Hyperbole: Analyze & Complete

hyperbole — **an exaggeration that cannot possibly be true**

When we went ice fishing, it was a million degrees below zero!

Directions: Read each statement. On the line, write *yes* if the statement is a hyperbole and *no* if the statement is not a hyperbole. Remember, a hyperbole cannot possibly be true.

_____ 1. In science class this morning, I was dying of boredom.

_____ 2. Dad won like a thousand dollars at the casino last night.

_____ 3. When Mom was pregnant for my little brother, she was bigger than a whale.

_____ 4. Mrs. Baker's new white tennis shoes were brighter than the sun.

_____ 5. With her new shoes, she is faster than the speed of light.

_____ 6. Molly couldn't go to the party because she had a ton of homework to do.

_____ 7. That last day of school stretches on for hours.

_____ 8. I am not going outside in that 100 degree weather!

_____ 9. Mark has a brain the size of a peanut.

_____ 10. I'm so hungry, I could eat 2 steaks right now!

Directions: Finish each statement to make a hyperbole.

11. Dad snores so loud! He _____.

12. After a week of summer camp, I was so tired _____.

13. His car is so old, _____.

14. Bob is taller than _____.

15. The meatloaf in the school cafeteria is _____.

Lesson 1

Powers and Exponents

Vocabulary Start-Up

A product of like factors can be written in exponential form using an exponent and a base. The **base** is the number used as a factor. The **exponent** tells how many times a base is used as a factor.

1. Fill in the boxes with the words *factors*, *exponent*, and *base*.

$10 \times 10 = 10^2$

2. Give an example of an exponent.

_____

3. Write the definition of exponent in your own words.

_____

_____

Essential Question

HOW is it helpful to write numbers in different ways?

Vocabulary

base
exponent
powers
perfect square

Common Core State Standards

Content Standards
6.EE.1, 6.NS.3

Mathematical Practices
1, 3, 4, 6, 8

Real-World Link

MP3 players come in different storage sizes, such as 2GB, 4GB, or 16GB, where GB means gigabyte. One gigabyte is equal to $10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10$ bytes.

What is this number written with exponents? ☐

Which Mathematical Practices did you use? Shade the circle(s) that applies.

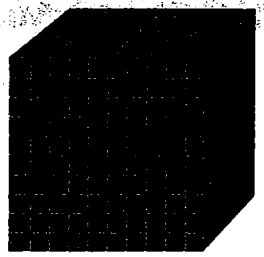
① Persevere with Problems
② Reason Abstractly
③ Construct an Argument
④ Model with Mathematics
⑤ Use Math Tools
⑥ Attend to Precision
⑦ Make Use of Structure
⑧ Use Repeated Reasoning

Work Zone

Write Products as Powers

Numbers expressed using exponents are called **powers**. For example, 100 is a power of 10 because it can be written as 10^2. Numbers like 100 are **perfect squares** because they are the squares of whole numbers.

$10 \times 10 = 100$
$10^2 = 100$



$10 \times 10 \times 10 = 1{,}000$
$10^3 = 1{,}000$

Perfect cubes are numbers with three identical whole number factors such as $4 \times 4 \times 4 = 64$. So, the number 64 is a perfect cube.

Examples

Tutor

1. **Write $6 \times 6 \times 6 \times 6$ using an exponent.**

$6 \times 6 \times 6 \times 6 = 6^4$ 6 is used as a factor four times.

2. **Write $4 \times 4 \times 4$ using an exponent.**

The factor ☐ is the base.

The factor is multiplied ☐ times.

The exponent is ☐.

So, $4 \times 4 \times 4$ can be written as _____.

Show your work

Got It? **Do these problems to find out.**

Write each product using an exponent.

a. $7 \times 7 \times 7 \times 7$

b. $9 \times 9 \times 9 \times 9 \times 9 \times 9 \times 9$

a. _____

b. _____

Write Powers as Products

To write powers as products, determine the base and the exponent. The base of 10^2 is 10 and the exponent is 2. To read powers, consider the exponent. The power 10^2 is read as *ten squared* and 10^3 is read as *ten cubed*.

Examples

Tutor

3. **Write 5^2 as a product of the same factor. Then find the value.**

The base is 5. The exponent is 2. So, 5 is used as a factor two times.

$5^2 = 5 \times 5$ Write 5^2 as a product.

$= 25$ Multiply 5 by itself.

4. **Write 1.5^3 as a product of the same factor. Then find the value.**

The base is 1.5. The exponent is 3. So, 1.5 is used as a factor three times.

$1.5^3 = 1.5 \times 1.5 \times 1.5$ Write 1.5^3 as a product.

$= 3.375$ Multiply.

5. **Write $\left(\frac{1}{2}\right)^3$ as a product of the same factor. Then find the value.**

The base is $\frac{1}{2}$. The exponent is 3. So $\frac{1}{2}$ is used as a factor three times.

$\left(\frac{1}{2}\right)^3 = \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}$ Write $\left(\frac{1}{2}\right)^3$ as a product.

$= \frac{1}{8}$ Multiply.

Notation

In Example 5, the fraction $\frac{1}{2}$ is set in parentheses to note that the entire fraction is the base.

$\left(\frac{1}{2}\right)^3 = \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{8}$

Without the parentheses, it is understood that the base is only the numerator of the fraction.

