

HW43

1. $\sqrt[5]{128} = \sqrt[5]{2^7}$

$$128 \begin{array}{c} \wedge \\ 2 \ 64 \\ \wedge \ \wedge \\ 8 \ 8 \\ \wedge \ \wedge \ \wedge \ \wedge \\ 4 \ 2 \ 4 \ 2 \\ \wedge \ \wedge \ \wedge \ \wedge \\ 2 \ 2 \ 2 \ 2 \end{array}$$

$$2^{7/5} = 2^1 \cdot 2^{2/5}$$

$$= 2(\sqrt[5]{2^2})$$

$$= \boxed{2(\sqrt[5]{4})}$$

2. $\sqrt[4]{3125} = \sqrt[4]{5^5}$

$$3125 \begin{array}{c} \wedge \\ 25 \ 125 \\ \wedge \ \wedge \\ 5 \ 5 \ 5 \ 25 \\ \wedge \ \wedge \\ 5 \ 5 \end{array}$$

$$= 5^{5/4} = 5^1 \cdot 5^{1/4}$$

$$= \boxed{5(\sqrt[4]{5})}$$

3. $\sqrt[3]{256m^{10}} = \sqrt[3]{2^8 m^{10}}$

$$256 \begin{array}{c} \wedge \\ 2 \ 128 \\ \wedge \ \wedge \\ 2 \ 64 \\ \wedge \ \wedge \ \wedge \ \wedge \\ 2 \ 32 \\ \wedge \ \wedge \ \wedge \ \wedge \\ 2 \ 16 \\ \wedge \ \wedge \\ 2 \ 8 \\ \wedge \ \wedge \\ 4 \ 2 \\ \wedge \\ 2 \ 2 \end{array}$$

$$= 2^{8/3} m^{10/3}$$

$$= 2m^3(\sqrt[3]{2^2 m})$$

$$= \boxed{2m^3(\sqrt[3]{8m})}$$

4. $\sqrt[4]{81c^{14}} = \sqrt[4]{3^4 c^{14}}$

$$= 3^{4/4} \cdot c^{14/4}$$

$$= 3^1 \cdot c^3 \cdot c^{2/4}$$

$$= \boxed{3c^3(\sqrt[4]{c^2})}$$

5. $\sqrt{216t^3m^8}$

$$216 = \sqrt{2^3 3^3 t^3 m^8}$$

$$2 \begin{array}{c} \wedge \\ 108 \\ \wedge \ \wedge \\ 2 \ 54 \\ \wedge \ \wedge \ \wedge \ \wedge \\ 6 \ 9 \\ \wedge \ \wedge \\ 3 \ 2 \ 3 \ 3 \end{array}$$

$$= 2^{3/2} \cdot 3^{3/2} \cdot t^{3/2} \cdot m^{8/2}$$

$$2 \begin{array}{c} \wedge \\ 54 \\ \wedge \ \wedge \ \wedge \ \wedge \\ 6 \ 9 \\ \wedge \ \wedge \\ 3 \ 2 \ 3 \ 3 \end{array} = 2 \cdot 3 \cdot t \cdot m^4 \sqrt{2 \cdot 3 \cdot t}$$

$$= \boxed{6tm^4\sqrt{6t}}$$

6. $\sqrt[4]{25z^{11}}$

$$= \sqrt[4]{5^4 z^{11}}$$

$$= 5^{4/4} \cdot z^{11/4}$$

$$= \boxed{5 \cdot z^2(\sqrt[4]{z^3})}$$

7. $\sqrt[3]{32x^4y^9}$

$$= \sqrt[3]{2^5 x^4 y^9}$$

$$= 2^{5/3} x^{4/3} y^{9/3}$$

$$= 2 \cdot x \cdot y^3 (\sqrt[3]{2^2 x})$$

$$= \boxed{2xy^3(\sqrt[3]{4x})}$$

8. $\sqrt[5]{243r^{14}t^{10}}$

$$243 = \sqrt[5]{3^5 r^{14} t^{10}}$$

$$3 \begin{array}{c} \wedge \\ 81 \\ \wedge \ \wedge \\ 9 \ 9 \\ \wedge \ \wedge \ \wedge \ \wedge \\ 3 \ 3 \ 3 \ 3 \end{array}$$

