UNDERSTAND

13. Model With Mathematics In the expression $PV^{\frac{4}{3}}$, P represents the pressure and V represents the volume of a sample of a gas. Evaluate the expression for $P = 7$ and $V = 8$.

14. Reason Describe the possible values of k such that $\sqrt{32} + \sqrt{k}$ can be rewritten as a single term.

15. Error Analysis Explain why the following work is incorrect. Find the correct answer.

$$5\left(4 - 5^{\frac{1}{2}}\right) = 5(4) - 5\left(5^{\frac{1}{2}}\right)$$
$$= 20 - 25^{\frac{1}{2}}$$
$$= 15 \quad ✗$$

16. Communicate Precisely Discuss the advantages and disadvantages of first rewriting $\sqrt{27} + \sqrt{48} + \sqrt{147}$ in order to estimate its decimal value.

17. Higher Order Thinking Write $\sqrt{\frac{4}{5}}$ in two different ways, one where the numerator is simplified and another where the denominator is rationalized.

18. Construct Arguments Justify each step used in simplifying the expression below.

$$\left(\frac{a^2}{a^{\frac{3}{4}}}\right)^{\frac{1}{5}} = \left(a^{2-\frac{3}{4}}\right)^{\frac{1}{5}}$$
$$= \left(a^{\frac{5}{4}}\right)^{\frac{1}{5}}$$
$$= a^{\frac{1}{4}}$$
$$= \sqrt[4]{a}$$

