

# Exponents - A Crash Course

## Shortcuts

Here are the basic rules for exponents:

<p>When you are multiplying, if your base numbers or variables match, add the exponents.</p> <p>Example:</p> $x^3 \cdot x^5 = x^8$	<p>When you are dividing you can subtract the exponents as long as the bases are the same.</p> <p>Example:</p> $\frac{y^6}{y^2} = y^4$
<p>Negative exponents mean that the base should be moved to the other part of the fraction and the exponent made positive.</p> <p>Examples:</p> $a^{-3} = \frac{1}{a^3} \text{ or } \frac{5}{b^{-2}} = 5b^2$	<p>If you find an exponent attached to a product or quotient, every factor must receive that exponent. Think of it as the distributive property for exponents.</p> <p>Example:</p> $\left(\frac{3a^3}{4b^5}\right)^2 = \frac{3^2(a^3)^2}{4^2(b^5)^2} = \frac{9a^6}{16b^{10}}$

Now give these a try:

- 1)  $a^4 \cdot a^7 = a^{11}$   
 $a^{4+7}$
- 2)  $b^3 \cdot b^{-7} = \frac{1}{b^4}$   
 $b^{3+(-7)} = b^{-4}$
- 3)  $\frac{c^4}{c} = c^3$   
 $c^{4-1}$
- 4)  $d^{-2} = \frac{1}{d^2}$
- 5)  $\frac{f^5}{f^7} = \frac{1}{f^2}$   
 $f^{5-7} = f^{-2}$
- 6)  $3g^2 \cdot 7g = 21g^3$   
 $3 \cdot 7 \cdot g^{2+1}$
- 7)  $\frac{18h^5}{12h^2} = \frac{3h^3}{2}$   
 $\frac{3}{2} h^{5-2}$
- 8)  $\frac{3j^2k^5}{12j^4k^3} = \frac{k^2}{4j^2}$   
 $\frac{1}{4} j^{2-4} k^{5-3}$
- 9)  $(4m^2n^4)^3 = \frac{64m^6n^{12}}{64m^6n^{12}}$   
 $4^{1 \cdot 3} m^{2 \cdot 3} n^{4 \cdot 3}$   
 $64$
- 10)  $\frac{p^4}{p^{-2}} = p^6$   
 $p^{4-(-2)}$
- 11)  $\left(\frac{3q^5}{7r^2}\right)^{-2} = \frac{49r^4}{9q^{10}}$   
 $\left(\frac{7r^2}{3q^5}\right)^2 = \frac{49r^4}{9q^{10}}$
- 12)  $(-2s^3)^4 = 16s^{12}$   
 $(-2)^{1 \cdot 4} s^{3 \cdot 4}$
- 13)  $\left(\frac{5t^3u}{2}\right)^3 = \frac{125t^9u^3}{8}$   
 $\frac{5^{1 \cdot 3} t^{3 \cdot 3} u^{1 \cdot 3}}{2^{1 \cdot 3}}$
- 14)  $-(6v^3)^{-3} = \frac{1}{216v^9}$   
 $-\left(\frac{1}{6v^3}\right)^3 = -\frac{1^3}{6^3 v^{3 \cdot 3}}$
- 15)  $5w^3 \cdot 3w^{-4} = \frac{15}{w}$   
 $5 \cdot 3 w^{3+(-4)} = 15w^{-1}$
- 16)  $\frac{x^3yz^4}{xy^4z^2} = \frac{x^2z^2}{y^3}$   
 $x^{3-1} y^{1-4} z^{4-2}$   
 $x^2 y^{-3} z^2$