Name: _____ Date: _____

EXPONENTS
N-GEN MATH® 6

As we begin our study of **algebra** we first need to look at how to express **repeated multiplication** by a given number. First, let's review **repeated addition**.

***Exercise* #1:** Rewrite each of the following **expressions** using multiplication and then state the result.

(a) $2+2+2+2+2=$ (b) $3+3+3+3+3+3=$

Adding the same number again and again is common enough that we invented **multiplication** to give a way to represent it and to make it faster. We can do the same for repeated multiplication.

***Exercise* #2:** Consider the following multiplication problems. Rewrite them using an **exponent** (also called a **power**) and then evaluate them. Show the various steps that lead to the result.

(a) $2\times2\times2\times2=$ (b) $10\times10\times10\times10\times10=$

EXPONENTS (POWERS) AS REPEATED MULTIPLICATION

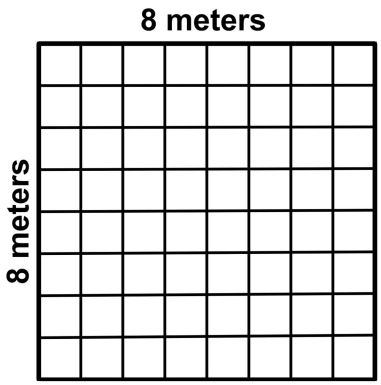
If a is any number that shows up in a product n-times then: $\underbrace{a\times a\times a\times\cdots a\times a}_{n\text{-times}}=a^n$

***Exercise* #3:** Rewrite each of the following expressions using multiplication and evaluate.

(a) 3^4 (b) 4^3 (c) 5^2

Two of the most important types of exponents are the **second power** and the **third power** of a number.

***Exercise* #4:** A square is shown below whose side length is 8 meters. The square has been subdivided into square meters.

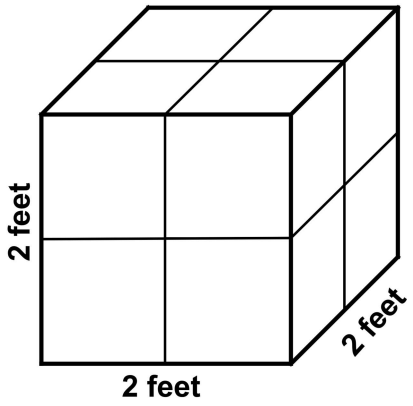


(a) What is the area of the 8 meter by 8 meter square, in square meters? (How many of those 1 by 1 squares fit inside it?)

(b) Write an expression for the area of this square, A, using an exponent.

Since **all squares** have **areas** that can be expressed as a number raised to the **second exponent**, we call raising a number to the second power **squaring the number**.

***Exercise* #5:** A cube is shown whose sides are each 2 feet long. Like the square in Exercise #4, the cube has been subdivided into cubic feet (cubes that are 1 foot by 1 foot by 1 foot).



(a) What is the volume of the 2 by 2 by 2 cube in cubic feet? (How many of the smaller cubes fit inside of it?)

(b) Write an expression for the volume of the cube, V, using an exponent.

Since **all cubes** have **volumes** that can be expressed as a number raised to the **third exponent**, we call raising a number to the third power **cubing the number**.

***Exercise* #6:** Rewrite each of the following using exponents and then evaluate.

(a) 7 squared (b) 5 cubed (c) 6 squared (d) 10 cubed

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EXPONENTS
N-GEN MATH® 6 HOMEWORK

FLUENCY

1. Rewrite each of the following products using exponents. **Do not evaluate**. The first is done as an example.

   (a) $5 \times 5 \times 5$ (b) 12×12 (c) $7 \times 7 \times 7 \times 7$ (d) $9 \times 9 \times 9 \times 9 \times 9 \times 9$

   ans: 5^3

2. Write each of the following in its expanded product form. **Do not evaluate**. The first is done as an example.

   (a) 8^4 (b) 15^3 (c) 11^2 (d) 6^5

   ans: $8 \times 8 \times 8 \times 8$

3. Write each of these exponents as a product and then find the value of the product.

   (a) 2^4 (b) 12^2 (c) 7^3

   (d) 20^2 (e) 9^3 (f) 5^4

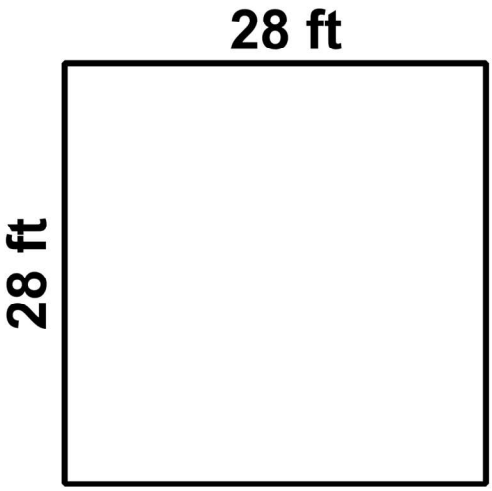
4. Which of the following is the value of 15 cubed?

(1) 2,715 (3) 3,375

(2) 3,150 (4) 4,235

USING YOUR MATH

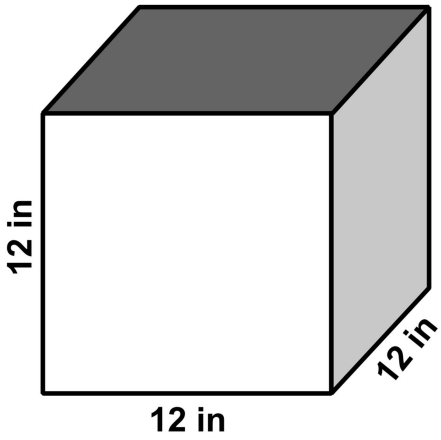
5. A square has side lengths that each measure 28 feet.



(a) Write an expression using an exponent that represents the area, A, of the square.

(b) Evaluate the expression from (a) to find the square's area. Use the correct units.

6. A cube has sides that measure 12 inches each.



(a) Write an expression using an exponent that represents the volume, V, of the cube.

(b) Evaluate the expression from (a) to find the cube's volume. Use the correct units.

7. How many cubes that measure 2 inches by 2 inches by 2 inches would fit inside a cube that measures 10 inches by 10 inches by 10 inches? Justify.