

Section 2.4 – Practice Problems

Find the product and simplify the result.

1. $\sqrt{2x}(\sqrt{2} - \sqrt{x})$ waterbamb

$$\sqrt{2x}\sqrt{2} - \sqrt{2x}\sqrt{x}$$

$$2\sqrt{x} - x\sqrt{2}$$

$$\boxed{2\sqrt{x} - \sqrt{2}x}$$

2. $\sqrt{7y}(\sqrt{y} + \sqrt{7})$

$$y\sqrt{7} + 7\sqrt{y}$$

$$\boxed{\sqrt{7}y + 7\sqrt{y}}$$

3. $(2x - \sqrt{3})(2x + \sqrt{3})$ FOIL

$$4x^2 + 2x\sqrt{3} - 2x\sqrt{3} - \sqrt{9}$$

$$\boxed{4x^2 - 3}$$

4. $(2x - \sqrt{3})(2x - \sqrt{3})$

$$4x^2 - 2\sqrt{3}x - 2\sqrt{3}x + \sqrt{9}$$

$$\boxed{4x^2 - 4\sqrt{3}x + 3}$$

5. $(\sqrt{x+2})^2$

$$\sqrt{x+2}\sqrt{x+2}$$

$$\boxed{x+2}$$

6. $(\sqrt{x} + 2)^2$

$$(\sqrt{x} + 2)(\sqrt{x} + 2)$$

$$x + 2\sqrt{x} + 2\sqrt{x} + 4$$

$$\boxed{x + 4\sqrt{x} + 4}$$

7. $(\sqrt{x-3} - 4)^2$

$$(\sqrt{x-3} - 4)(\sqrt{x-3} - 4)$$

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

$$x - 3 - 8\sqrt{x-3} + 16$$

$$\boxed{x - 8\sqrt{x-3} + 13}$$

8. $(\sqrt{x-3} - 4)(\sqrt{x-3} + 4)$

$$x - 3 + 4\sqrt{x-3} - 4\sqrt{x-3} - 16$$

$$x - 3 - 16$$

$$\boxed{x - 19}$$

9. $(3\sqrt{x} + \sqrt{y})^2$ FOIL

$$(3\sqrt{x} + \sqrt{y})(3\sqrt{x} + \sqrt{y})$$

$$3 \cdot 3\sqrt{x}\sqrt{x} + 3\sqrt{x}\sqrt{y} + 3\sqrt{x}\sqrt{y} + \sqrt{y}\sqrt{y}$$

$$\boxed{9x + 6\sqrt{xy} + y}$$

10. $(\sqrt{x} + 3\sqrt{6})(\sqrt{x} - 3\sqrt{6})$ FOIL

$$x - 9\sqrt{6}\sqrt{6}$$

$$\boxed{x - 54}$$

Simplify the following

11. $\sqrt{x} \cdot \sqrt[3]{x}$

$$x^{\frac{1}{2}} \cdot x^{\frac{1}{3}} \rightarrow x^{\frac{3}{6}} \cdot x^{\frac{2}{6}}$$

$$x^{\frac{5}{6}} = \boxed{\sqrt[6]{x^5}}$$

12. $\frac{\sqrt{x}}{\sqrt[3]{x}}$

$$\frac{x^{\frac{1}{2}}}{x^{\frac{1}{3}}} \rightarrow \frac{x^{\frac{3}{6}}}{x^{\frac{2}{6}}} = x^{\frac{1}{6}}$$

$$\boxed{\sqrt[6]{x}}$$

13. $\sqrt{x^3} \cdot \sqrt[5]{x^2}$

$$x^{\frac{3}{2}} \cdot x^{\frac{2}{5}}$$

$$x^{\frac{15}{10}} \cdot x^{\frac{4}{10}} = x^{\frac{19}{10}}$$

$$\sqrt[10]{x^{19}} \rightarrow \sqrt[10]{x^{10} \cdot x^9} = \boxed{x\sqrt[10]{x^9}}$$

14. $\frac{\sqrt{x^3}}{\sqrt[5]{x^2}}$

$$\frac{x^{\frac{3}{2}}}{x^{\frac{2}{5}}} \rightarrow \frac{x^{\frac{15}{10}}}{x^{\frac{4}{10}}}$$

$$x^{\frac{11}{10}} \rightarrow \sqrt[10]{x^{11}}$$

$$\boxed{x\sqrt[10]{x}}$$

15. $\sqrt[4]{a^3} \cdot \sqrt[3]{a^2}$

$$a^{\frac{3}{4}} \cdot a^{\frac{2}{3}}$$

$$a^{\frac{9}{12}} \cdot a^{\frac{8}{12}} = a^{\frac{17}{12}}$$

$$\sqrt[12]{a^{17}} = \boxed{a\sqrt[12]{a^5}}$$

16. $\frac{\sqrt{ab^3}}{\sqrt[5]{a^2b^3}}$ = $\frac{(ab^3)^{\frac{1}{2}}}{(a^2b^3)^{\frac{1}{5}}} = \frac{a^{\frac{1}{2}}b^{\frac{3}{2}}}{a^{\frac{2}{5}}b^{\frac{3}{5}}}$

$$\frac{a^{\frac{5}{10}}b^{\frac{15}{10}}}{a^{\frac{4}{10}}b^{\frac{6}{10}}} =$$

$$a^{\frac{1}{10}}b^{\frac{9}{10}} = \boxed{\sqrt[10]{ab^9}}$$

17. $\sqrt{16x^3y^3} \cdot \sqrt[3]{8xy^2}$

$4x^{3/2}y^{3/2} \cdot 2x^{1/3}y^{2/3}$

$8x^{3/2+1/3}y^{3/2+2/3}$

$8x^{9/6+2/6}y^{9/6+4/6} \rightarrow 8x^{11/6}y^{13/6}$

$8xy^{2/6}\sqrt{x^5y}$

Simplify, if possible.