$$= 3^{5/5} \cdot r^{14/5} \cdot t^{10/5}$$

$$3 \begin{array}{c} \wedge \ \wedge \\ 9 \ 9 \\ \wedge \ \wedge \ \wedge \ \wedge \\ 3 \ 3 \ 3 \ 3 \end{array} = 3^1 \cdot r^2 \cdot r^{4/5} \cdot t^2$$

$$= \boxed{3r^2 t^2 (\sqrt[5]{r^4})}$$

9. $\sqrt[4]{567w^7m^{12}}$

$$567 = \sqrt[4]{3^4 \cdot 7 \cdot w^7 m^{12}}$$

$$3 \begin{array}{c} \wedge \\ 189 \\ \wedge \ \wedge \\ 3 \ 63 \\ \wedge \ \wedge \ \wedge \ \wedge \\ 7 \ 9 \\ \wedge \ \wedge \\ 3 \ 3 \end{array}$$

$$= 3^{4/4} \cdot 7^{1/4} \cdot w^{7/4} \cdot m^{12/4}$$

$$= 3 \cdot 7^{1/4} \cdot w \cdot w^{3/4} \cdot m^3$$

$$= \boxed{3wm^3(\sqrt[4]{7w^3})}$$

10. $\sqrt[3]{3456e^6f^{13}}$

$$3456 = \sqrt[3]{2^7 3^3 e^6 f^{13}}$$

$$2 \begin{array}{c} \wedge \\ 1728 \\ \wedge \ \wedge \\ 2 \ 864 \\ \wedge \ \wedge \ \wedge \ \wedge \\ 2 \ 432 \\ \wedge \ \wedge \ \wedge \ \wedge \\ 2 \ 216 \\ \wedge \ \wedge \ \wedge \ \wedge \\ 2 \ 54 \\ \wedge \ \wedge \ \wedge \ \wedge \\ 2 \ 3 \ 3 \ 3 \end{array}$$

$$= 2^{7/3} \cdot 3^{3/3} \cdot e^{6/3} \cdot f^{13/3}$$

$$2 \begin{array}{c} \wedge \\ 864 \\ \wedge \ \wedge \ \wedge \ \wedge \\ 2 \ 432 \\ \wedge \ \wedge \ \wedge \ \wedge \\ 2 \ 216 \\ \wedge \ \wedge \ \wedge \ \wedge \\ 2 \ 54 \\ \wedge \ \wedge \ \wedge \ \wedge \\ 2 \ 3 \ 3 \ 3 \end{array} = 2^2 \cdot 3 \cdot e^2 \cdot f^4 (\sqrt[3]{2 \cdot f})$$

$$2 \begin{array}{c} \wedge \\ 432 \\ \wedge \ \wedge \ \wedge \ \wedge \\ 2 \ 216 \\ \wedge \ \wedge \ \wedge \ \wedge \\ 2 \ 54 \\ \wedge \ \wedge \ \wedge \ \wedge \\ 2 \ 3 \ 3 \ 3 \end{array} = \boxed{12e^2 f^4 (\sqrt[3]{2f})}$$

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11. $\sqrt[6]{576a^{10}b^{13}}$

$$576 = \sqrt[6]{2^4 3^2 a^{10} b^{13}}$$

$$2 \begin{array}{c} \wedge \\ 288 \\ \wedge \ \wedge \\ 2 \ 144 \\ \wedge \ \wedge \ \wedge \ \wedge \\ 4 \ 3 \ 4 \ 3 \\ \wedge \ \wedge \\ 2 \ 2 \end{array}$$

