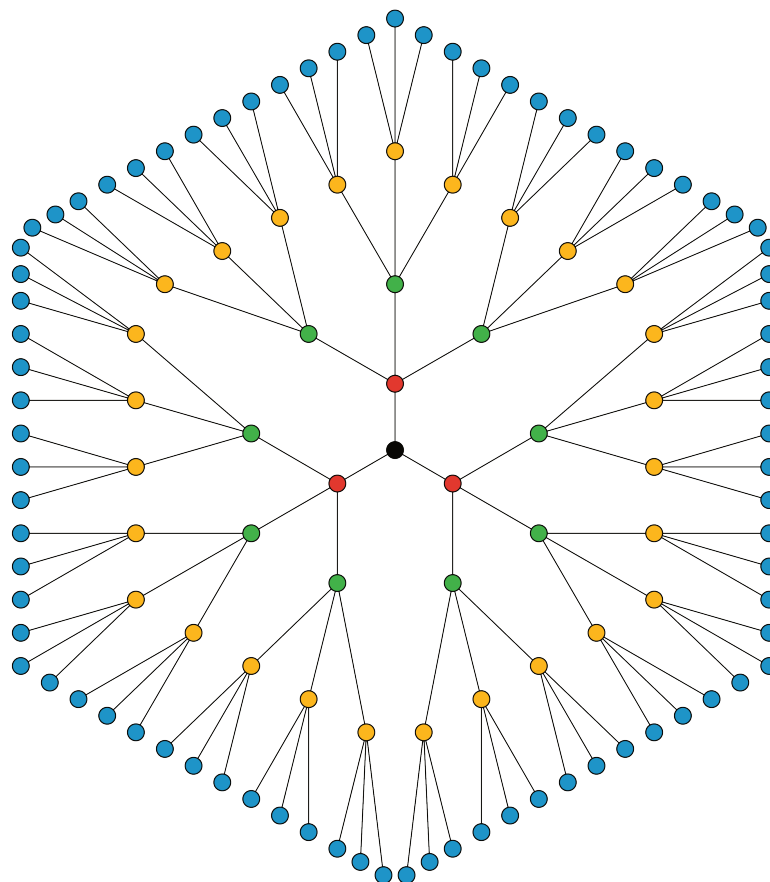


# Lesson 12: Meaning of Exponents

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.

$2^3 \cdot 2$

$4^2$

$\frac{2^5}{2}$

$8^2$

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.”