Math 8

<u>Our Goal</u>: To learn about zero and negative exponents

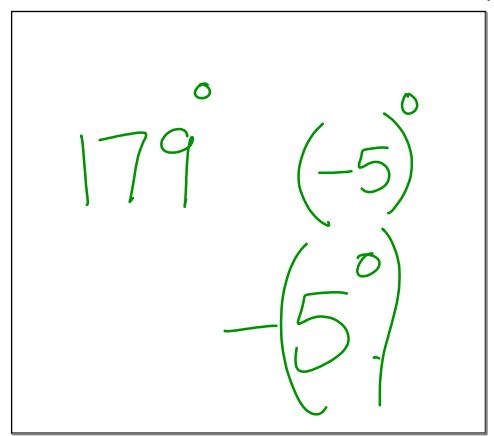<u>Warm Up</u>: Exponent review

<u>Today's Homework</u>
10.4 Exercises, p.432: 5-27

<u>Previous Homework</u>
~~10.3 Exercises, p.426: 1-21~~

you know what I mean, Kaitlyn

$$1 \cdot 8^4$$

$$1 \cdot 8^1$$

$$8^0 = 1$$

$179°$

$(-5)°$

$-(5)°$

Simplify the expression. Write your answer as a power.

1. $\dfrac{5^4 \cdot 5^2}{5^3}$ S^3

2. $\dfrac{2^{11} \cdot 2^5}{2^{13}}$ 2^3

3. $\dfrac{4^5 \cdot 4^3}{4^2}$ 4^6

4. $\dfrac{a^{13} \cdot a^{11}}{a^{12}}$ a^{12}

5. $\dfrac{c^9 \cdot c^5}{c^{10}}$ c^4

6. $\dfrac{n^7 \cdot n^{14}}{n^{11}}$ n^{10}

Essential Question

How can you evaluate a nonzero number with an exponent of zero? How can you evaluate a nonzero number with a negative integer exponent?

$$10^0 = 1 \qquad (-8)^0 = 1$$

$$\left(\frac{2}{3}\right)^0 = 1 \qquad -(7)^0 = -1$$

Work with a partner.

a. Copy and complete the table.

Quotient	Quotient of Powers Property	Power
$\dfrac{5^3}{5^3}$		
$\dfrac{6^2}{6^2}$		
$\dfrac{(-3)^4}{(-3)^4}$		
$\dfrac{(-4)^5}{(-4)^5}$		

b. REPEATED REASONING Evaluate each expression in the first column of the table. What do you notice?

c. How can you use these results to define a^0 where $a \neq 0$?

🔑 Key Ideas

Zero Exponents

Words For any nonzero number a, $a^0 = 1$. The power 0^0 is *undefined*.

Numbers $4^0 = 1$ **Algebra** $a^0 = 1$, where $a \neq 0$

Negative Exponents

Words For any integer n and any nonzero number a, a^{-n} is the reciprocal of a^n.

Numbers $4^{-2} = \dfrac{1}{4^2}$ **Algebra** $a^{-n} = \dfrac{1}{a^n}$, where $a \neq 0$

Evaluate the expression.

1. $\dfrac{3^6}{3^6} = 1$

2. $7^0 \cdot 7^2$ 7^2

3. $\dfrac{-2^6}{-2^6} + 1$

4. $5^3 \cdot 5^{-3}$ 1

5. $9^0 \cdot 9^3$ 9^3

6. $(-3)^3 \cdot (-3)^3$ $(-3)^6$

a. 3^{-4}

b. $(-8.5)^{-4} \cdot (-8.5)^{4}$

c. $\dfrac{2^6}{2^8}$

Evaluate the expression.

1. 4^{-2}

$\dfrac{1}{16}$

2. $(-2)^{-5}$

$\dfrac{1}{-2^5} = \dfrac{1}{-32}$

3. $6^{-8} \cdot 6^{8}$

1

4. $\dfrac{(-3)^5}{(-3)^6}$

$\dfrac{-3}{-3} = \dfrac{1}{-3}$

5. $\dfrac{1}{5^7} \cdot \dfrac{1}{5^{-4}}$

$\dfrac{1 \cdot 1}{5^7 \cdot 5^{-4}} = \dfrac{1}{125}$

6. $\dfrac{4^5 \cdot 4^{-3}}{4^2}$

1

a. $-5x^0$

b. $\dfrac{9y^{-3}}{y^5}$

$$\frac{2^3}{2^4} = 2^{3-4} = 2^{-1}$$

same thing

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

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

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

Simplify. Write the expression using only positive exponents.

7. $8x^{-2}$

$\dfrac{8}{x^2}$

8. $b^0 \cdot b^{-10}$

9. $\dfrac{z^6}{15z^9}$

$\dfrac{z^{-3}}{15}$

$\boxed{\dfrac{1}{15z^3}}$

A drop of water leaks from a faucet every second. How many liters of water leak from the faucet in 1 hour?

Drop of water: 50^{-2} liter

Exit Ticket: Simplify.

1. $4x^{-3}$

$\dfrac{4}{x^3}$

4^{-1}

$\boxed{\dfrac{1}{4^1}}$

2. $\dfrac{6^3}{6^5}$

6^{-2}

$\dfrac{1}{6^2} = \dfrac{1}{36}$

3. $\dfrac{4n^0}{n^2 \cdot 2}$

$\dfrac{4}{n^2}$