$$= 2 \cdot a \cdot b^2 (\sqrt[6]{3^2 a^4 b})$$

$$= \boxed{2ab^2(\sqrt[6]{9a^4b})}$$

12. $\sqrt{9x^3y^5z^2}$

$$= \sqrt{3^2 x^3 y^5 z^2}$$

$$= 3 \cdot x \cdot y^2 \cdot z (\sqrt{xy})$$

$$= \boxed{3xy^2z(\sqrt{xy})}$$

$$13. \sqrt{504v^4g^9k^2}$$

$$\begin{aligned} 504 &= \sqrt{2^3 \cdot 3^2 \cdot 7 \cdot v^4 \cdot g^9 \cdot k^2} \\ \begin{matrix} \wedge \\ 2 \end{matrix} \sqrt{252} &= 2 \cdot 3 \cdot v^2 \cdot g^4 \cdot k (\sqrt{2 \cdot 7 \cdot g}) \\ \begin{matrix} \wedge \\ 2 \end{matrix} \sqrt{126} &= \boxed{6v^2g^4k(\sqrt{14g})} \\ \begin{matrix} \wedge \\ 2 \end{matrix} \sqrt{63} & \\ \begin{matrix} \wedge \\ 7 \end{matrix} \sqrt{9} & \\ \begin{matrix} \wedge \\ 3 \end{matrix} & \end{aligned}$$

$$\begin{aligned} 14. \sqrt[3]{2^3c^3d^6e} \\ &= 2 \cdot c \cdot d^2 (\sqrt[3]{e}) \\ &= \boxed{2cd^2(\sqrt[3]{e})} \end{aligned}$$

$$\begin{aligned} 15. \sqrt[6]{2^7b^2c^{11}d^{18}} \\ &= 2 \cdot c \cdot d^3 (\sqrt[6]{2 \cdot b^2 \cdot c^5}) \\ &= \boxed{2cd^3(\sqrt[6]{2b^2c^5})} \end{aligned}$$

$$16. \sqrt[4]{6250d^9e^{12}f}$$

$$\begin{aligned} 6250 &= \sqrt[4]{5^5 \cdot 2 \cdot d^9 \cdot e^{12} \cdot f} \\ \begin{matrix} \wedge \\ 625 \end{matrix} \sqrt[4]{10} &= 5 \cdot d^2 \cdot e^3 (\sqrt[4]{5 \cdot 2 \cdot d \cdot f}) \\ \begin{matrix} \wedge \\ 25 \end{matrix} \sqrt[4]{25} & \\ \begin{matrix} \wedge \\ 5 \end{matrix} \sqrt[4]{5} & \\ \begin{matrix} \wedge \\ 5 \end{matrix} & \end{aligned}$$

$$\begin{aligned} 17. \sqrt{12x^{-2}} \\ &= \sqrt{2^2 \cdot 3 \cdot x^{-2}} \\ &= 2^{1/2} \cdot 3^{1/2} \cdot x^{-1/2} \\ &= 2^1 \cdot 3^{1/2} \cdot x^{-1} \\ &= \boxed{\frac{2}{x} \sqrt{3}} \text{ or } \boxed{\frac{2\sqrt{3}}{x}} \end{aligned}$$

$$\begin{aligned} 18. \sqrt{8^{-2}a^4b^{-6}} \\ &= 8^{-1} a^2 b^{-3} \\ &= \boxed{\frac{a^2}{8b^3}} \end{aligned}$$

$$19. \sqrt[3]{\frac{54y^4}{x^{12}}}$$

$$\begin{aligned} 54 &= \sqrt[3]{3^3 \cdot 2 \cdot y^4 \cdot x^{-12}} \\ \begin{matrix} \wedge \\ 9 \end{matrix} \sqrt[3]{6} &= 3^{3/3} \cdot 2^{1/3} \cdot y^{4/3} \cdot x^{-12/3} \\ \begin{matrix} \wedge \\ 3 \end{matrix} \sqrt[3]{3} &= 3^1 \cdot 2^{1/3} \cdot y^1 \cdot y^{1/3} \cdot x^{-4} \\ &= \boxed{\frac{3y}{x^4} (\sqrt[3]{2y})} \\ &\text{ or } \boxed{\frac{3y\sqrt[3]{2y}}{x^4}} \end{aligned}$$

$$\begin{aligned} 20. \sqrt[4]{\frac{32m^{10}n^5}{p^7}} \\ &= \sqrt[4]{2^5 m^{10} n^5 p^{-7}} \\ &= 2 \cdot m^2 \cdot n \cdot p^{-1} (\sqrt[4]{2 \cdot m^2 \cdot n \cdot p^{-3}}) \\ &= \boxed{\frac{2m^2n}{p} (\sqrt[4]{\frac{2m^2n}{p^3}})} \end{aligned}$$