PRACTICE

What is the reduced radical form of each expression? SEE EXAMPLE 1

19. $\left(3x^{\frac{1}{2}}\right)\left(4x^{\frac{2}{3}}\right)$

20. $2b^{\frac{1}{2}}\left(3b^{\frac{1}{2}}c^{\frac{1}{3}}\right)^2$

21. $\left(x^{\frac{1}{2}} \cdot x^{\frac{5}{12}}\right)^4 \div x^{\frac{2}{3}}$

22. $\left(\frac{16c^{14}}{81d^{18}}\right)^{\frac{1}{2}}$

What is the reduced radical form of each expression? SEE EXAMPLE 2

23. $\sqrt[3]{250y^2z^4}$

24. $\sqrt[4]{256v^7w^{12}}$

25. $\sqrt{\frac{48x^3}{3xy^2}}$

26. $\sqrt{\frac{56x^5y^5}{7xy}}$

27. $\sqrt[3]{216m}$

28. $\sqrt[3]{\frac{250f^7g^3}{2f^2g}}$

What is the reduced radical form of each expression? SEE EXAMPLE 3

29. $\sqrt{x^5y^5} \cdot 3\sqrt{2x^7y^6}$

30. $\sqrt[3]{\frac{18n^2}{24n}}$

31. $\sqrt[3]{3x^2} \cdot \sqrt[3]{x^2} \cdot \sqrt[3]{9x^3}$

32. $\sqrt{\frac{162a}{6a^3}}$

33. $\sqrt[5]{2pq^6} \cdot 2\sqrt{2p^3q}$

34. $\sqrt[3]{\frac{x^2}{9y}}$

35. $\sqrt[3]{6} \cdot \sqrt[3]{16}$

36. $\sqrt[4]{\frac{2}{5x}}$

What is the reduced radical form of each expression? SEE EXAMPLE 4

37. $4\sqrt[3]{81} - 2\sqrt[3]{72} - \sqrt[3]{24}$

38. $6\sqrt{45y^2} - 4\sqrt{20y^2}$

39. $3\sqrt{12} - \sqrt{54} + 7\sqrt{75}$

40. $\sqrt{32h} + 4\sqrt{98h} - 3\sqrt{50h}$

Multiply. SEE EXAMPLE 5

41. $(3\sqrt{p} - \sqrt{5})(\sqrt{p} + 5\sqrt{5})$

42. $(4m - \sqrt{3})(4m - \sqrt{3})$

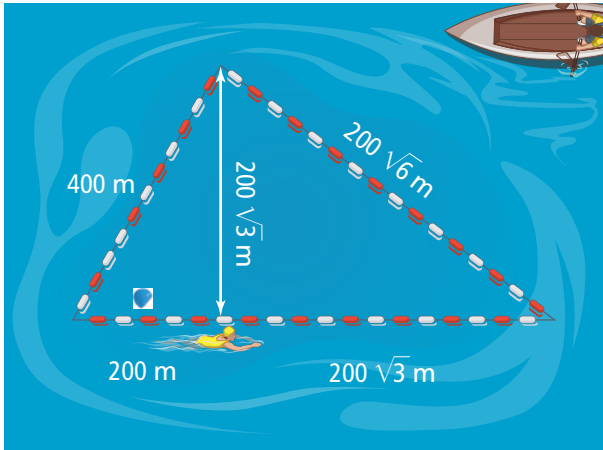**43.** $(3\sqrt{2} + 8)(3\sqrt{2} - 8)$

44. $\sqrt[3]{3}(5\sqrt[3]{9} - 4)$

What is the reduced radical form of each expression? SEE EXAMPLE 6

45. $\dfrac{4}{1 - \sqrt{3}}$

46. $\dfrac{20}{3 + \sqrt{2}}$

47. $\dfrac{3 + \sqrt{8}}{2 - 2\sqrt{8}}$

48. $\dfrac{-2x}{3 + \sqrt{x}}$

APPLY

49. Model With Mathematics A triangular swimming area is marked off by a rope.

a. If a woman swims around the perimeter of the swimming area, how far will she swim?

b. What is the area of the roped off section?

400 m $200\sqrt{3}$ m $200\sqrt{6}$ m

200 m $200\sqrt{3}$ m

50. Use Structure The interest rate r required to increase your investment p to the amount a in m months is found by $r = \left(\frac{a}{p}\right)^{\frac{1}{m}} - 1$. What interest rate would be required to increase your investment of $3,600 to $6,400 over 7 months? Round your answer to the nearest tenth of a percent.

51. Use Structure The length of a rectangle is $(2 + \sqrt{5})y$. The width is $(4 + 3\sqrt{5})z$. What is the area of the rectangle?

$(4+3\sqrt{5})z$ $(2+\sqrt{5})y$
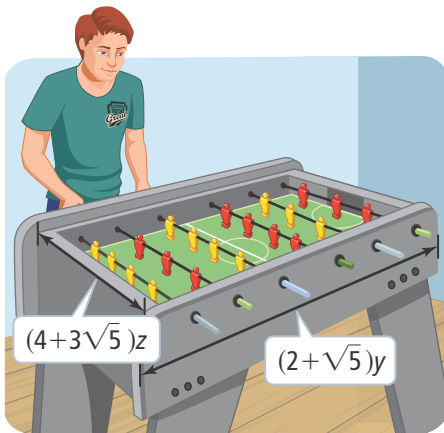
52. Model With Mathematics A rectangular boardroom table is $\sqrt{440}$ ft by $\sqrt{20}$ ft. Find its area.

ASSESSMENT PRACTICE

53. Aaron is rewriting $\frac{1+\sqrt{3}}{5-\sqrt{3}}$ into reduced radical form. Determine if Aaron would have written the steps below to show his work. Select *Yes* or *No*.

	Yes	No
$\frac{6 + 4\sqrt{3} - 3}{25 + 9}$	❑	❑
$\frac{5 + \sqrt{3} + 5\sqrt{3} + \sqrt{9}}{25 + 5\sqrt{3} - 5\sqrt{3} - \sqrt{9}}$	❑	❑
$\frac{4 + 3\sqrt{3}}{11}$	❑	❑
$\frac{8 + 6\sqrt{3}}{28}$	❑	❑
$\frac{5 + 6\sqrt{3} + 3}{25 - 3}$	❑	❑

54. SAT/ACT Which expression cannot be rewritten as -10?

Ⓐ $\sqrt{25} \cdot \sqrt[3]{-8}$ Ⓑ $\sqrt[3]{-125} \cdot \sqrt[4]{16}$

Ⓒ $-\sqrt[3]{1,000}$ Ⓓ $-\sqrt{25} \cdot \sqrt[5]{-32}$

Ⓔ $\sqrt{4} \cdot -\sqrt[3]{125}$

55. Performance Task The volume of a sphere of radius r is $V = \frac{4}{3}\pi r^3$.

Part A Use the formula to find r in terms of V. Rationalize the denominator.

Part B A snowman is made using three spherical snowballs. The top snowball for the head has a volume of 500 in.^{3}. What is the diameter of the top snowball?

$V = 500$ in.^{3}
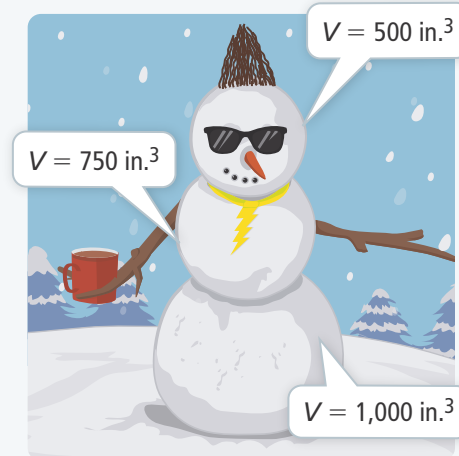
$V = 750$ in.^{3}

$V = 1,000$ in.^{3}

Part C The volumes of the other two snowballs are 750 in.^{3} and 1,000 in.^{3}. How tall is the snowman?