

Using the exponent rules you have already learned simplify the following problems...

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

$$\frac{b^3c^7}{b^6c^2}$$

$$\frac{18f^3g^4}{27fg^5}$$

Can you generalize what has happened?

**Negative Exponents Rule:**

Using the exponent rules you have already learned simplify the following problems...

4 <sup>x</sup>	
Power	Answer
4 <sup>5</sup>	
4 <sup>4</sup>	
4 <sup>3</sup>	
4 <sup>2</sup>	
4 <sup>1</sup>	
4 <sup>0</sup>	

Two ways of looking at it...	
$\frac{x^5}{x^5}$	
$\frac{x^5}{x^5}$	

Can you generalize what has happened?

**Zero as the Exponent Rule:**

Exponential Expression	Exponential Expression (positive exponents)
$k^{-3}$	
$6f^{-7}$	
$12g^3f^{-2}$	
$\frac{-37x^3}{y^{-7}}$	
$a^{-1}b^{-2}c^{-3}$	

Operations with exponents that are negative and zero:

1.  $x^3 \cdot x^{-2}$

2.  $\frac{14x^{-6}}{x^3}$

3.  $\frac{a^{-5}}{a^4}$

4.  $\frac{10m^3n^4}{-25n^9}$

5.  $(k^5)^{-3}$

6.  $(16z^{-5})^2$

7.  $\left(\frac{42x^{-3}}{20y^{-5}}\right)^2$

8.  $\left(\frac{14x^7z^4}{21x^3z^{10}}\right)(9x^{-8}y^{-2})^0$

9.  $\left(\frac{-9d^3e}{2d^3e^7}\right)^3$

**Simplify each expression so your answer does not contain negative exponents.**

1.  $\frac{x^4 y^{-5}}{z^{-2}}$

2.  $\frac{x^{-7}}{x^4}$

3.  $\frac{x^3}{x^{-6}}$

4.  $x^{-2} \cdot x \cdot x^{-8}$

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

6.  $\frac{x^4}{x^8}$

7.  $(10x^{-2}y^4)^0$

8.  $(x^{-3})^{-9}$

9.  $\frac{12x^7}{36x^9}$

10.  $\frac{48x^6 y^7 z^5}{-6xy^7 z^6}$

11.  $\left(\frac{3x^{-5}}{-24y^2}\right)$

12.  $\left(\frac{4x^3}{7x^{-2}}\right)^2$

$$*13. \left( \frac{6x^{-4}y}{9xy^{-3}} \right)^3$$

$$*14. \left( \frac{2x^3y^2z}{3x^{-4}yz^{-2}} \right)^{-2}$$

$$*15. \frac{(12xz^{-2})(3x^{-3}yz^{-4})}{(2x^5yz^{-7})^2}$$

$$*16. \frac{(3x^{-5}y^2)^0(-4x^7y)^2}{(2x^6)(-6y)^{-1}}$$