

PERFECT ROOTS

$$\sqrt{4} = \underline{2}$$

$$\sqrt{9} = \underline{3}$$

$$\sqrt{16} = \underline{4}$$

$$\sqrt{25} = \underline{5}$$

$$\sqrt{36} = \underline{6}$$

$$\sqrt{49} = \underline{7}$$

$$\sqrt{64} = \underline{8}$$

$$\sqrt{81} = \underline{9}$$

$$\sqrt{100} = \underline{10}$$

$$\sqrt{121} = \underline{11}$$

$$\sqrt{144} = \underline{12}$$

$$\sqrt{169} = \underline{13}$$

$$\sqrt[3]{8} = \underline{2}$$

$$\sqrt[3]{27} = \underline{3}$$

$$\sqrt[3]{64} = \underline{4}$$

$$\sqrt[3]{125} = \underline{5}$$

$$\sqrt[3]{216} = \underline{6}$$

$$\sqrt[3]{343} = \underline{7}$$

$$\sqrt[3]{512} = \underline{8}$$

$$\sqrt[4]{16} = \underline{2}$$

$$\sqrt[4]{81} = \underline{3}$$

$$\sqrt[4]{256} = \underline{4}$$

$$\sqrt[4]{625} = \underline{5}$$

$$\sqrt[4]{1296} = \underline{6}$$

$$\sqrt[5]{32} = \underline{2}$$

$$\sqrt[5]{243} = \underline{3}$$

$$\sqrt[5]{1024} = \underline{4}$$

$$\sqrt[6]{64} = \underline{2}$$

$$\sqrt[6]{729} = \underline{3}$$

Simplify.

$$\begin{aligned} \text{a.) } & \sqrt{24x^2y^5} \\ &= \sqrt{4x^2y^4} \cdot \sqrt{6y} \\ &= \boxed{2xy^2\sqrt{6y}} \end{aligned}$$

$$\begin{aligned} \text{b.) } & \sqrt[3]{128x^3y^6z^8} \\ &= \sqrt[3]{64x^3y^6z^6} \cdot \sqrt[3]{2z^2} \\ &= \boxed{4xy^2z^2\sqrt[3]{2z^2}} \end{aligned}$$

$$\begin{aligned} \text{c.) } & \sqrt[4]{64ab^8c^{10}} \\ &= \sqrt[4]{16b^8c^8} \cdot \sqrt[4]{4ac^2} \\ &= \boxed{2b^2c^2\sqrt[4]{4ac^2}} \end{aligned}$$

$$\begin{aligned} \text{d.) } & \sqrt[3]{9x^4y^2} \cdot \sqrt[3]{9x^3y^2} \\ &= \sqrt[3]{81x^7y^4} \\ &= \sqrt[3]{27x^6y^3} \cdot \sqrt[3]{3xy} \\ &= \boxed{3x^2y\sqrt[3]{3xy}} \end{aligned}$$

$$\begin{aligned} \text{e.) } & \sqrt{6abc} \cdot \sqrt{2ab^4c^3} \\ &= \sqrt{12a^2b^5c^4} \\ &= \sqrt{4a^2b^4c^4} \cdot \sqrt{3b} \\ &= \boxed{2ab^2c^2\sqrt{3b}} \end{aligned}$$

$$\begin{aligned} \text{f.) } & \sqrt[5]{16m^3n^2} \cdot \sqrt[5]{4m^7n^6} \\ &= \sqrt[5]{64m^{10}n^8} \\ &= \sqrt[5]{32m^{10}n^5} \cdot \sqrt[5]{2n^3} \\ &= \boxed{2m^2n\sqrt[5]{2n^3}} \end{aligned}$$

$$\begin{aligned}
 \text{g.) } & 2\sqrt{5} + \sqrt{3} - 4\sqrt{80} + 5\sqrt{27} \\
 & = 2\sqrt{5} + \sqrt{3} - 4\sqrt{16 \cdot 5} + 5\sqrt{9 \cdot 3} \\
 & = 2\sqrt{5} + \sqrt{3} - 4 \cdot 4\sqrt{5} + 5 \cdot 3\sqrt{3} \\
 & = 2\sqrt{5} + \sqrt{3} - 16\sqrt{5} + 15\sqrt{3} \\
 & = \boxed{-14\sqrt{5} + 16\sqrt{3}}
 \end{aligned}$$

