

4.2 Simplifying Radical Expressions

Solutions

Simplify the expressions.	
<p>1. $\sqrt{12} = \sqrt{2^2 \cdot 3}$ $= \sqrt{2^2} \cdot \sqrt{3}$ $= 2\sqrt{3}$</p> <p style="text-align: right;"> $2 \overline{)12}$ $2 \overline{)6}$ 3 </p>	<p>2. $\sqrt{18}$</p>
<p>3. $\sqrt{28} = \sqrt{2^2 \cdot 7}$ $= \sqrt{2^2} \cdot \sqrt{7}$ $= 2\sqrt{7}$</p> <p style="text-align: right;"> $2 \overline{)28}$ $2 \overline{)14}$ 7 </p>	<p>4. $\sqrt{50}$</p>
<p>5. $\sqrt{72} = \sqrt{2^3 \cdot 3^2}$ $= \sqrt{2^2} \cdot \sqrt{2} \cdot \sqrt{3^2}$ $= 2 \cdot 3\sqrt{2} = 6\sqrt{2}$</p> <p style="text-align: right;"> $2 \overline{)72}$ $2 \overline{)36}$ $2 \overline{)18}$ $3 \overline{)9}$ 3 </p>	<p>6. $\sqrt{90}$</p>
<p>7. $\sqrt{196} = \sqrt{2^2 \cdot 7^2}$ $= \sqrt{2^2} \cdot \sqrt{7^2}$ $= 2 \cdot 7 = 14$</p> <p style="text-align: right;"> $2 \overline{)196}$ $2 \overline{)98}$ $7 \overline{)49}$ 7 </p>	<p>8. $\sqrt{225}$</p>
<p>9. $\sqrt[3]{8} = \sqrt[3]{2^3} = 2$</p> <p style="text-align: right;"> $2 \overline{)8}$ $2 \overline{)4}$ 2 </p>	<p>10. $\sqrt[3]{27}$</p>
<p>11. $\sqrt[3]{24} = \sqrt[3]{2^3 \cdot 3}$ $= \sqrt[3]{2^3} \cdot \sqrt[3]{3}$ $= 2\sqrt[3]{3}$</p> <p style="text-align: right;"> $2 \overline{)24}$ $2 \overline{)12}$ $2 \overline{)6}$ 3 </p>	<p>12. $\sqrt[3]{54}$</p>
<p>13. $\sqrt[4]{32} = \sqrt[4]{2^5}$ $= \sqrt[4]{2^4} \cdot \sqrt[4]{2}$ $= 2\sqrt[4]{2}$</p> <p style="text-align: right;"> $2 \overline{)32}$ $2 \overline{)16}$ $2 \overline{)8}$ $2 \overline{)4}$ 2 </p>	<p>14. $\sqrt[4]{48}$</p>
<p>Answers: 1. $2\sqrt{3}$; 3. $2\sqrt{7}$; 5. $6\sqrt{2}$; 7. 14; 9. 2; 11. $2\sqrt[3]{3}$; 13. $2\sqrt[4]{2}$</p>	

Simplify the expressions.

$$\begin{aligned}
 15. \quad \sqrt{a^6} &= \sqrt{a^2 \cdot a^2 \cdot a^2} \\
 &= \sqrt{a^2} \cdot \sqrt{a^2} \cdot \sqrt{a^2} \\
 &= a \cdot a \cdot a = \boxed{a^3}
 \end{aligned}$$

$$16. \quad \sqrt{x^{12}}$$

$$\begin{aligned}
 17. \quad \sqrt{25a^2} &= \sqrt{5^2 a^2} \\
 &= \sqrt{5^2} \cdot \sqrt{a^2} \\
 &= \boxed{5a}
 \end{aligned}$$

$$18. \quad \sqrt{64x^4}$$

$$\begin{aligned}
 19. \quad \sqrt{a^6 b^4} &= \sqrt{a^2 \cdot a^2 \cdot a^2 \cdot b^2 \cdot b^2} \\
 &= \sqrt{a^2} \cdot \sqrt{a^2} \cdot \sqrt{a^2} \cdot \sqrt{b^2} \cdot \sqrt{b^2} \\
 &= a \cdot a \cdot a \cdot b \cdot b = \boxed{a^3 b^2}
 \end{aligned}$$