$\frac{1^3}{2} = \frac{1 \times 1 \times 1}{2} = \frac{1}{2}$

Show your work.

Got It? **Do these problems to find out.**

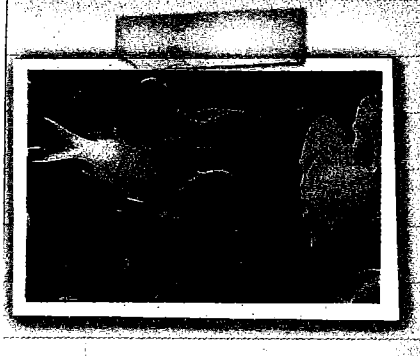
Write each power as a product of the same factor. Then find the value.

c. 10^5 **d.** 2.1^2 **e.** $\left(\frac{1}{4}\right)^2$

c. _____

d. _____

e. _____



Real World Example

Tutor

6. STEM **The zoo has an aquarium that holds around 7^4 gallons of water. About how many gallons of water does the aquarium hold?**

$7^4 = 7 \times 7 \times 7 \times 7$ Write 7^4 as a product.

$= 2{,}401$ Multiply.

So, the aquarium holds about 2,401 gallons of water.

Got It? **Do this problem to find out.**

Show your work.

f. STEM Michigan has more than 10^4 inland lakes. Find the value of 10^4.

Guided Practice

Check

Write each product using an exponent. (Examples 1 and 2)

1. $8 \times 8 \times 8 =$ _____

2. $1 \times 1 \times 1 \times 1 \times 1 =$ _____

Show your work.

Write each power as a product of the same factor. Then find the value. (Examples 3–5)

3. $\left(\frac{1}{7}\right)^3 =$ _____

4. $2^5 =$ _____

5. $1.4^2 =$ _____

6. Coal mines have shafts that can be as much as 7^3 feet deep. About how many feet deep into Earth's crust are these shafts? (Example 6)

_____

_____

7. **Building on the Essential Question** How is using exponents helpful? _____

_____

_____

_____

Rate Yourself!

How confident are you about powers and exponents? Shade the ring on the target.

For more help, go online to access a Personal Tutor.

Tutor

Name _____ My Homework _____

Independent Practice

Go online for Step-by-Step Solutions eHelp

Write each product using an exponent. (Examples 1 and 2)

1. $6 \times 6 =$

_____

Show your work.

2. $1 \times 1 \times 1 =$

_____

3. $5 \times 5 \times 5 \times 5 \times 5 \times 5 =$

_____

4. $12 \times 12 =$

_____

5 $27 \times 27 \times 27 \times 27 =$

_____

6. $15 \times 15 \times 15 =$

_____

Write each power as a product of the same factor. Then find the value. (Examples 3–5)

7 $6^4 =$

_____

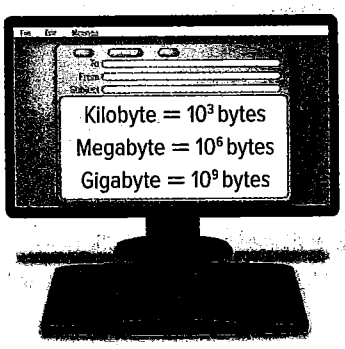
8. $0.5^3 =$

_____

9 $\left(\frac{1}{8}\right)^2 =$

_____

10. MP **Identify Repeated Reasoning** A byte is a basic unit of measurement for information storage involving computers. (Example 6)



a. A kilobyte is equal to 10^3 bytes. Write 10^3 as a product of the same factor. Then find the value.

_____

_____

b. A megabyte is equal to 10^6 bytes. Write 10^6 as a product of the same factor. Then find the value.

_____

_____

c. How many more bytes of information are in a gigabyte than a megabyte? _____

_____

Find the value of each expression.

11. $0.5^4 + 1 =$ _____

12. $3.2^3 \times 10 =$ _____

13. $10.3^3 + 8 =$ _____

H.O.T. Problems Higher Order Thinking

14. **Model with Mathematics** Write a power whose value is greater than 1,000. _____

15. **Persevere with Problems** Use the table to solve.

Powers of 2	Powers of 4	Powers of 10
$2^4 = 16$	$4^4 = 256$	$10^4 = 10{,}000$
$2^3 = 8$	$4^3 = 64$	$10^3 = 1{,}000$
$2^2 = 4$	$4^2 = 16$	$10^2 = 100$
$2^1 =$	$4^1 =$	$10^1 =$
$2^0 =$	$4^0 =$	$10^0 =$

a. Describe the pattern for the powers of 2.

Write the values of 2^1 and 2^0 in the table.

_____

_____

b. Describe the pattern for the powers of 4.

Write the values of 4^1 and 4^0 in the table. _____

_____

c. Describe the pattern for the powers of 10. Write the values of 10^1 and 10^0 in the table. _____

_____

d. Write a rule for finding the value of any base with an exponent of 0.

_____

16. **Be Precise** Multiplication is defined as repeated addition. Use the word repeated to define exponential form. Justify your reasoning.

_____

_____

_____

17. **Reason Inductively** Suppose the population of the United States is about 230 million. Is this number closer to 10^7 or 10^8? Explain your reasoning.

_____

_____

_____