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**

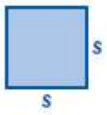
power, p. 10
base, p. 10
exponent, p. 10

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.

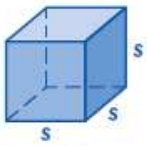
| Power | In words | Value |
|---|---|---|
| $12^1$ | 12 to the first power | $12^1 = 12$ |
| $(0.5)^2$ | 0.5 to the second power, or 0.5 squared | $(0.5)(0.5) = 0.25$ |
| $4^3$ | 4 to the third power, or 4 cubed | $4 \cdot 4 \cdot 4 = 64$ |
| $8^4$ | 8 to the fourth power | $8 \cdot 8 \cdot 8 \cdot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

**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 ($m^3$).

LESSON 1.2

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

.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.** $m^6$

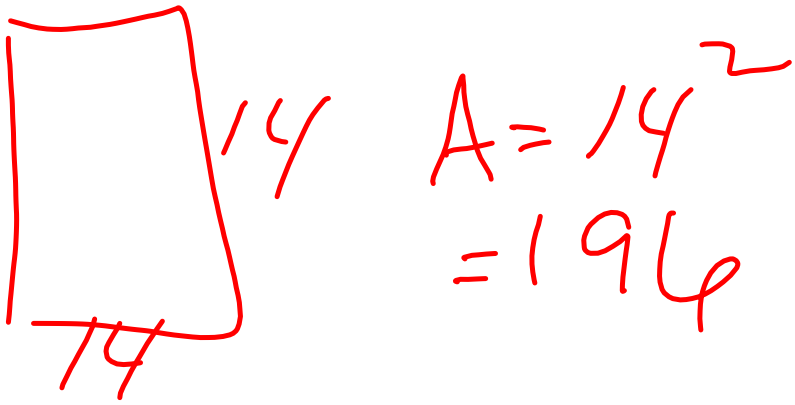
**24.** $n^2$ **25.** $n^3$ **26.** $n^1$

$10^5$ $.12^1$

$100{,}000$ $.12$

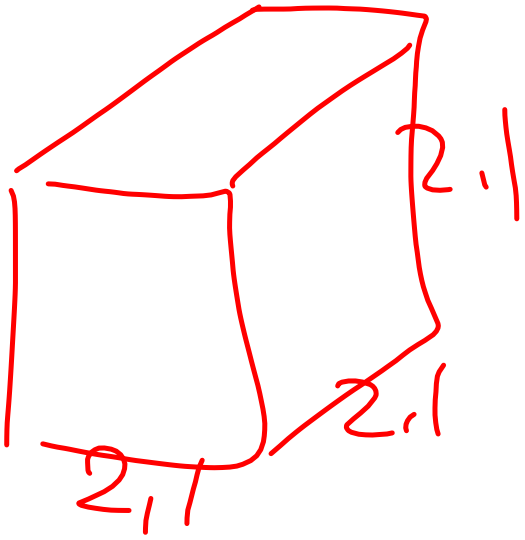
**27.** Find the area of a square with side length 14 meters.

**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