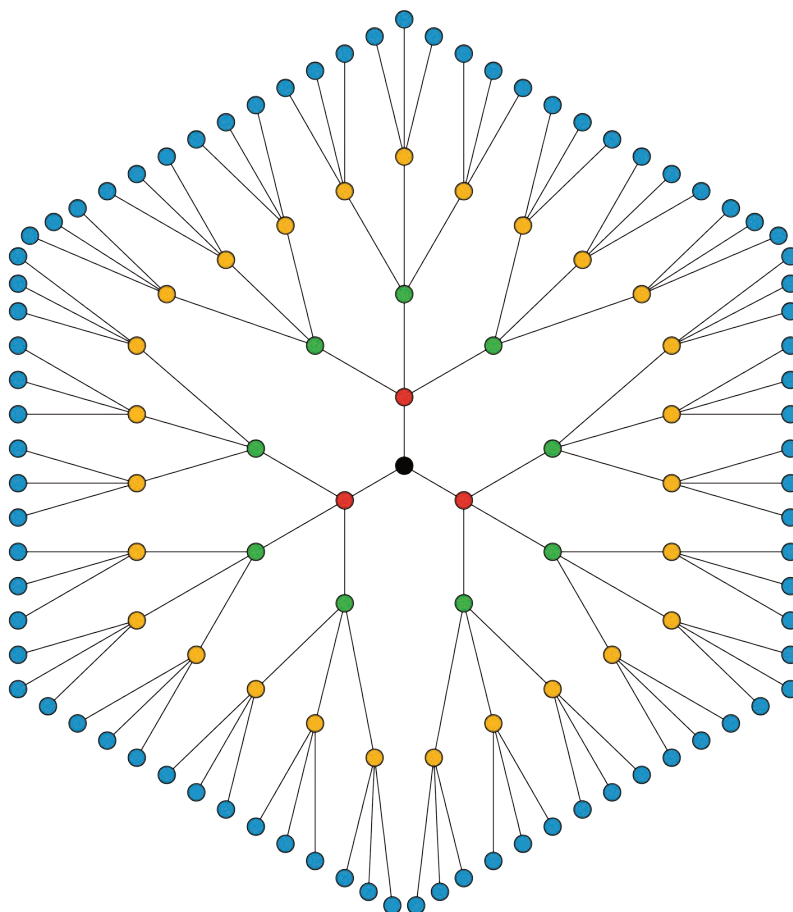# Unit 6, Lesson 12: Meaning of Exponents

Let's see how exponents show repeated multiplication.

12.1: Notice and Wonder: Dots and Lines

What do you notice? What do you wonder?

12.2: The Genie's Offer

You find a brass bottle that looks really old. When you rub some dirt off of the bottle, a genie appears! The genie offers you a reward. You must choose one:

- $50,000, or

- A magical $1 coin. The coin will turn into two coins on the first day. The two coins will turn into four coins on the second day. The four coins will double to 8 coins on the third day. The genie explains the doubling will continue for 28 days.

1. The number of coins on the third day will be $2 \cdot 2 \cdot 2$. Write an equivalent expression using exponents.

2. What do 2^5 and 2^6 represent in this situation? Evaluate 2^5 and 2^6 without a calculator. Pause for discussion.

3. How many days would it take for the number of magical coins to exceed $50,000?

4. Will the value of the magical coins exceed a million dollars within the 28 days? Explain or show your reasoning.

Are you ready for more?

A scientist is growing a colony of bacteria in a petri dish. She knows that the bacteria are growing and that the number of bacteria doubles every hour.

When she leaves the lab at 5 p.m., there are 100 bacteria in the dish. When she comes back the next morning at 9 a.m., the dish is completely full of bacteria. At what time was the dish half full?

12.3: Make 81

1. Here are some expressions. All but one of them equals 16. Find the one that is *not* equal to 16 and explain how you know.

$$2^3 \cdot 2 \qquad\qquad 4^2 \qquad\qquad \frac{2^5}{2} \qquad\qquad 8^2$$

2. Write three expressions containing exponents so that each expression equals 81.

Lesson 12 Summary

When we write an expression like 2^n, we call n the exponent.

If n is a positive whole number, it tells how many factors of 2 we should multiply to find the value of the expression. For example, $2^1 = 2$, and $2^5 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$.

There are different ways to say 2^5. We can say "two raised to the power of five" or "two to the fifth power" or just "two to the fifth."

NAME   DATE   PERIOD

Unit 6, Lesson 12: Meaning of Exponents

1. Select **all** expressions that are equivalent to 64.

   A. 2^6
   B. 2^8
   C. 4^3
   D. 8^2
   E. 16^4
   F. 32^2

2. Select **all** the expressions that equal 3^4.

   A. 7
   B. 4^3
   C. 12
   D. 81
   E. 64
   F. 9^2

3. 4^5 is equal to 1,024. Evaluate the following expressions.

   a. 4^6 b. 4^4 c. $4^3 \cdot 4^2$

4. $6^3 = 216$. Using exponents, write three more expressions whose value is 216.

5. Find two different ways to rewrite $3xy + 6yz$ using the distributive property.
   (from Unit 6, Lesson 11)

6. Solve each equation.

   a. $a - 2.01 = 5.5$ b. $b + 2.01 = 5.5$ c. $10c = 13.71$ d. $100d = 13.71$
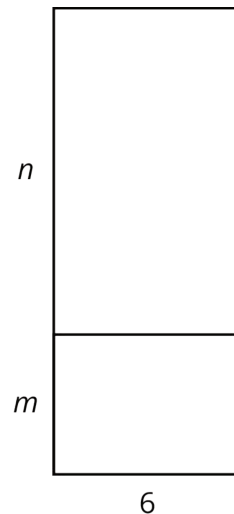
   (from Unit 6, Lesson 5)

7. Which expressions represent the total area of the large rectangle? Select **all** that apply.

A. $6(m + n)$

B. $6n + m$

C. $6n + 6m$

D. $6mn$

E. $(n + m)6$

(from Unit 6, Lesson 10)

8. Is each statement true or false? Explain your reasoning.

a. $\frac{45}{100} \cdot 72 = \frac{45}{72} \cdot 100$

b. 16% of 250 is equal to 250% of 16

(from Unit 3, Lesson 16)