

Algebra Review: Radical Expressions

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

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|-------------------------|--------------------------------|---------------------------|----------------------------------|-----------------------------|
| 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

$$\begin{aligned} 4 + x^2 &= 16 \\ x^2 &= 12 \\ x &= \sqrt{12} \\ x &= 2\sqrt{3} \end{aligned}$$

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

Solution

$$\begin{aligned} x^2 + 18 &= 81 \\ x^2 &= 63 \\ x &= \sqrt{63} \\ x &= 3\sqrt{7} \end{aligned}$$

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|-----------------------|---------------------------------|--------------------------------------|
| 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} .)

