13. Standardized Test Practice A rectangular field has a length of ℓ feet and a width of w feet. The distance from any corner of the field to the diagonally-opposite corner is $\sqrt{\ell^2 + w^2}$. What is the diagonal distance across a field that is 96 feet long and 28 feet wide?

A 144 ft

B 100 ft

C 124 ft

D 114 ft

Answers: 1. $\frac{3}{4}$ 2. 21 3. $-\frac{11}{14}$ 4. $-\frac{14}{11}$ 5. 18 6. -12 7. 36 8. -22 9. 0.3 10. 0.08 11. $-\frac{7}{9}$ 12. $\frac{25}{14}$ 13. B