

Square Roots

A **square root** of a number is a number that, when multiplied by itself, equals the given number. Every positive number has a positive and a negative square root. A **perfect square** is a number with integers as its square roots.

Example 1 Find the two square roots of 64.

$$8 \cdot 8 = 64 \text{ and } -8 \cdot (-8) = 64$$

▶ So, the square roots of 64 are 8 and -8 .

The symbol $\sqrt{\quad}$ is called a **radical sign**. It is used to represent a square root. The number under the radical sign is called the **radicand**.

Example 2 Find the square root(s).

a. $\sqrt{49}$

▶ Because $7^2 = 49$, $\sqrt{49} = \sqrt{7^2} = 7$.

b. $-\sqrt{\frac{1}{4}}$

▶ Because $\left(\frac{1}{2}\right)^2 = \frac{1}{4}$, $-\sqrt{\frac{1}{4}} = -\sqrt{\left(\frac{1}{2}\right)^2} = -\frac{1}{2}$.

c. $\pm\sqrt{1.21}$

▶ Because $1.1^2 = 1.21$, $\pm\sqrt{1.21} = \pm\sqrt{1.1^2} = \pm 1.1$.

Example 3 Evaluate $3\sqrt{144} - 10$.

$$\begin{aligned} 3\sqrt{144} - 10 &= 3(12) - 10 && \text{Evaluate the square root.} \\ &= 36 - 10 && \text{Multiply.} \\ &= 26 && \text{Subtract.} \end{aligned}$$

Practice

Check your answers at BigIdeasMath.com.

Find the two square roots of the number.

1. 9 3 and -3 2. 100 10 and -10 3. 169 13 and -13 4. 400 20 and -20

Find the square root(s).

5. $\sqrt{4}$ 2 6. $-\sqrt{81}$ -9 7. $\pm\sqrt{900}$ ± 30 8. $\pm\sqrt{\frac{1}{36}}$ $\pm\frac{1}{6}$
 9. $\sqrt{\frac{4}{9}}$ $\frac{2}{3}$ 10. $-\sqrt{\frac{36}{25}}$ $-\frac{6}{5}$ 11. $\sqrt{2.25}$ 1.5 12. $\pm\sqrt{0.01}$ ± 0.1

Evaluate the expression.

13. $\sqrt{10+6}$ 4 14. $4 - 2\sqrt{9}$ -2 15. $12 - \sqrt{\frac{98}{2}}$ 5 16. $4(2\sqrt{25} + 3)$ 52

17. **PERIMETER** What is the perimeter of a square with an area of 900 square feet? 120 ft

18. **DIAMETER** What is the diameter of a circle with an are of 100π square yards? 20 yd