

# Exponent Properties

Recall  $a^3 = a \cdot a \cdot a$

$$a^5 = a \cdot a \cdot a \cdot a \cdot a$$

$$a^n = \underbrace{a \cdot a \cdot a \cdot \dots \cdot a}_{n \text{ times}}$$

$$a^m \cdot a^n = a^{m+n}$$

Product Property

$$3^6 \cdot 3^8 = 3^{6+8} = 3^{14}$$

$$\frac{a^m}{a^n} = a^{m-n}$$

Quotient Property

$$\frac{6^5}{6^3} = 6^{5-3} = 6^2$$

$$\frac{2^5}{2^7} = 2^{5-7} = 2^{-2} = \frac{1}{2^2}$$

$$(a^m)^n = a^{m \cdot n}$$

Power of Power

$$(5^6)^3 = 5^{6 \cdot 3} = 5^{18}$$

$$a^0 = 1$$

Zero Power

$$12^0 = 1$$

$$(-7)^0 = 1$$

$$\ominus \left(\frac{3}{19}\right)^0 = \ominus 1 \quad \left(\frac{3}{19}\right)^0 = 1$$

$$a^3 = a \cdot a \cdot a$$

$$a^2 = a \cdot a = \frac{a^3}{a^1}$$

$$a^1 = a = \frac{a^2}{a^1}$$

$$a^0 = \frac{a^1}{a^1} = \frac{a}{a} = 1$$

$$a^{-1} = \frac{1}{a}$$

$$a^{-n} = \frac{1}{a^n}$$

Negative Exponent

$$b^{-7} = \frac{1}{b^7}$$

$$c^{-12} = \frac{1}{c^{12}}$$

$$7c^{-12} = \frac{7}{1} \cdot \frac{1}{c^{12}}$$

$$*7c^{-12} \neq (7c)^{-12}$$

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

$$a^{-1} = \frac{a^0}{a} = \frac{1}{a}$$

$$a^{-2} = \frac{a^{-1}}{a} = \frac{\frac{1}{a}}{a}$$

$$= \frac{1}{a} \div \frac{a}{1}$$

$$= \frac{1}{a} \cdot \frac{1}{a}$$

"Keep Change Flip"

$$a^{-2} = \frac{1}{a^2}$$

\* multiply across

$$a^{-3} = \frac{a^{-2}}{a} = \frac{\frac{1}{a^2}}{a}$$

$$= \frac{1}{a^2} \div \frac{a}{1}$$

$$= \frac{1}{a^2} \cdot \frac{1}{a}$$

$$= \frac{1}{a^2 \cdot a}$$

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

$$\begin{aligned}
 -(5b)^{-2} &= -\frac{1}{(5b)^2} \\
 &= -\frac{1}{5^2 b^2} \\
 &= -\frac{1}{25b^2}
 \end{aligned}$$

$$(ab)^n = a^n \cdot b^n$$

Power of Product

$$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$$

Power of Quotient

$$6^2 = 36$$

$$6^2 = (3 \cdot 2)^2$$

$$= (3 \cdot 2)(3 \cdot 2)$$

$$= 3 \cdot 2 \cdot 3 \cdot 2$$

$$= 3 \cdot 3 \cdot 2 \cdot 2$$

$$(3 \cdot 2)^2 = 3^2 \cdot 2^2$$

$$6^2 = 36$$

$$(1 \cdot 6)^2 = 1^2 \cdot 6^2$$

$$= 1 \cdot 6^2$$

$$6^2 = 6^2 \checkmark$$

$$(4ac^2)^3 = 4^3 a^3 c^{2 \cdot 3}$$
$$= 64a^3c^6$$

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$$\left(\frac{2m}{n^4}\right)^5 = \frac{2^5 m^5}{(n^4)^5}$$
$$= \frac{32m^5}{n^{20}}$$

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$$\left(\frac{a}{b}\right)^{-1} = \frac{a^{-1}}{b^{-1}}$$

$$= a^{-1} \div b^{-1}$$

$$= \frac{1}{a} \div \frac{1}{b}$$

$$= \frac{1}{a} \cdot \frac{b}{1}$$

$$\left(\frac{a}{b}\right)^{-1} = \frac{b}{a}$$

Fraction to  $-1$  power  
→ reciprocal