NEGATIVE (OR ZERO) EXPONENTS

LEARNING GOAL

1. I can evaluate expressions with **exponents** that are **negative** or **zero**

Exponential Rules

Product Rule

$$a^x \times a^y = a^{x+y}$$

$$a^2 \times a^3 = a^5$$

Quotient Rule

$$a^x \div a^y = a^{x-y}$$

$$a^7 \div a^3 = a^4$$

Power Rule

$$\left(a^x\right)^y = a^{xy}$$

$$\left(a^7\right)^2 = a^{14}$$

Negative Rule

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

$$a^{-4} = \frac{1}{a^4}$$

Zero Rule

$$a^0 = 1$$

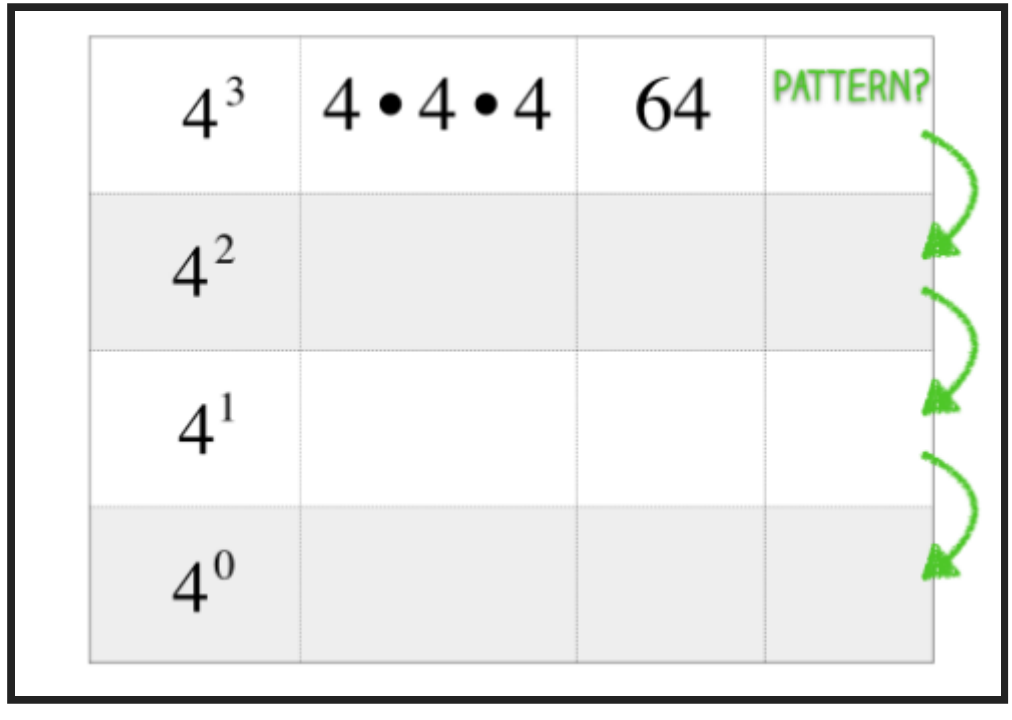
ESSENTIAL QUESTIONS

LEARNING GOAL

1. We know that a positive exponent tells us how many times to multiply.
2. What does a *negative* exponent mean?
3. What does an exponent of *zero* mean?

Fill in the table

What do you notice?



Fill in the table

What do you notice?

2^3	$2 \cdot 2 \cdot 2$	8	PATTERN?
2^2			
2^1			
2^0			

Fill in the table

What do you notice?

4^3	$4 \cdot 4 \cdot 4$	64	PATTERN?
4^2			
4^1			
4^0			
4^{-1}			
4^{-2}			

Fill in the table

What do you notice?

2^3	$2 \cdot 2 \cdot 2$	8	PATTERN?
2^2			
2^1			
2^0			
2^{-1}			
2^{-2}			

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Negative and Zero Exponent Worksheet

Simplify. Express your answers in fraction form using only positive exponents

1. 2^{-4}	**2.** 4^{-2}	**3.** x^{-6}
4. $3z^{-2}$	**5.** $\frac{1}{3^{-2}}$	**6.** 5^{0}
7. $2^{-5} \cdot 2^{3}$ $\frac{1}{2^5} \cdot 2^3$ $= \frac{2^3}{2^5} = \boxed{\frac{1}{2^2}}$ or $\boxed{\frac{1}{4}}$	**8.** $x^{3} \cdot x^{-7}$ $x^3 \cdot \frac{1}{x^7} = \frac{x^3}{x^7}$ $= \boxed{\frac{1}{x^4}}$	**9.** $\frac{3^3}{3^5}$ $= \boxed{\frac{1}{3^2}}$ or $\boxed{\frac{1}{9}}$
10. $\frac{x^4}{x^{-6}}$ $x^4 \cdot x^6$ $\boxed{x^{10}}$	**11.** x^{0} 1	**12.** 1001^{-1} $\frac{1}{1001}$

NAME:

The following statements are all INCORRECT.

1. Identify the mistake.
2. Correct.
3. Justify (show) your reasoning.

a) $2^5 = 10$

b) $(-2)^3 = 8$

c) $-6^2 = 36$

d) $\frac{x^2}{x^2} = 0$

e) $x^3 \bullet x^4 = x^{12}$

f) $\frac{x^{10}}{x^5} = x^2$

g) $\frac{x^5}{x^2} = \frac{1}{x^3}$

h) $7^{-2} = -49$

i) $(-3)^4 = -81$

j) $\frac{x^5}{x^9} = x^4$