

### 8.3: Define & Use Zero and Negative Exponents

$$a^0 = 1$$

ex.  $1, 236^0 = 1$

$$-3^0 = 1$$

$$-(3^0) = -1$$

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

$$\text{ex. } 2^{-1} = \frac{1}{2}$$

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

$$\text{ex. } \frac{1}{2^{-1}} = 2$$

$$a) 3^{-2} = \frac{1}{3^2} = \frac{1}{9}$$

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

$$c) \left(\frac{1}{5}\right)^{-2} = \frac{1^{-2}}{5^{-2}} = \frac{5^2}{1^2} = \frac{25}{1}$$

25

On Your Own:

①  $\left(\frac{2}{3}\right)^0$

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②  $(-8)^{-2} = \frac{1}{(-8)^2} = \frac{1}{64}$

③  $\frac{1}{2^{-3}}$

$2^3 = 8$

④  $(-1)^0$

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\* Negative exponents have NOTHINGs to do with the # being + or -

$$a^m \cdot a^n$$

 $=$ 

$$a^{m+n}$$

$$(a^m)^n$$

 $=$ 

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

$$(ab)^m$$

 $=$ 

$$a^m \cdot b^m$$

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

 $=$ 

$$a^{m-n}$$

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

 $=$ 

$$\frac{a^m}{b^m}$$

$$3^4 \cdot 3^2 = 3^6$$

$$(a^2)^{10} = a^{20}$$

$$(4x)^3 = 4^3 x^3 = 64x^3$$

$$\frac{5^5}{5^3} = 5^2 = 25$$

$$\left(\frac{2}{x^3}\right)^2 = \frac{2^2}{x^6} = \frac{4}{x^6}$$

Rule: You can never have a  
negative exponent...  
if you do you need  
to move it and make  
it positive!!

examples

$$a) 6^{-4} \cdot 6^4 = 6^{-4+4} = 6^0 = 1$$

$$b) (4^{-2})^2 = 4^{-4} = \frac{1}{4^4} = \frac{1}{256}$$

$$c) \frac{1}{3^{-4}} = 3^4 = 81$$

$$d) \frac{5^{-1}}{5^2} = 5^{-1-2} = 5^{-3} = \frac{1}{5^3} = \frac{1}{125}$$

On your own

$$\textcircled{1} \frac{1}{4^3} \rightsquigarrow 4^3 = 64$$

$$\textcircled{2} (5^{-3})^{-1}$$
$$5^3 = 125$$

$$\textcircled{3} (-3)^5 \cdot (-3)^{-5}$$

$$(-3)^{5+(-5)}$$
$$=$$

$$(-3)^0 = 1$$

$$\textcircled{4} \frac{6^{-2}}{6^2}$$

$$6^{-4} \rightsquigarrow \frac{1}{6^4}$$

examples.

$$\bullet (2xy^{-5})^3 = 2^3 x^3 \boxed{y^{-15}}$$

$$\left( \frac{8x^3}{y^{15}} \right)$$

$$\bullet \frac{(2x)^{-2} y^5}{-4x^2 y^2} = \frac{2^{-2} x^{-2} y^5}{-4x^2 y^2} = \frac{2^{-2} x^{-4} y^3}{-4}$$

$$\frac{y^3}{2^2 x^4 (-4)} \Rightarrow \frac{y^3}{4(-4)x^4} = \frac{y^3}{-16x^4}$$

$$\text{a) } (3x^{-2}y^2)^3 = 3^3 x^{-6} y^6 = \frac{27y^6}{x^6}$$

$$\text{b) } \frac{4x^{-2}y^4}{8xy^6} = \frac{1x^{-3}y^{-2}}{2} = \frac{1}{2x^3y^2}$$