Solution

$$\frac{\sqrt{4x}-\sqrt{6y}}{2x-3y}=\left(\frac{\sqrt{4x}-\sqrt{6y}}{2x-3y}\right)\left(\frac{\sqrt{4x}+\sqrt{6y}}{\sqrt{4x}+\sqrt{6y}}\right)$$

Multiply both the numerator and denominator by the conjugate of the numerator.

$$=\frac{4x-6y}{(2x-3y)\left(\sqrt{4x}+\sqrt{6y}\right)}$$

$$=\frac{2(2x-3y)}{(2x-3y)\left(2\sqrt{x}+\sqrt{6y}\right)}$$

Note that we could have begun by simplifying the term $\sqrt{4x}$. The final answer is the same.

$$=\frac{2}{2\sqrt{x}+\sqrt{6y}}$$

0.4 EXERCISES

PRACTICE

Evaluate the following radical expressions. See Example 1.

1. $-\sqrt{9}$ **2.** $\sqrt[3]{-27}$ **3.** $\sqrt{-25}$ **4.** $\sqrt[6]{-64}$

5. $-\sqrt[6]{64}$ **6.** $-\sqrt{169}$ **7.** $\sqrt[3]{-125}$ **8.** $\sqrt{-49}$

9. $\sqrt[4]{-256}$ **10.** $-\sqrt[3]{-64}$ **11.** $\sqrt[3]{-\frac{27}{125}}$ **12.** $\sqrt{\frac{25}{121}}$

13. $\sqrt[3]{\frac{-8}{64}}$ **14.** $\sqrt{\frac{1}{4}}$ **15.** $-\sqrt[3]{-8}$

16. $\sqrt[4]{\sqrt{16}-\sqrt[3]{-27}+\sqrt{81}}$ **17.** $\sqrt{\frac{\sqrt[3]{-64}}{-\sqrt{144}-\sqrt{169}}}$

18. $\sqrt{\sqrt[3]{64}+\sqrt[4]{81}+\sqrt[5]{32}}$

Simplify the following radical expressions. See Example 3.

19. $\sqrt{9x^2}$ **20.** $\sqrt[3]{-8x^6y^9}$ **21.** $\sqrt[4]{\frac{x^8z^4}{16}}$ **22.** $\sqrt{2x^6y}$

23. $\sqrt[7]{x^{14}y^{49}z^{21}}$ **24.** $\sqrt{\frac{x^2}{4x^4y^6}}$ **25.** $\sqrt[3]{\frac{a^3b^{12}}{27c^6}}$ **26.** $\sqrt[3]{-125x^{12}y^9}$

27. $\sqrt[4]{\frac{x^{12}y^8}{16}}$ **28.** $\sqrt[3]{81m^4n^7}$ **29.** $\sqrt[5]{\frac{y^{30}z^{25}}{32x^{35}}}$ **30.** $\sqrt[5]{32x^7y^{10}}$

Simplify the following radicals by rationalizing the denominators. See Example 4.

31. $\sqrt[3]{\dfrac{4x^2}{3y^4}}$ **32.** $\dfrac{-\sqrt{3a^3}}{\sqrt{6a}}$ **33.** $\dfrac{3}{\sqrt{2}-\sqrt{5}}$ **34.** $\dfrac{10}{\sqrt{7}-\sqrt{2}}$

35. $\dfrac{3}{\sqrt{6}-\sqrt{3}}$ **36.** $\dfrac{5}{6-\sqrt{5}}$ **37.** $\dfrac{\sqrt{x}}{\sqrt{x}-\sqrt{2}}$ **38.** $\dfrac{x-y}{\sqrt{x}+\sqrt{y}}$

39. $\dfrac{\sqrt{x}+\sqrt{y}}{\sqrt{x}-\sqrt{y}}$ **40.** $\dfrac{1}{2-\sqrt{x}}$ **41.** $\dfrac{\sqrt{y}}{\sqrt{y}+2}$ **42.** $-\dfrac{\sqrt{6y^7}}{\sqrt{5y}}$

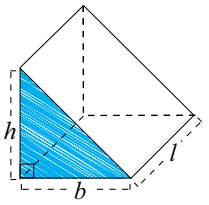
Rationalize the numerators of the following expressions. See Example 5.

43. $\dfrac{\sqrt{5}-3}{-4}$ **44.** $\dfrac{\sqrt{7}-6}{7}$ **45.** $\dfrac{3+\sqrt{y}}{6}$ **46.** $\dfrac{\sqrt{x}+\sqrt{y}}{\sqrt{x}}$

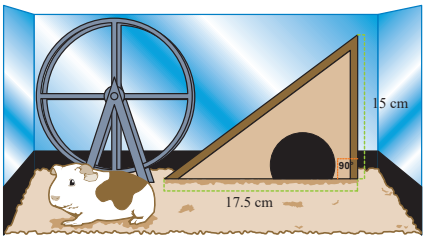
47. $\dfrac{\sqrt{13}+\sqrt{t}}{13-t}$ **48.** $\dfrac{2\sqrt{x}+\sqrt{y}}{\sqrt{x}-\sqrt{y}}$ **49.** $\dfrac{\sqrt{6}+\sqrt{y}}{\sqrt{6}-\sqrt{y}}$ **50.** $\dfrac{4\sqrt{xy}+y}{x-y}$

APPLICATIONS

51. The prism shown below is a right triangular cylinder, where the base is a right triangle. Find the surface area of the prism in terms of b, h, and l.



52. Terri has made a home for her pet guinea pig (Ralph) in the shape of a right triangular cylinder. Before she can put the new home in Ralph's cage, she must paint it with a nontoxic outer coat. If the front of the home has a base of 17.5 cm and a height of 15 cm and the length of the home is 25 cm, what is the surface area of Ralph's home, rounded to the nearest square centimeter? The small bottle of nontoxic coating will cover up to 1500 cm^2. Will the small bottle contain enough nontoxic coating to cover Ralph's home?



WRITING & THINKING

53. Explain, in your own words, why the square root of a negative number is not a real number.