

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. $10 \times 10 \times 10 \times 10 \times 10$
10; 100,000

d. 2.1×2.1 ; **4.41**

e. $\frac{1}{4} \times \frac{1}{4}$; **$\frac{1}{16}$**

Guided Practice

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

1. $8 \times 8 \times 8 = 8^3$

2. $1 \times 1 \times 1 \times 1 \times 1 = 1^5$

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


3. $\left(\frac{1}{7}\right)^3 = \frac{1}{7} \times \frac{1}{7} \times \frac{1}{7} = \frac{1}{343}$

4. $2^5 = 2 \times 2 \times 2 \times 2 \times 2$; **32**

5. $1.4^2 = 1.4 \times 1.4$; **1.96**

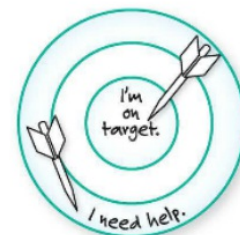
6. Coal mines have shafts that can be as much as 7^3 feet deep. About how many feet deep into Earth's crust are these shafts? (Example 6)

about 343 feet

7.  **Building on the Essential Question** How is using exponents helpful? **Sample answer: A product of like factors can be written in a simpler, shorter format using exponents. For example $9 \times 9 \times 9 \times 9 \times 9 \times 9 \times 9 \times 9$ can be written as 9^8 .**

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.



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

1. $6 \times 6 =$

6^2

Show your work.

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

1^3

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

5^6

4. $12 \times 12 =$

12^2

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

27^4

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

15^3

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

7. $6^4 =$

$6 \times 6 \times 6 \times 6; 1,296$

8. $0.5^3 =$

$0.5 \times 0.5 \times 0.5; 0.125$

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

$\frac{1}{8} \times \frac{1}{8} = \frac{1}{64}$

10. **CCSS 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.

$10 \times 10 \times 10$; 1,000

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

$10 \times 10 \times 10 \times 10 \times 10 \times 10$; 1,000,000

c. How many more bytes of information are in a gigabyte than a megabyte? 999,000,000 bytes



Find the value of each expression.


 $0.5^4 + 1 = \underline{1.0625}$

12. $3.2^3 \times 10 = \underline{327.68}$

13. $10.3^3 + 8 = \underline{1,100.727}$



H.O.T. Problems Higher Order Thinking

14.  **Model with Mathematics** Write a power whose value is greater than 1,000. Sample answer: 50^2

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

- a. Describe the pattern for the powers of 2.

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

The next values are found by dividing the previous power by 2.

- b. Describe the pattern for the powers of 4.

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



b. Describe the pattern for the powers of 4.

Write the values of 4^1 and 4^0 in the table. **The next**


values are found by dividing the previous power by 4.

c. Describe the pattern for the powers of 10. Write the values of 10^1 and 10^0 in the table. **The next values are found by dividing the previous**

power by 10.


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

Any nonzero number with an exponent of 0 has a value of 1.

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

Sample answer: Exponential form is a short way to write repeated

multiplication of a common factor such as $5 \times 5 \times 5 \times 5 = 5^4$.

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.

10^8 ; Sample answer: $10^7 = 10,000,000$ and $10^8 = 100,000,000$.

$100,000,000$ is much closer to $230,000,000$ than $10,000,000$.