

Laws of Exponents

$a^m \bullet a^n = a^{m+n}$	$a^{-n} = \frac{1}{a^n}$
$\frac{a^m}{a^n} = a^{m-n}$	$\frac{1}{a^{-n}} = a^n$
$(a^m)^n = a^{mn}$	$\frac{a^{-m}}{b^{-n}} = \frac{b^n}{a^m}$
$(a^m b^n)^p = a^{mp} b^{np}$	$\left(\frac{a}{b}\right)^{-p} = \left(\frac{b}{a}\right)^p = \frac{b^p}{a^p}$

Examples:

Simplify the following expressions. Use Positive exponents.

1. $x^2 \bullet x^5 = x^{2+5} = x^7$

6. $(x^2)^3 = x^{2 \bullet 3} = x^6$

2. $x^{-3} \bullet x^5 = x^{-3+5} = x^2$

7. $(3x^5 y)^2 = 3^{1 \bullet 2} x^{5 \bullet 2} y^{1 \bullet 2} = 9x^{10} y^2$

3. $\frac{y^7}{y^4} = y^{7-4} = y^3$

8. $(x^{-2})^3 = x^{-2 \bullet 3} = x^{-6} = \frac{1}{x^6}$

4. $\frac{y^{-6}}{y^2} = y^{-6-2} = y^{-8} = \frac{1}{y^8}$

9. $\left(\frac{x}{y^5}\right)^{-3} = \left(\frac{y^5}{x}\right)^3 = \frac{y^{5 \bullet 3}}{x^{1 \bullet 3}} = \frac{y^{15}}{x^3}$

5. $\frac{24xy^7}{10x^5 y^{-2}} = \frac{12x^{1-5} y^{7-(-2)}}{5} = \frac{12x^{-4} y^9}{5} = \frac{12y^9}{5x^4}$

10. $\frac{18x^{-6} y^3}{3x^{-4} y} = 6x^{-6-(-4)} y^{3-1} = 6x^{-2} y^2 = \frac{6y^2}{x^2}$

Exercises: Simplify the following expressions. Use Positive exponents.

1. $z^6 \bullet z^3$

2. $n^{-1} \bullet n^3$

3. $\frac{x^5}{x^7}$

4. $(4x^{-3})(2x^5)$

5. $(-2x^2y^{-3})^4$

6. $\frac{4x^{-1}y^{-4}}{14x^{-2}y^{-2}}$

7. $\left(\frac{x^3}{y^2z}\right)^{-5}$

Answers:

1. z^9 2. n^2 3. $\frac{1}{x^2}$ 4. $8x^2$ 5. $\frac{16x^8}{y^{12}}$ 6. $\frac{2x}{7y^2}$ 7. $\frac{y^{10}z^5}{x^{15}}$