

# 13-1 Squares and Square Roots (Pages 664–668)

A **square root** is one of two equal factors of a number. For example, the square root of 25 is 5 because  $5 \cdot 5$  or  $5^2$  is 25. Since  $-5 \cdot (-5)$  is also 25,  $-5$  is also a square root of 25.

<b>Definition of Square Root</b>	The square root of a number is one of its two equal factors. If $x^2 = y$ the $x$ is a square root of $y$ . The symbol $\sqrt{\quad}$ is called the <b>radical sign</b> and is used to indicate a nonnegative square root. $\sqrt{25}$ indicates the nonnegative square root of 25, so $\sqrt{25} = 5$ . $-\sqrt{25}$ indicates the negative square root of 25, so $-\sqrt{25} = -5$ .
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Numbers like 25, 49, and 64 are called **perfect squares** because their nonnegative square roots are whole numbers. Numbers that are not perfect squares do not have whole number square roots. You can use perfect squares to estimate the square root of a number that is not a perfect square. See Example B below.

### EXAMPLES

**A** Find 64.

*The symbol  $\sqrt{64}$  represents the nonnegative square root of 64. Since  $8 \cdot 8 = 64$ ,  $\sqrt{64} = 8$ .*

**B** Find the best integer estimate for  $\sqrt{44}$ .

*Locate the closest perfect squares to 44. They are 36 and 49. Because  $36 < 44 < 49$ , you know that  $\sqrt{36} < \sqrt{44} < \sqrt{49}$ , or  $6 < \sqrt{44} < 7$ . So,  $\sqrt{44}$  is between 6 and 7. Since 44 is closer to 49 than to 36, then  $\sqrt{44}$  is closer to 7 than 6. The best integer estimate for  $\sqrt{44}$  is 7.*

### PRACTICE

**Find each square root.**

1.  $\sqrt{16}$       2.  $-\sqrt{36}$       3.  $\sqrt{36}$       4.  $\sqrt{121}$       5.  $\sqrt{225}$       6.  $-\sqrt{900}$

**Find the best integer estimate for each square root. Then check your estimate with a calculator.**

7.  $\sqrt{45}$                       8.  $\sqrt{29}$                       9.  $\sqrt{5}$   
 10.  $\sqrt{640}$                       11.  $-\sqrt{250}$                       12.  $-\sqrt{57}$   
 13.  $\sqrt{10}$                       14.  $\sqrt{6.2}$                       15.  $\sqrt{2}$

**16. Art Framing** A man has an favorite square picture he wants to frame using a mat technique. He knows the area of the picture is  $144 \text{ in}^2$ .

- How would he find the length of the sides of the picture for the mat?
- What is the length of each side?



**17. Standardized Test Practice** Find  $\sqrt{529}$ .

- A** 23                      **B** 25                      **C** 52                      **D** 529

Answers: 1. 4   2. -6   3. 6   4. 11   5. 15   6. -30   7. 7   8. 5   9. 2   10. 25   11. -16   12. -8   13. 3   14. 2   15. 1
16a. Find the square root of $144 \text{ in}^2$ .   16b. 12 in.   17. A