

Simplifying Rational Exponents

Simplify.

1) $(n^4)^{\frac{3}{2}}$

$$n^{12/2} = \boxed{n^6}$$

2) $(27p^6)^{\frac{5}{3}}$

$$(3^3 p^6)^{5/3} = 3^5 p^{30/3} = \boxed{243 p^{10}}$$

3) $(25b^6)^{-1.5}$

$$(5^2 p^6)^{-3/2} \\ 5^{-3} p^{-18/2} = \frac{1}{5^3 p^9} = \boxed{\frac{1}{125 p^9}}$$

4) $(64m^4)^{\frac{3}{2}}$

$$(8^2 m^4)^{3/2} \\ 8^3 m^{12/2} = \boxed{512 m^6}$$

5) $(a^8)^{\frac{3}{2}}$

$$a^{24/2} = \boxed{a^{12}}$$

6) $(9r^4)^{0.5}$

$$(3^2 r^4)^{1/2} \\ 3^1 r^2 = \boxed{3r^2}$$

7) $(81x^{12})^{1.25}$

$$(3^4 x^{12})^{5/4} \\ 3^5 x^{60/4} = \boxed{243 x^{15}}$$

8) $(216r^9)^{\frac{1}{3}}$

$$(6^3 r^9)^{1/3} \\ 6^1 r^3 = \boxed{6r^3}$$

Simplify. Your answer should contain only positive exponents with no fractional exponents in the denominator.

9) $2m^2 \cdot 4m^{\frac{3}{2}} \cdot 4m^{-2}$

$$32m^{4/2+3/2-4/2} \\ \boxed{32m^{3/2}}$$

10) $3b^{\frac{1}{2}} \cdot b^{\frac{4}{3}}$

$$3b^{3/6+8/6} \\ \boxed{3b^{11/6}}$$

11) $(\frac{3}{p^2})^{-2}$

$$p^{-3} = \boxed{\frac{1}{p^3}}$$

12) $(\frac{1}{a^2})^{\frac{3}{2}}$

$$a^{-3/4} = \boxed{a^{-3/4}}$$

$$13) \frac{2x^{\frac{7}{4}}}{4x^{\frac{4}{3}}}$$

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

$$\frac{1}{2} x^{-3\frac{1}{2}} = \boxed{\frac{1}{2x^{3\frac{1}{2}}}}$$

$$15) \frac{3x^{\frac{1}{2}} \cdot 3x^{\frac{1}{2}} y^{-\frac{1}{3}}}{3y^{\frac{7}{4}}} = \frac{3y^{-\frac{1}{3}}}{y^{-\frac{7}{4}}}$$

$$= y^{-\frac{1}{3} + \frac{7}{4}} = y^{\frac{17}{12}}$$

$$= \boxed{3y^{\frac{17}{12}}}$$

$$17) (m^1 \cdot m^{-2} n^{\frac{5}{3}})^2$$

$$= (m^{-1} n^{\frac{5}{3}})^2$$

$$= m^{-2} n^{\frac{10}{3}} = \boxed{\frac{n^{\frac{10}{3}}}{m^2}}$$

$$19) \left(\frac{x^2 y^{-2}}{y x^{-\frac{7}{4}}} \right)^4$$

$$\frac{x^2 y^{-8}}{x^{-7} y^4} = x^{2+7} y^{-8-4} = x^9 y^{-12}$$

$$= \boxed{\frac{x^9}{y^{12}}}$$

$$21) \frac{(x^{-\frac{1}{2}} y^2)^{-\frac{5}{4}}}{x^2 y^{\frac{1}{2}}}$$

$$\frac{x^{\frac{5}{8}} y^{-\frac{5}{2}}}{x^2 y^{\frac{1}{2}}} = x^{\frac{5}{8} - 1\frac{1}{2}} y^{-\frac{5}{2} - \frac{1}{2}} = x^{-\frac{11}{8}} y^{-3}$$

$$= \boxed{\frac{1}{x^{\frac{11}{8}} y^3}}$$

$$14) \frac{4x^2}{2x^{\frac{1}{2}}}$$

$$2x^{4\frac{1}{2} - \frac{1}{2}}$$

$$= \boxed{2x^{3\frac{1}{2}}}$$

$$16) \frac{3y^{\frac{1}{4}}}{4x^{\frac{2}{3}} y^{\frac{3}{2}} \cdot 3y^{\frac{1}{2}}} = \frac{y^{\frac{1}{4}}}{4x^{\frac{2}{3}} y^2}$$

$$= 4x^{\frac{2}{3}} y^{\frac{1}{4} - 2} = 4x^{\frac{2}{3}} y^{-\frac{7}{4}}$$

$$= \boxed{\frac{x^{\frac{2}{3}}}{4y^{\frac{7}{4}}}}$$

$$18) (a^{-1} b^{\frac{1}{3}} \cdot a^{-\frac{4}{3}} b^2)^2$$

$$(a^{-\frac{3}{3} + -\frac{4}{3}} b^{\frac{1}{3} + \frac{6}{3}})^2$$

$$(a^{-\frac{7}{3}} b^{\frac{7}{3}})^2 = a^{-\frac{14}{3}} b^{\frac{14}{3}}$$

$$= \boxed{\frac{b^{\frac{14}{3}}}{a^{\frac{14}{3}}}}$$

$$20) \frac{(x^3 y^2)^{\frac{3}{2}}}{(x^{-1} y^{-\frac{2}{3}})^{\frac{1}{4}}}$$

$$\frac{x^{\frac{9}{2}} y^3}{x^{-\frac{1}{4}} y^{-\frac{1}{6}}} = x^{18\frac{1}{4} + \frac{1}{4}} y^{18\frac{1}{6} + \frac{1}{6}} = x^{19\frac{1}{4}} y^{\frac{19}{6}}$$

$$= \boxed{x^{19\frac{1}{4}} y^{\frac{19}{6}}}$$

$$22) \frac{(x^{\frac{2}{3}} y^{\frac{3}{2}} \cdot x^{-\frac{3}{2}} y^{\frac{1}{2}})^{\frac{1}{4}}}{x^{-\frac{1}{8}} y^1}$$

$$\frac{x^{\frac{2}{6} - \frac{3}{6}} y^{\frac{3}{4} + \frac{1}{4}}}{x^{-\frac{1}{8}} y^1} = \frac{x^{-\frac{1}{6}} y^1}{x^{-\frac{1}{8}} y^1} = x^{-\frac{1}{6} + \frac{1}{8}} y^{-1}$$

$$= x^{-\frac{3}{24} + \frac{3}{24}} y^{-1} = \boxed{\frac{1}{y}}$$