$$20. \quad \sqrt{x^2 y^8}$$

$$\begin{aligned}
 21. \quad \sqrt{9a^4 b^8} &= \sqrt{3^2 \cdot a^2 \cdot a^2 \cdot b^2 \cdot b^2 \cdot b^2 \cdot b^2} \\
 &= \sqrt{3^2} \cdot \sqrt{a^2} \cdot \sqrt{a^2} \cdot \sqrt{b^2} \cdot \sqrt{b^2} \cdot \sqrt{b^2} \cdot \sqrt{b^2} \\
 &= 3 \cdot a \cdot a \cdot b \cdot b \cdot b \cdot b = \boxed{3a^2 b^4}
 \end{aligned}$$

$$22. \quad \sqrt{16x^4 y^2}$$

$$23. \quad \sqrt{\frac{a^2}{9b^4}} = \frac{\sqrt{a^2}}{\sqrt{3^2 b^2 \cdot b^2}} = \boxed{\frac{a}{3b^2}}$$

$$24. \quad \sqrt{\frac{4x^6}{y^{14}}}$$

Answers: 15. a^3 ; 17. $5a$; 19. $a^3 b^2$; 21. $3a^2 b^4$; 23. $\frac{a}{3b^2}$

Simplify the expressions.

25.

$$\sqrt{\frac{8a^6}{81b^2c^8}} = \frac{\sqrt{2^2 \cdot 2 \cdot (a^3)^2}}{\sqrt{9^2 \cdot b^2 \cdot (c^4)^2}} = \frac{2a^3\sqrt{2}}{9bc^4}$$

$$\text{or } = \frac{\sqrt{2^2 \cdot 2 \cdot a^2 \cdot a^2 \cdot a^2}}{\sqrt{9^2 \cdot b^2 \cdot c^2 \cdot c^2 \cdot c^2 \cdot c^2}} = \boxed{\frac{2a^3\sqrt{2}}{9bc^4}}$$

26.

$$\sqrt{\frac{75a^6b^{10}}{4c^2}}$$

27.

$$\sqrt{a^3} = \sqrt{a^2 \cdot a} = \boxed{a\sqrt{a}}$$

28.

$$\sqrt{x^5}$$

29.

$$\sqrt{a^9b^2} = \sqrt{(a^4)^2 \cdot a \cdot b^2} = a^4b\sqrt{a}$$

$$\text{or } = \sqrt{a^2 \cdot a^2 \cdot a^2 \cdot a^2 \cdot a \cdot b^2} = \boxed{a^4b\sqrt{a}}$$

30.

$$\sqrt{x^4y^{11}}$$

31.

$$\begin{aligned} \sqrt{27a^5} &= \sqrt{3^3a^5} \\ &= \sqrt{3^2 \cdot 3 \cdot (a^2)^2 \cdot a} = 3a^2\sqrt{3a} \end{aligned}$$

$$\text{or } = \sqrt{3^2 \cdot 3 \cdot a^2 \cdot a^2 \cdot a} = \boxed{3a^2\sqrt{3a}}$$

32.

$$\sqrt{20x^7}$$

33.

$$\begin{aligned} \sqrt[5]{32a^6b^{10}} &= \sqrt[5]{2^5 \cdot a^5 \cdot a \cdot (b^2)^5} \\ &= 2ab^2\sqrt[5]{a} \end{aligned}$$

$$\text{or } = \sqrt[5]{2^5 \cdot a^5 \cdot a \cdot b^5 \cdot b^5} = \boxed{2ab^2\sqrt[5]{a}}$$

34.

$$\sqrt[4]{81a^4b^7}$$

Answers: 25. $\frac{2a^3\sqrt{2}}{9bc^4}$; 27. $a\sqrt{a}$; 29. $a^4b\sqrt{a}$; 31. $3a^2\sqrt{3a}$; 33. $2ab^2\sqrt[5]{a}$