$$\begin{aligned}
 \text{h.) } & 5\sqrt[3]{128} - 6\sqrt[3]{54} \\
 & = 5\sqrt[3]{64 \cdot 2} - 6\sqrt[3]{27 \cdot 2} \\
 & = 5 \cdot 4\sqrt[3]{2} - 6 \cdot 3\sqrt[3]{2} \\
 & = 20\sqrt[3]{2} - 18\sqrt[3]{2} \\
 & = \boxed{2\sqrt[3]{2}}
 \end{aligned}$$

$$\begin{aligned}
 \text{i.) } & 3\sqrt{40} + \sqrt{160} - \sqrt{242} \\
 & = 3\sqrt{4 \cdot 10} + \sqrt{16 \cdot 10} - \sqrt{121 \cdot 2} \\
 & = 3 \cdot 2\sqrt{10} + 4\sqrt{10} - 11\sqrt{2} \\
 & = 6\sqrt{10} + 4\sqrt{10} - 11\sqrt{2} \\
 & = \boxed{10\sqrt{10} - 11\sqrt{2}}
 \end{aligned}$$

$$\begin{aligned}
 \text{j.) } & \sqrt[4]{162} - 8\sqrt[4]{48} + 3\sqrt[4]{32} \\
 & = \sqrt[4]{81 \cdot 2} - 8\sqrt[4]{16 \cdot 3} + 3\sqrt[4]{16 \cdot 2} \\
 & = 3\sqrt[4]{2} - 8 \cdot 2\sqrt[4]{3} + 3 \cdot 2\sqrt[4]{2} \\
 & = 3\sqrt[4]{2} - 16\sqrt[4]{3} + 6\sqrt[4]{2} \\
 & = \boxed{9\sqrt[4]{2} - 16\sqrt[4]{3}}
 \end{aligned}$$

$$\begin{aligned}
 \text{k.) } & (\sqrt{3} + 4)(\sqrt{6} - 2) \\
 & = \sqrt{18} - 2\sqrt{3} + 4\sqrt{6} - 8 \\
 & = \sqrt{9 \cdot 2} - 2\sqrt{3} + 4\sqrt{6} - 8 \\
 & = \boxed{3\sqrt{2} - 2\sqrt{3} + 4\sqrt{6} - 8}
 \end{aligned}$$

$$\begin{aligned}
 \text{l.) } & (2\sqrt{2} - 4)(\sqrt{8} - \sqrt{2}) \\
 & = 2\sqrt{16} - 2\sqrt{4} - 4\sqrt{8} + 4\sqrt{2} \\
 & = 2 \cdot 4 - 2 \cdot 2 - 4\sqrt{4 \cdot 2} + 4\sqrt{2} \\
 & = 8 - 4 - 4 \cdot 2\sqrt{2} + 4\sqrt{2} \\
 & = 8 - 4 - 8\sqrt{2} + 4\sqrt{2} \\
 & = \boxed{4 - 4\sqrt{2}}
 \end{aligned}$$

$$\begin{aligned}
 \text{m.) } & \frac{4}{2 + \sqrt{3}} \cdot \frac{2 - \sqrt{3}}{2 - \sqrt{3}} \\
 & = \frac{8 - 4\sqrt{3}}{4 - 2\sqrt{3} + 2\sqrt{3} - \sqrt{9}} \\
 & = \frac{8 - 4\sqrt{3}}{4 - 3} \\
 & = \boxed{8 - 4\sqrt{3}}
 \end{aligned}$$

$$\begin{aligned}
 \text{n.) } & \frac{3 - \sqrt{6}}{\sqrt{3} - 5} \cdot \frac{\sqrt{3} + 5}{\sqrt{3} + 5} \\
 & = \frac{3\sqrt{3} + 15 - \sqrt{18} - 5\sqrt{6}}{\sqrt{9} + 5\sqrt{3} - 5\sqrt{3} - 25} \\
 & = \frac{3\sqrt{3} + 15 - \sqrt{9 \cdot 2} - 5\sqrt{6}}{3 - 25} \\
 & = \boxed{\frac{3\sqrt{3} + 15 - 3\sqrt{2} - 5\sqrt{6}}{-22}}
 \end{aligned}$$