

EXONENTS

TODAY WE WILL...

Learn the negative & "0" exponent properties

SO WE CAN...

Evaluate expressions w/ negative and zero exponents

10.4: ZERO EXPONENTS

For any nonzero number "a", $a^0 = 1$.

The power 0^0 is undefined.

ex:

$$4^0 = 1$$

NEGATIVE EXPONENTS

For any integer n and any nonzero number

a , a^{-n} is the reciprocal of a^n .

ex:

$$4^{-2} = \frac{1}{4^2} = \frac{1}{16}$$

FOUNDATION

Find the reciprocal of the following rational numbers:

$$\frac{2}{3} \downarrow \frac{3}{2}$$

$$4 \downarrow \frac{1}{4}$$

$$-\frac{1}{5} \downarrow \frac{-5}{1}$$

EXAMPLE 1: Evaluate the expression.

A. $3^{-4} = \frac{1}{3^4} = \frac{1}{3 \cdot 3 \cdot 3 \cdot 3} = \frac{1}{81}$

B. $(-8.5)^{-4} \cdot (-8.5)^4 =$ Add exp! $(-8.5)^{-4+4} = (-8.5)^0 = \boxed{1}$

C. $\frac{2^6}{2^8} = 2^{6-8} = 2^{-2} = \frac{1}{2^2} = \boxed{\frac{1}{4}}$

D. $(-2)^{-5} = \frac{1}{(-2)^5} = \frac{1}{(-2)(-2)(-2)(-2)(-2)} = \frac{1}{-32} = \boxed{-\frac{1}{32}}$

$$E. \frac{1}{5^7} \cdot \frac{1}{5^{-4}} = \frac{1}{5^{7+(-4)}} = \frac{1}{5^3} = \frac{1}{5 \cdot 5 \cdot 5} = \boxed{\frac{1}{125}}$$

$$F. \frac{4^5 \cdot 4^{-3}}{4^2} = \frac{4^{5+(-3)}}{4^2} = \frac{4^2}{4^2} = 4^{2-2} = 4^0 = \boxed{1}$$

Quick Check! Explain what you should do when you are given a negative exponent.

Write the reciprocal and get rid of the negative exponent.

EXAMPLE 2: Simplify the expression.

$$A. -5x^0 = -5 \cdot 1 = \boxed{-5}$$

$$B. 8x^{-2} = 8 \cdot \frac{1}{x^2} = \boxed{\frac{8}{x^2}}$$

$$C. b^0 \cdot b^{-10} = 1 \cdot b^{-10} = \boxed{\frac{1}{b^{10}}}$$

$$D. \frac{9y^{-3}}{y^5} = \frac{9 \cdot y^{-3}}{y^5} = 9 \cdot y^{-3-5} = 9y^{-8} = \boxed{\frac{9}{y^8}}$$

$$E. \frac{z^6}{15z^9} = \frac{z^{6-9}}{15} = \frac{z^{-3}}{15} = \boxed{\frac{1}{15z^3}}$$