

PART 1: SIMPLIFY EACH EXPRESSION

$$\textcircled{1} \sqrt{24} = \sqrt{4 \cdot 6} = \boxed{2\sqrt{6}}$$

$$\textcircled{2} \sqrt[3]{24} = \sqrt[3]{8 \cdot 3} = \boxed{2\sqrt[3]{3}}$$

$$\textcircled{3} \sqrt[4]{162} = \sqrt[4]{81 \cdot 2} = \boxed{3 \cdot \sqrt[4]{2}}$$

EX:

$$\textcircled{2} \sqrt{x^{16}}$$

$$(x^8)^2 = x^{16}$$

$$\textcircled{4} \sqrt[3]{x^{10}y^{23}} = \sqrt[3]{x^9 \cdot x \cdot y^{21} \cdot y^2} = \boxed{x^3 y^7 \cdot \sqrt[3]{xy^2}}$$

$$\textcircled{5} \sqrt[4]{x^{16}y^{21}} = x^4 \cdot \sqrt[4]{y^{20} \cdot y} = \boxed{x^4 y^5 \cdot \sqrt[4]{y}}$$

$$\textcircled{6} -5\sqrt{15} \cdot 3\sqrt{35} = -5 \cdot 3 \sqrt{15 \cdot 35}$$

$$= -5 \cdot 3 \sqrt{3 \cdot 5 \cdot 5 \cdot 7} = -5 \cdot 3 \cdot 5 \sqrt{21}$$

$$= \boxed{-75\sqrt{21}}$$

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

$$\sqrt{6}$$

$$\sqrt{2} + \sqrt{3} \checkmark$$

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

$$2\sqrt{2} \checkmark$$

$$\textcircled{7} \sqrt{14ac^6} \cdot \sqrt{21a^3c^9}$$

$$= \sqrt{2 \cdot 7 \cdot 7 \cdot 3 \cdot a^4 \cdot c^{15}} = 7a^2 \sqrt{6c^{14} \cdot c} = \boxed{7a^2 c^7 \sqrt{6c}}$$

$$\textcircled{8} \quad \underline{6\sqrt{3}} - \underline{\sqrt[4]{16}} - \underline{2\sqrt{75}} + \underline{\sqrt[4]{81}} = 6\sqrt{3} - 2 - 2\sqrt{25 \cdot 3} + 3$$

$$= 6\sqrt{3} - 2 - 10\sqrt{3} + 3$$

$$= \boxed{-4\sqrt{3} + 1}$$

$$\textcircled{9} \quad (5 - \sqrt{3})(2 + \sqrt{3}) = \underline{10} + \underline{5\sqrt{3}} - \underline{2\sqrt{3}} - \underline{3}$$

$$= \boxed{7 + 3\sqrt{3}}$$

$-\sqrt{3} \cdot \sqrt{3}$
 $-\sqrt{9}$
 -3
 $\sqrt{3} \cdot \sqrt{3}$

$$\textcircled{10} \quad (3 + 2\sqrt{5})(7 - 5\sqrt{2})$$

PART 2: RATIONAL EXPONENTS

$b^{\frac{1}{n}} = \sqrt[n]{b}$
$b^{\frac{m}{n}} = \sqrt[n]{b^m}$

EX: $25^{\frac{1}{2}} = \sqrt{25} = 5$

EX: $9^{\frac{3}{2}} = \sqrt{9^3}$
 3^3
 $\boxed{27}$

$$\textcircled{1} \quad 25^{\frac{3}{2}} = \sqrt{25^3} = 5^3 = \boxed{125}$$

$$\textcircled{2} \quad (x^2)^{\frac{5}{3}} = x^{2 \cdot \frac{5}{3}} = x^{\frac{10}{3}} = \sqrt[3]{x^{10}} = \sqrt[3]{x^9 \cdot x} = \boxed{x^3 \cdot \sqrt[3]{x}}$$

$$\textcircled{3} -27^{\frac{2}{3}} = -9 \quad -\sqrt[3]{27^2}$$

$$(-27)^{\frac{2}{3}} \\ \sqrt[3]{(-27)^2} \\ (-3)^2 = 9$$

$$\textcircled{4} \left(-\frac{125}{27}\right)^{-\frac{2}{3}}$$

$$\left(\frac{x}{y}\right)^2 = \frac{x^2}{y^2}$$

$$\left(\frac{27}{-125}\right)^{2/3} = \frac{27^{2/3}}{(-125)^{2/3}} = \frac{\sqrt[3]{27^2}}{\sqrt[3]{(-125)^2}} = \frac{3^2}{(-5)^2} = \boxed{\frac{9}{25}}$$

$$x^{-2} \\ \frac{1}{x^2}$$

$$\textcircled{5} X^{\frac{3}{4}} \cdot X^{\frac{4}{3}} = X^{\frac{33}{34} + \frac{44}{34}} = X^{\frac{9}{12} + \frac{16}{12}} = X^{\frac{25}{12}} = \sqrt[12]{X^{25}}$$

$$= \sqrt[12]{X^{24} \cdot X} \\ = \boxed{X^2 \cdot \sqrt[12]{X}}$$

$$\textcircled{6} (81y^{16}k^{22})^{\frac{1}{4}} = \sqrt[4]{81y^{16}k^{22}} = 3y^4 \sqrt[4]{k^{20} \cdot k^2}$$

$$\boxed{3y^4 k^5 \cdot \sqrt[4]{k^2}}$$

$$\textcircled{7} \sqrt{\sqrt[3]{4}} = (4^{\frac{1}{3}})^{\frac{1}{2}} = 4^{\frac{1}{6}}$$