

Operations withExponentsExponent Rules

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

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

$$\frac{x^4}{x^4} = \frac{x^4}{1} \cdot \frac{1}{x^4} = x^4 \cdot x^{-4} = x^{4+(-4)} = x^{4-4} = x^0 = 1$$

$$7^0 \quad \text{or} \quad r^0$$

|                      |

$$(-4)^0 \quad \text{or} \quad \left( \frac{x^3 y^5}{9z^6} \right)^0$$

|                                      |

$$-3^0 \quad \text{or} \quad -5x^0$$

↓                      ↓

$$\textcircled{-1} \quad \quad \quad -5 \cdot 1$$

$\textcircled{-5}$

$$6y^0 + z^0$$

6 · 1    +    1

6           +    1

$\textcircled{7}$

Take the reciprocal.

$$4^{-2} = \frac{1}{4^2} = \textcircled{\frac{1}{16}}$$

$$4x^{-2} = \textcircled{\frac{4}{x^2}}$$

$$7m^5 n^{-3} = \textcircled{\frac{7m^5}{n^3}}$$

$$\frac{8r^6}{s^{-4}} = \textcircled{8r^6 s^4}$$

$$\frac{8r^6}{s^{-4}} = \frac{8r^6}{\frac{1}{s^4}} = \frac{8r^6}{1} \cdot \frac{s^4}{1} = \textcircled{8r^6 s^4}$$

$$1. \left(\frac{1}{7}\right)^{-2} = \left(\frac{7}{1}\right)^2 = 7^2 = 49$$

$$\frac{1}{7^{-2}} = 7^2 = 49$$

$$2. \left(\frac{3x^{-5}y}{8z^4}\right)^{-2} = \left(\frac{8z^4}{3x^{-5}y}\right)^2 = \left(\frac{8z^4x^5}{3y}\right)^2 = \frac{64z^8x^{10}}{9y^2}$$

$$3. \frac{p^3r^{-5}}{p^{-7}q^0r^4} = \frac{p^3p^7}{r^5r^4} = \frac{p^{10}}{r^9}$$

$$4. (2u^7)^{-3} = \frac{1}{(2u^7)^3} = \frac{1}{2^3u^{21}} = \frac{1}{8u^{21}}$$

$$5. (-4s^9)^{-2} = \frac{1}{(-4s^9)^2} = \frac{1}{(-4)^2s^{18}} = \frac{1}{16s^{18}}$$

$$6. (5t^0u^{-6})^{-3} = \frac{1}{(5u^{-6})^3} = \frac{1}{5^3u^{-18}} = \frac{u^{18}}{125}$$

7.

$$\left( \frac{x^4 y^{-9}}{x^{-10} y^{-8}} \right)^2 = \left( \frac{x^4 \cancel{x^{10}} \cancel{y^8}}{y^9} \right)^2 = \left( \frac{x^{14}}{y} \right)^2 = \frac{x^{28}}{y^2}$$

8.

$$\left( \frac{x^4 y^{-9}}{x^{-10} y^{-8}} \right)^{-2} = \frac{\cancel{x^{-8}} y^{\cancel{18}}}{x^{20} \cancel{y^{16}}} = \frac{y^2}{\cancel{x^8} x^{20}} = \frac{y^2}{x^{28}}$$

$$9. (6m^3 n^{-4})(-5m^7 n^{-2})$$

$$-30m^{3+7} n^{-4-2}$$

$$-30m^{10} n^{-6} =$$

$$\frac{-30m^{10}}{n^6}$$

$$10a) y^3 y^{-10} y^5$$

$$y^{3-10+5} = y^{-2} = \frac{1}{y^2}$$

$$10b) 2^4 \cdot 2^{-7}$$

$$2^{4-7} = 2^{-3} = \frac{1}{2^3} = \frac{1}{8}$$

$$11. 4^{-1} + 6^{-2}$$

$$\frac{1}{4} + \frac{1}{6^2}$$

$$\frac{1 \cdot 9}{4 \cdot 9} + \frac{1}{36}$$

$$\frac{9}{36} + \frac{1}{36} = \frac{10}{36} = \frac{5}{18}$$