

Do Now:

Objective To define, identify, and apply geometric sequences

SOLVE IT!

Getting Ready!

Find the fifth term in each of these number patterns. Can you tell what these sequences have in common? Explain your reasoning.

A. 3, 6, 12, 24,
 B. 0.1, 0.01, 0.001, 0.0001,
 C. $\frac{1}{3}, -\frac{1}{9}, \frac{1}{27}, -\frac{1}{81}$

I- Geometric Sequence**1) You build a geometric series by multiplying each term by a constant**

- 2) A **geometric sequence** with a starting value a and a **common ratio** r is a sequence of the form

$$a, ar, ar^2, ar^3, \dots$$

Is the sequence geometric? If it is, what are a_1 and r ?

- 3) **A** 3, 6, 12, 24, 48, ...

An explicit definition for this sequence is a single formula:

- 4) $a_n = a_1 \cdot r^{n-1}, \text{ for } n \geq 1$

A recursive definition for the sequence has two parts:

- 5) $a_1 = a$ initial condition
 $a_n = a_{n-1} \cdot r, \text{ for } n > 1$ recursive formula

II – On your own

1) Write a geometric sequence with a common ratio of $\frac{1}{4}$. Explain how you developed the sequence.

2) Find the ninth term of each geometric sequence.

- a. 3, 12, 48, 192, ... b. 2, 6, 18, 54, ... c. 1875, 375, 75, 15, ...

Use the explicit formula.

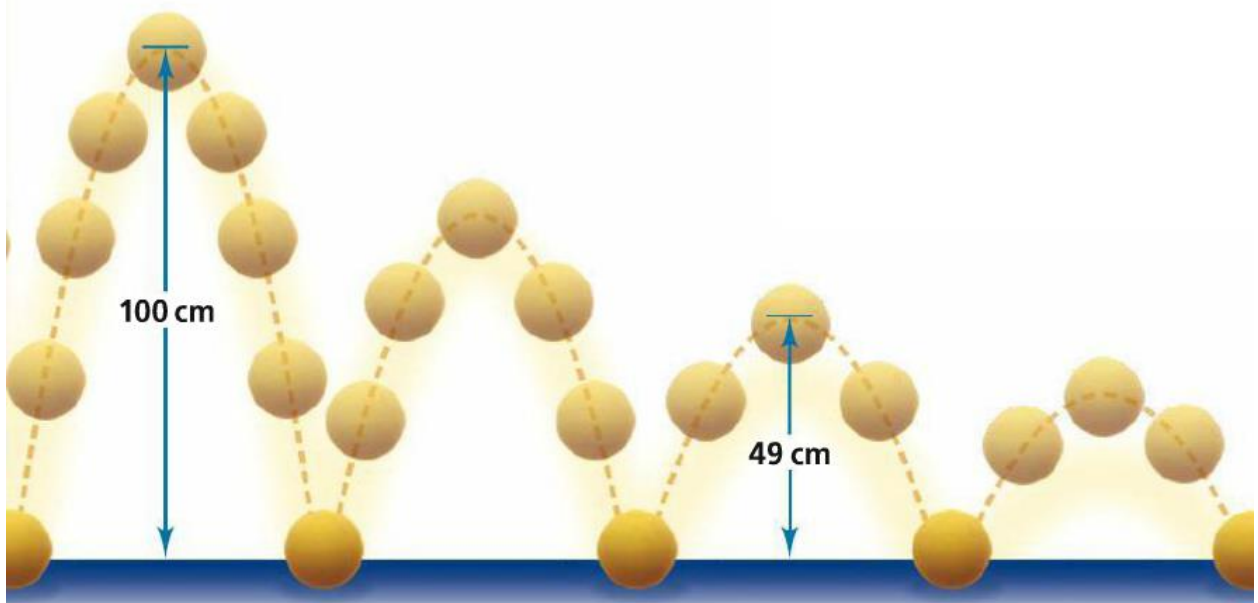
$$a_n = a_1 \cdot r^{n-1}$$

$$a_9 = 3(4^8)$$

$$a_9 = 3(65,536)$$

$$a_9 = \boxed{}$$

3) **Physics** When a ball bounces, the heights of consecutive bounces form a geometric sequence. What are the heights of the 4th and 5th bounces?



- a. **Reasoning** To find the height of the 10th bounce, would you use the recursive or the explicit formula? Explain.
- 4) b. What are the heights of the 6th and 10th bounces?

III – Geometric Mean (in between)

1) The **geometric mean** of two positive numbers x and y is \sqrt{xy} .

2) For example, let's examine the Geometric Sequence 2, -6, 18, -54...

$$(-6)^2 = 2 \cdot 18 = 36$$

3) On your own

Find the missing term of each geometric sequence. It could be the geometric

mean or its opposite.

a. 5, _____, 45,...

b. 2, , 72, ...

Find the geometric mean of 5 and 45.

$$\sqrt{xy}$$

$$\sqrt{45 \cdot 5}$$

$$\sqrt{225}$$

c. $\frac{1}{4}$, , $2\frac{1}{4}$, ... d. 175 , 7, ... e. 1.2 , 43.2, ...

- f. Error Analysis** On a recent math test, your classmate was asked to find the missing term in the geometric sequence 4, _____, 256. Her answer was 130. What error did your classmate make? What is the correct answer?
- g.** The bacteria population in a petri dish was 14 at the beginning of an experiment. After 30 min, the population was 28, and after an hour the population was 56.
- Write an explicit definition to represent this sequence.
 - If this pattern continues, what will be the bacteria population after 4 h?
- h.** A corporation earned a profit of \$420,000 in its first year of operation. Over the next 10 years, the company's CEO hopes to increase the profit by 8% each year. If the CEO reaches her goal, what will be the company's profit in its seventh year, to the nearest dollar?