

Lesson 1.5 Zero as an Exponent (Day 1)

Objective

- *Understand zero and negative exponents
- *Simplify expressions involving zero and negative exponents

- **Common Core State Standards** *8.EE.1*
- **Mathematical Practices** 4. Model mathematics. 5. Use tools strategically. 6. Attend to precision.

Lesson 1.5 Zero as an Exponent (Day 1)

Expand each exponential expressions and write what you notice

$$10^5 =$$

$$10^4 =$$

$$10^3 =$$

$$10^2 =$$

$$10^1 =$$

Lesson 1.5 Zero as an Exponent (Day 1)

Expand each exponential expressions and write what you notice

$$10^5 = 100,000$$

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Lesson 1.5 Zero as an Exponent (Day 1)

After noticing a pattern with exponents, what do you think 10 to the zero power will be? Think-Pair-Share

$$10^5 = 100,000$$

$$10^4 = 10,000$$

$$10^3 = 1,000$$

$$10^2 = 100$$

$$10^1 = 10$$

$$10^0 = \star$$

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$$10^2 = 100$$

$$10^1 = 10$$

$$10^0 = 1$$

Lesson 1.5 Zero as an Exponent (Day 1)

Zero as an Exponent

A nonzero number raised to the zero power is equal to 1.

$$a^0 = 1, a \neq 0$$

You have seen that when a number such as 4 is raised to the zero power, its value is 1.

In fact, any number except 0 raised to the zero power is equal to 1.

Lesson 1.5 Zero as Exponent (Day 1)

Simplify each expression. Write your answer in exponential notation.

Example 22

a) $7^3 \cdot 7^0$

b) $1 \cdot 10^2 + 2 \cdot 10^1 + 3 \cdot 10^0$

Lesson 1.5 Zero as Exponent (Day 1)

Simplify each expression. Write your answer in exponential notation.

Example 22

a) $7^3 \cdot 7^0$

b) $1 \cdot 10^2 + 2 \cdot 10^1 + 3 \cdot 10^0$

Solution

$$\begin{aligned} 7^3 \cdot 7^0 &= 7^3 \cdot 1 && \text{Raise to the zero power.} \\ &= 7^3 && \text{Simplify.} \\ &= 343 && \text{Evaluate.} \end{aligned}$$

Solution

$$\begin{aligned} 1 \cdot 10^2 + 2 \cdot 10^1 + 3 \cdot 10^0 &= 1 \cdot 100 + 2 \cdot 10 + 3 \cdot 1 \\ &= 123 \end{aligned}$$

Lesson 1.5 Zero as an Exponent (Day 1)

Simplify each expression. Write your answer in exponential notation. _____

c)
$$\frac{4^2 \cdot 4^4}{4^8}$$

Lesson 1.5 Zero as an Exponent (Day 1)

Simplify each expression. Write your answer in exponential notation.

c) $\frac{4^2 \cdot 4^6}{4^8}$

Solution

$$\frac{4^2 \cdot 4^6}{4^8} = \frac{4^{2+6}}{4^8}$$

$$= \frac{4^8}{4^8}$$

$$= 4^{8-8}$$

$$= 4^0$$

$$= 1$$

Use the product of powers property.

Simplify.

Use the quotient of powers property.

Simplify.

Evaluate.

Lesson 1.5 Zero as an Exponent (Day 1)

Simplify each expression. Write your answer in exponential notation. _____

d) $(a^4 \div a^0) \cdot a^3$ _____

Lesson 1.5 Zero as an Exponent (Day 1)

Simplify each expression. Write your answer in exponential notation.

d) $(a^4 \div a^0) \cdot a^3$

Solution

$$\begin{aligned}(a^4 \div a^0) \cdot a^3 &= a^4 \div 1 \cdot a^3 \\ &= a^4 \cdot a^3 \\ &= a^{4+3} \\ &= a^7\end{aligned}$$

Raise to the zero power.

Simplify.

Use the product of powers property.

Simplify.

Lesson 1.5 Zero as an Exponent (Day 1)

Your Turn

1 $1.6^0 \div 0.4^2$

2 $\frac{3 \cdot 3^9}{3^{10}}$

Lesson 1.5 Zero as an Exponent (Day 1)

Your Turn

1 $1.6^0 \div 0.4^2$

$$1.6^0 \div 0.4^2 = \frac{?}{?} \div \frac{?}{?} \quad 1; 0.4^2$$

Raise to the ? power. **zero**

$$= \frac{?}{?} \frac{1}{0.4^2}$$

Simplify.

$$= \frac{?}{?} 6.25$$

Evaluate.

2 $\frac{3 \cdot 3^9}{3^{10}}$

$$\frac{3 \cdot 3^9}{3^{10}} = \frac{?}{?} \frac{3^{1+9}}{3^{10}}$$
$$= \frac{?}{?}$$
$$= \frac{?}{?} 3^{10-10}$$
$$= \frac{?}{?} 3^0$$
$$= \frac{?}{?} 1$$

Lesson 1.5 Zero as an Exponent (Day 1)

Your Turn

3 $\frac{t^0 \cdot t^7}{t^5}$

Lesson 1.5 Zero as an Exponent (Day 1)

Your Turn

3 $\frac{t^0 \cdot t^7}{t^5}$

t^2

Lesson 1.5 Zero as an Exponent

Independent Practice #1-8 & 15

Practice 1.5

Simplify each expression and evaluate.

1 $8^3 \cdot 8^0$

3 $\left(\frac{1}{3}\right)^4 \cdot \left(\frac{1}{3}\right)^0$

5 $(2.3) \cdot 10^2 + 5 \cdot 10^1 + 1 \cdot 10^0$

7 $(9^{-3})^0 \cdot 5^2$

15 $1.2^0 \div 1.8^2$

2 $5^4 \cdot (-5)^0$

4 $7 \cdot 10^3 + 4^2 \cdot 10^2 + 5 \cdot 10^0$

6 $\frac{7^4 \cdot 7^5}{7^9}$

8 $\frac{(6^{-3})^{-2} \cdot 8^6}{48^6}$

Homework #1-8

Name: _____

Period _____

Tuesday Homework

Lesson 1.5 #1-8

Lesson 1.5 Zero and Negative Exponents

Simplify each expression and evaluate.

1. $9^4 \cdot 9^0$

2. $11^3 \cdot (-11)^0$

3. $\left(\frac{6}{7}\right)^8 \cdot \left(\frac{6}{7}\right)^0$

4. $9^2 \cdot 10^3 + 5^3 \cdot 10^2 + 2^6 \cdot 10^0$

5. $4.7 \cdot 10^3 + 6 \cdot 10^2 + 7 \cdot 10^0$

6. $\frac{5^3 \cdot 5^7}{5^{10}}$



Lesson Check #1 and 8 (can simplify expressions containing numbers raised to the power of zero)