LESSON 1.2

Powers *and* Exponents

BEFORE | *Now* | WHY?

You multiplied whole numbers and decimals. | You'll use powers to describe repeated multiplication. | So you can find the total number of e-mails sent, as in Ex. 29.

Vocabulary

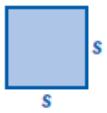
power, p. 10
base, p. 10
exponent, p. 10

A **power** is the result of a repeated multiplication of the same factor. For example, the number 125 is a power because $125 = 5 \cdot 5 \cdot 5$. A power can be written in a form that has two parts: a number called the **base** and a number called the **exponent**. The exponent shows the number of times the base is used as a factor.

The table shows how to read and write powers. Numbers raised to the first power, such as 12^1, are usually written without the exponent.

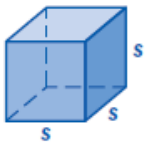
Power	In words	Value
12^1	12 to the first power	$12^1 = 12$
$(0.5)^2$	0.5 to the second power, or 0.5 squared	$(0.5)(0.5) = 0.25$
4^3	4 to the third power, or 4 cubed	$4 \cdot 4 \cdot 4 = 64$
8^4	8 to the fourth power	$8 \cdot 8 \cdot 8 \cdot 8 = 4096$

Using Formulas A formula describes a relationship between quantities. Some formulas involve powers. For example, you can use a formula to find the area of a square or the volume of a cube.



Area A of a square

$A = s^2$



Volume V of a cube

$V = s^3$

Area is measured in square units, such as square feet (ft^2) or square centimeters (cm^2). Volume is measured in cubic units, such as cubic inches ($in.^3$) or cubic meters (m^3).

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Name _____ Date _____

Practice A

For use with pages 10–13

Write the product using an exponent.

1. $16 \cdot 16 \cdot 16$
2. $18 \cdot 18 \cdot 18 \cdot 18 \cdot 18$
3. $(0.4)(0.4)(0.4)(0.4)$
4. $(1.2)(1.2)$
5. $c \cdot c \cdot c \cdot c \cdot c \cdot c \cdot c$
6. $n \cdot n \cdot n \cdot n \cdot n \cdot n \cdot n \cdot n$

18^5

1.2^2

n^8

Evaluate the expression when $x = 4$ and $y = 0.8$.

7. x^3 **8.** x^4 **9.** x^6

10. y^1 **11.** y^4 **12.** y^2

.8

.8

4 4

4 · 4 · 4 · 4

256

.8²

.8 · .8

.64

Write the power in words and as a repeated multiplication. Then evaluate the power.

13. 19^2 **14.** 20^3 **15.** 0.7^3 **16.** 2.4^2

20 to the 3rd power

or 20 cubed

20·20·20

8000

17. 3.2^3 **18.** 0.6^4 **19.** 11^4 **20.** 9^5

$.6^4$

.6 to the 4th power

$.6 \cdot .6 \cdot .6 \cdot .6$

$.1296$

Evaluate the expression when $m = 10$ and $n = 0.12$.

21. m^4 **22.** m^5 **23.** m^6

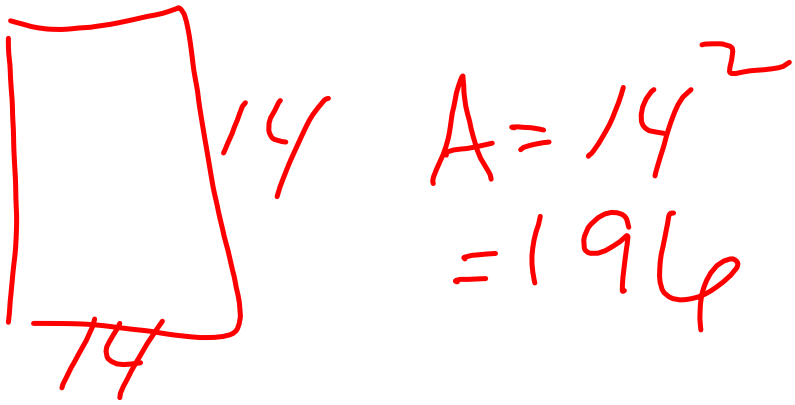
24. n^2 **25.** n^3 **26.** n^1

10^5 $.12^1$

$100{,}000$ $.12$

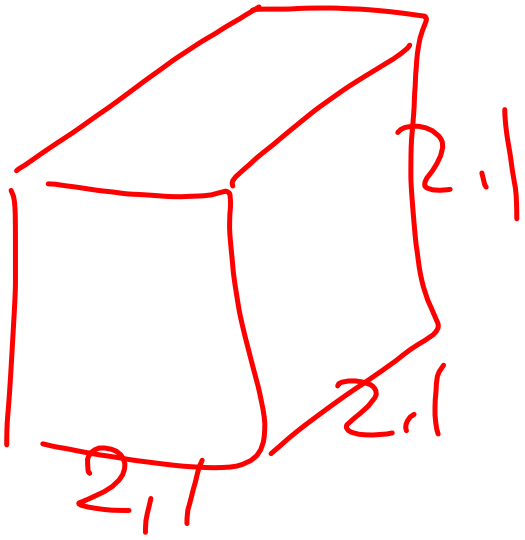
27. Find the area of a square with side length 14 meters.

28. Find the area of a square with side length 2.5 feet.



29. Find the volume of a cube with edge length 2.1 inches.

30. Find the volume of a cube with edge length 6 centimeters.



$V = s^3$

$= 2.1^3$

$= 9.261$

31. School has been cancelled for the next day. You call and tell 3 friends the news. Each of your 3 friends calls 3 of their friends. Complete the table. How many calls have been made after stage 8?

Stage	Calls made, as a power	Value of power
1	3^1	3
2	3^2	9
3	?	?
4	?	?

8 3^8 6561