Algebra Review: *Radical Expressions*

The symbol $\sqrt{\ }$ always indicates the positive square root of a number. The *radical* $\sqrt{64}$ can be *simplified*.

Simplify.

Example 1 a. $\sqrt{56}$ b. $\sqrt{\frac{16}{3}}$ c. $(3\sqrt{7})^2$

Solution

a. $\sqrt{56} = \sqrt{4 \cdot 14} = \sqrt{4} \cdot \sqrt{14} = 2\sqrt{14}$

b. $\sqrt{\frac{16}{3}} = \frac{\sqrt{16}}{\sqrt{3}} = \frac{4}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{4\sqrt{3}}{3}$

c. $(3\sqrt{7})^2 = 3\sqrt{7} \cdot 3\sqrt{7} = 3 \cdot 3 \cdot \sqrt{7} \cdot \sqrt{7} = 9 \cdot 7 = 63$

1. $\sqrt{36}$	**2.** $\sqrt{81}$	**3.** $\sqrt{24}$	**4.** $\sqrt{98}$	**5.** $\sqrt{300}$
6. $\sqrt{\frac{1}{4}}$	**7.** $\frac{\sqrt{5}}{\sqrt{3}}$	**8.** $\sqrt{\frac{80}{25}}$	**9.** $\frac{2\sqrt{3}}{\sqrt{12}}$	**10.** $\sqrt{\frac{250}{48}}$
11. $\sqrt{13^2}$	**12.** $(\sqrt{17})^2$	**13.** $(2\sqrt{3})^2$	**14.** $(3\sqrt{8})^2$	**15.** $(9\sqrt{2})^2$
16. $5\sqrt{18}$	**17.** $4\sqrt{27}$	**18.** $6\sqrt{24}$	**19.** $5\sqrt{8}$	**20.** $9\sqrt{40}$

Solve for x. Assume x represents a positive number.

Example 2 $2^2 + x^2 = 4^2$

Solution

$4 + x^2 = 16$
$x^2 = 12$
$x = \sqrt{12}$
$x = 2\sqrt{3}$

Example 3 $x^2 + (3\sqrt{2})^2 = 9^2$

Solution

$x^2 + 18 = 81$
$x^2 = 63$
$x = \sqrt{63}$
$x = 3\sqrt{7}$

21. $3^2 + 4^2 = x^2$	**22.** $x^2 + 4^2 = 5^2$	**23.** $5^2 + x^2 = 13^2$
24. $x^2 + 3^2 = 4^2$	**25.** $4^2 + 7^2 = x^2$	**26.** $x^2 + 5^2 = 10^2$
27. $1^2 + x^2 = 3^2$	**28.** $x^2 + 5^2 = (5\sqrt{2})^2$	**29.** $(x)^2 + (7\sqrt{3})^2 = (2x)^2$

Challenge

Given regular hexagon $ABCDEF$, with center O and sides of length 12. Let G be the midpoint of $\overline{BC}$. Let H be the midpoint of $\overline{DE}$. $\overline{AH}$ intersects $\overline{EB}$ at J and $\overline{FG}$ intersects $\overline{EB}$ at K.

Find JK.

(*Hint*: Draw auxiliary lines $\overline{HG}$ and $\overline{DA}$.)