

Exponents Review Worksheet / Mastery

Simplify:

$$1. x^{\frac{1}{2}} \cdot x^{\frac{3}{5}} = x^{\frac{1}{2} + \frac{3}{5}} = x^{\frac{5}{10} + \frac{6}{10}} = x^{\frac{11}{10}} = \sqrt[10]{x^{11}}$$

$$2. x^{\frac{2}{3}} \cdot \sqrt[3]{x^3} = x^{\frac{2}{3}} \cdot x^{\frac{3}{5}} = x^{\frac{2}{3} + \frac{2}{3}} = x^{\frac{10}{15} + \frac{4}{15}} = x^{\frac{14}{15}} = \sqrt[15]{x^{14}}$$

$$3. \sqrt{x} \cdot \sqrt[3]{x^2} = x^{\frac{1}{2}} \cdot x^{\frac{2}{3}} = x^{\frac{3}{6} + \frac{4}{6}} = x^{\frac{7}{6}} = \sqrt[6]{x^7}$$

$$4. \frac{\sqrt{x}}{\sqrt[3]{x^2}} = x^{\frac{1}{2}} \cdot x^{-\frac{2}{3}} = x^{\frac{3}{6} - \frac{4}{6}} = x^{-\frac{1}{6}} = \frac{1}{\sqrt[6]{x}}$$

$$5. \frac{\sqrt[3]{x^2}}{x^{\frac{1}{7}}} = x^{\frac{2}{3}} \cdot x^{-\frac{1}{7}} = x^{\frac{14}{21} - \frac{3}{21}} = x^{\frac{11}{21}} = \sqrt[21]{x^{11}}$$

$$= x^{-\frac{1}{6}} = \frac{1}{\sqrt[6]{x}}$$

Evaluate for the given x. Simplify completely when possible:

$$6. x^{\frac{1}{2}}; x=8 \Rightarrow \sqrt{8} = 2\sqrt{2}$$

$$7. x^{\frac{2}{3}}; x=9 \Rightarrow \sqrt[3]{9^2} = \sqrt[3]{3^4} = 3\sqrt[3]{3}$$

$$8. x^{\frac{4}{5}}; x=4 \Rightarrow \sqrt[5]{4^4} = \sqrt[5]{(2^2)^4} = \sqrt[5]{2^8} = 2\sqrt[5]{8}$$

For the following put over a common denominator and simplify:

$$9. \frac{\sqrt{x}}{\sqrt[3]{x^4}} + x = \frac{x^{\frac{1}{2}} + x^{\frac{7}{3}}}{x^{\frac{4}{3}}} \Rightarrow \frac{\sqrt{x} + x^2 \sqrt[3]{x}}{x \sqrt[3]{x}}$$

$$10. \frac{\sqrt[3]{x^2}}{x} + \frac{x^2}{\sqrt{x}} = \frac{x^{\frac{2}{3}} + x^{\frac{5}{2}}}{x} \Rightarrow \frac{\sqrt[3]{x^2} + x^2 \sqrt{x}}{x}$$

$$11. \frac{3x^3}{\sqrt[3]{x^4}} + \frac{3x}{x^2} = \frac{3x^3}{x^{\frac{4}{3}}} + \frac{3x}{x^{\frac{3}{2}}} = \frac{3x^4 \sqrt{x} + 3x^2 \sqrt[3]{x}}{x^{\frac{17}{6}}} = \frac{3x^4 \sqrt{x} + 3x^2 \sqrt[3]{x}}{x^2 \sqrt[6]{x^5}} = \frac{3x^2 \sqrt{x} + 3\sqrt[3]{x}}{\sqrt[6]{x^5}}$$

$$12. \frac{\sqrt[3]{x^2}}{x} + \frac{x^2}{\sqrt{x}} + \frac{1}{x^5} = \frac{x^{\frac{2}{3}} + x^{\frac{5}{2}} + x^{\frac{4}{5}}}{x} = \frac{\sqrt[3]{x^2} + x^2 \sqrt{x} + \sqrt[5]{x^4}}{x}$$

$$13. \frac{\sqrt[3]{x^2}}{x^{\frac{3}{4}}} + \frac{x^2}{\sqrt{x}} + \frac{2x}{x^5} = x^{\frac{2}{3}} \cdot x^{\frac{1}{4}} \cdot x^{\frac{1}{5}} + x^2 \cdot x^{\frac{3}{4}} \cdot x^{\frac{1}{5}} + 2x \cdot x^{\frac{3}{4}} \cdot x^{\frac{1}{2}} = x^{\frac{3}{20}} \cdot x^{\frac{1}{2}} \cdot x^{\frac{1}{5}} + x^2 \cdot x^{\frac{3}{4}} \cdot x^{\frac{1}{5}} + 2x \cdot x^{\frac{3}{4}} \cdot x^{\frac{1}{2}}$$

$$= \frac{x^{\frac{20}{30} + \frac{15}{30} + \frac{6}{30}} + x^{\frac{40}{60} + \frac{15}{20} + \frac{4}{20}} + 2x^{\frac{4}{4} + \frac{3}{4} + \frac{1}{2}}}{x^{\frac{15}{20} + \frac{10}{20} + \frac{4}{20}}}$$

$$= \frac{x^{\frac{41}{30}} + x^{\frac{59}{20}} + 2x^{\frac{9}{4}}}{x^{\frac{29}{20}}} = \frac{x \cdot x^{\frac{11}{30}} + x^2 \cdot x^{\frac{19}{20}} + 2x^2 \cdot x^{\frac{1}{4}}}{x \cdot x^{\frac{9}{20}}}$$

$$= \frac{x^{\frac{11}{30}} + x \cdot x^{\frac{19}{20}} + 2x \cdot x^{\frac{1}{4}}}{x^{\frac{9}{20}}}$$

Alternate answers

$$9) \frac{1 + \sqrt[6]{x^{11}}}{\sqrt[6]{x^5}} = \frac{1 + X \sqrt[6]{x^5}}{\sqrt[6]{x^5}}$$

$$10) \frac{1 + \sqrt[6]{x^{11}}}{\sqrt[6]{x^2}} = \frac{1 + X \cdot X^{5/6}}{X^{1/3}}$$

$$11) \frac{3x^{13/6} + 3}{x^{3/6}} = \frac{3x^2 \cdot x^{1/6} + 3}{x^{1/2}}$$

$$12) \frac{1 + X^{59/30} + X^{4/30}}{X^{10/30}} = \frac{1 + X \cdot X^{5/6} + X^{2/15}}{X^{1/3}}$$

$$13) \frac{1 + X^{95/60} + 2X^{53/60}}{X^{1/12}} = \frac{1 + X \cdot X^{7/12} + 2X^{53/60}}{X^{1/12}} \quad \text{OR} \quad \frac{X^{11/12} + X^2 \cdot X^{1/2} + 2X \sqrt[5]{x^4}}{X}$$