

## Fractional Exponents

$$\text{base} \rightarrow x^{\frac{m}{n}} \begin{array}{l} \xrightarrow{\text{power}} \\ \xrightarrow{\text{root}} \end{array} \sqrt[n]{x^m} \text{ or } (\sqrt[n]{x})^m$$

Directions: Evaluate each expression.

$$1. 36^{\frac{1}{2}} = (\sqrt[2]{36})^1 = (6)^1 = \boxed{6}$$

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

Calculator:  
 $27 \wedge (2 / 3) = 9$

$$3. 25^{\frac{3}{2}} = (\sqrt[2]{25})^3 = (5)^3 = \boxed{125}$$

$$4. \left(\frac{81}{16}\right)^{\frac{3}{4}} = \left(\sqrt[4]{\frac{81}{16}}\right)^3 = \left(\frac{3}{2}\right)^3 = \boxed{\frac{27}{8}}$$

$$3^4 = 81$$

$$2^4 = 16$$

$$5. (64)^{\frac{2}{3}} = \left(\frac{64}{1}\right)^{\frac{2}{3}} = \left(\frac{1}{64}\right)^{\frac{2}{3}} = \left(\sqrt[3]{\frac{1}{64}}\right)^2 = \left(\frac{1}{4}\right)^2 = \boxed{\frac{1}{16}}$$

$$6. \left(\frac{27}{8}\right)^{\frac{2}{3}} = \left(\frac{8}{27}\right)^{\frac{2}{3}} = \left(\sqrt[3]{\frac{8}{27}}\right)^2 = \left(\frac{2}{3}\right)^2 = \boxed{\frac{4}{9}}$$

$$7. \left(-\frac{1000}{729}\right)^{\frac{2}{3}} = \left(\frac{-1000}{729}\right)^{\frac{2}{3}} = \left(\sqrt[3]{\frac{-1000}{729}}\right)^2 = \left(\frac{-10}{9}\right)^2 = \boxed{\frac{100}{81}}$$

Directions: Simplify each expression.

$$8. \left(3x^{\frac{2}{5}}\right)\left(2x^{\frac{1}{10}}\right) = \boxed{6x^{\frac{9}{10}}}$$

$$\underline{3}x^2 \cdot \underline{6}x^4 = 18x^6$$

$$\frac{2 \cdot 2}{2 \cdot 5} + \frac{1 \cdot 5}{2 \cdot 5} = \frac{4}{10} + \frac{5}{10} = \frac{9}{10}$$

$$\angle CD = 10$$

$$9. \frac{x^{\frac{4}{3}}y^{\frac{2}{3}}}{(xy)^{\frac{1}{3}}} = \frac{x^{\frac{4}{3}}y^{\frac{2}{3}}}{x^{\frac{1}{3}}y^{\frac{1}{3}}} = x^1y^{\frac{1}{3}} = \boxed{xy^{\frac{1}{3}}}$$

$$\frac{x^4y^3}{(xy)^2} = \frac{x^4y^3}{x^2y^2} = x^2y^1 = x^2y$$

$$\frac{4}{3} - \frac{1}{3} = \frac{3}{3} = 1$$

$$\frac{2}{3} - \frac{1}{3} = \frac{1}{3}$$

$$10. \frac{5^{\frac{1}{2}} \cdot 5x^{\frac{5}{2}}}{(5x)^{\frac{3}{2}}} = \frac{\underline{5}^{-\frac{1}{2}} \cdot \underline{5}^1 x^{\frac{5}{2}}}{\underline{5}^{\frac{3}{2}} x^{\frac{3}{2}}} = \frac{5^{\frac{1}{2}} x^{\frac{5}{2}}}{5^{\frac{3}{2}} x^{\frac{3}{2}}} = \frac{x^1}{5^1} = \frac{x}{5}$$

$$-\frac{1}{2} + 1 = \frac{1}{2}$$

$$= \boxed{\frac{x}{5}}$$

$$\frac{3}{2} - \frac{1}{2} = \frac{2}{2} = 1$$

$$\frac{5}{2} - \frac{3}{2} = \frac{2}{2} = 1$$