19. $\sqrt{2} + \sqrt{5}$

NOT POSSIBLE

18. $\frac{\sqrt[4]{x^2y^3}}{\sqrt{xy}}$

$\frac{x^{2/4}y^{3/4}}{x^{1/2}y^{1/2}} \rightarrow \frac{x^{1/2}y^{3/4}}{x^{1/2}y^{2/4}}$

$y^{1/4}$

$\sqrt[4]{y}$

20. $\sqrt{2} \cdot \sqrt{5}$

$\sqrt{2 \cdot 5} = \sqrt{10}$

21. $\sqrt{6} - \sqrt{3}$

NOT POSSIBLE

22. $\frac{\sqrt{6}}{\sqrt{3}}$

$\frac{\sqrt{2}\sqrt{3}}{\sqrt{3}} = \sqrt{2}$

23. $\sqrt{3} - 2\sqrt{3}$

$-\sqrt{3}$

24. $\sqrt{3} \cdot 2\sqrt{3}$

$2\sqrt{3}\sqrt{3} = 2 \cdot 3 = 6$

$$25. \frac{\sqrt{8}}{4\sqrt{2}} = \boxed{\frac{1}{4}}$$

$$26. \frac{\sqrt{3}}{4\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \boxed{\frac{\sqrt{6}}{8}}$$

Rationalize the denominator.

$$27. \frac{1}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \boxed{\frac{\sqrt{2}}{2}}$$

$$28. \frac{1}{\sqrt[3]{2}} \cdot \frac{\sqrt[3]{2}}{\sqrt[3]{2}} \cdot \frac{\sqrt[3]{2}}{\sqrt[3]{2}} = \boxed{\frac{\sqrt[3]{4}}{2}}$$

$$29. \frac{3+\sqrt{2}}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \boxed{\frac{3\sqrt{2}+2}{2}}$$

$$30. \frac{5-\sqrt{2}}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \boxed{\frac{5\sqrt{3}-\sqrt{6}}{3}}$$

$$31. \frac{1}{3+\sqrt{2}} \cdot \frac{3-\sqrt{2}}{3-\sqrt{2}}$$

$$\frac{3-\sqrt{2}}{9-2} = \boxed{\frac{3-\sqrt{2}}{7}}$$

$$32. \frac{1}{3-\sqrt{2}} \cdot \frac{3+\sqrt{2}}{3+\sqrt{2}}$$

$$\frac{3+\sqrt{2}}{9+3\sqrt{2}-3\sqrt{2}-\sqrt{2}\sqrt{2}}$$

$$\boxed{\frac{3+\sqrt{2}}{7}}$$

$$33. \frac{\sqrt{12}}{\sqrt{3}+1} \cdot \frac{\sqrt{3}-1}{\sqrt{3}-1}$$

$$\frac{\sqrt{36} - \sqrt{12}}{3 + \sqrt{3} - \sqrt{3} - 1} = \frac{6 - 2\sqrt{3}}{2}$$

$$= \boxed{3 - \sqrt{3}}$$

$$34. \frac{\sqrt{18}}{\sqrt{2}-1} \cdot \frac{\sqrt{2}+1}{\sqrt{2}+1}$$

$$\frac{\sqrt{36} + \sqrt{18}}{2 - 1} = \frac{6 + 3\sqrt{2}}{1}$$

$$= \boxed{6 + 3\sqrt{2}}$$

$$35. \frac{3+\sqrt{2}}{1+\sqrt{2}} \cdot \frac{1-\sqrt{2}}{1-\sqrt{2}} \quad \text{FOIL}$$

$$\frac{3 - 3\sqrt{2} + \sqrt{2} - 2}{1 - (\sqrt{2} + \sqrt{2}) - 2}$$

$$\frac{3 - 2\sqrt{2} - 2}{-1} = \frac{1 - 2\sqrt{2}}{-1}$$

$$= \boxed{2\sqrt{2} - 1}$$

$$36. \frac{\sqrt{5}}{\sqrt{2}-\sqrt{3}} \cdot \frac{\sqrt{2}+\sqrt{3}}{\sqrt{2}+\sqrt{3}}$$

$$\frac{\sqrt{10} + \sqrt{15}}{2 - 3} = \frac{\sqrt{10} + \sqrt{15}}{-1}$$

$$= \boxed{-\sqrt{10} - \sqrt{15}}$$

37. The volume of a cone is: $V = \frac{1}{3}\pi r^2 h$. If the volume of a cone is $18\pi \text{ cm}^3$ and the height is 6 cm , what is the radius?

$$V = \frac{1}{3}\pi r^2 h$$

$$18\pi = \frac{1}{3}\pi r^2 (6)$$

$$18\pi = 2\pi r^2$$

$$9 = r^2$$

$$r = \boxed{3 \text{ cm}}$$

38. The volume of a sphere is: $V = \frac{4}{3}\pi r^3$. If the volume of a sphere is $36\pi \text{ cm}^3$, what is the radius?

$$36 = \frac{4}{3}\pi r^3$$

$$\frac{3}{4} \cdot 36 = \pi r^3$$

$$27 = \pi r^3$$

$$\frac{27}{\pi} = r^3$$

$$r = \sqrt[3]{\frac{27}{\pi}}$$

$$r = \frac{3}{\sqrt[3]{\pi}} \cdot \frac{\sqrt[3]{\pi}}{\sqrt[3]{\pi}} \cdot \frac{\sqrt[3]{\pi}}{\sqrt[3]{\pi}} \rightarrow \boxed{\frac{3\sqrt[3]{\pi^2}}{\pi} \text{ cm}}$$