LESSON MAKER PRO

# Patterns That Add Up

*Use geometric patterns to find terms and totals.*

**HIGH SCHOOL · A2.A.3.4**

**A2.A.3.4** "Solve problems that can be modeled using finite geometric sequences and series given the nth terms and sum formulas. Graphing calculators or other appropriate technology may be used."

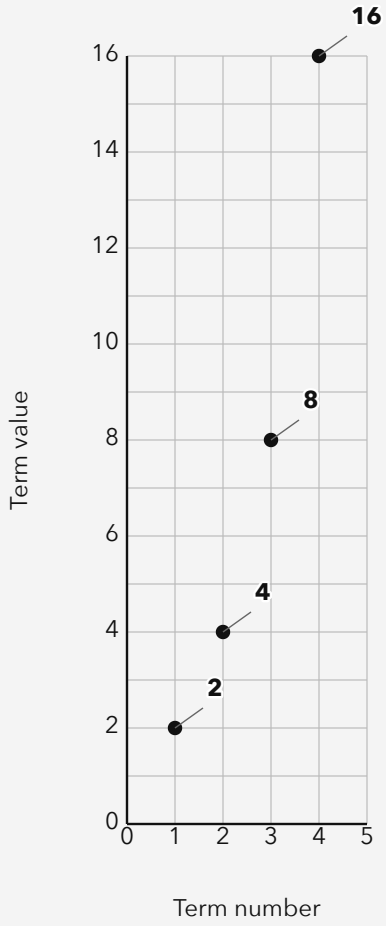
NAME _____ DATE _____

## TERMS AND TOTALS

In a geometric sequence, multiply each term by the same number, called the common ratio r, to get the next term. Use $a_n = a_1 r^{n-1}$ to find a term, or $S_n = a_1(1 - r^n)/(1 - r)$ to find a total when r is not 1.

### WORKED EXAMPLE

The points show four terms of a geometric sequence. Find their sum.

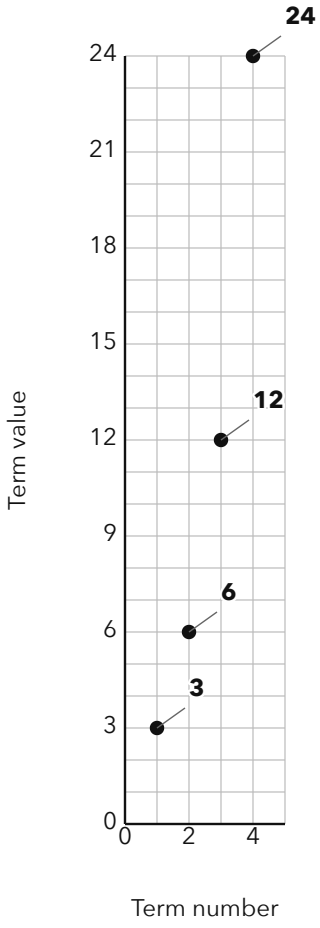



1. Read $a_1 = 2$ and $r = 4/2 = 2$ from the points.
2. Use $S_4 = 2(1 - 2^4)/(1 - 2)$.
3. Simplify: $S_4 = 2(-15)/(-1) = 30$.

**Answer: 30**

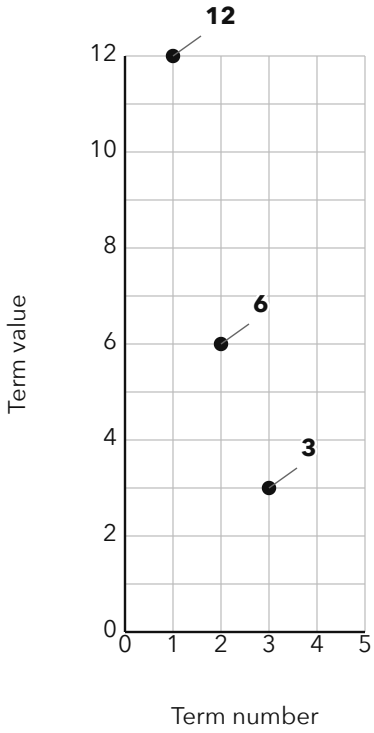
## PRACTICE 6 problems

**1** Use the points to find the sum of the first four terms.




**ANSWER** _____

**2** The points show the first three terms. Find the sum of the first four terms.




**ANSWER** _____

**3** A geometric sequence has $a_1 = 7$ and $r = 2$. Find $a_5$.

**ANSWER** _____

**4** A geometric sequence has $a_1 = 81$ and $r = 1/3$. Find $a_4$.

**ANSWER** _____

**5** A geometric sequence has $a_1 = 5$ and $r = 3$. Find $S_4$.

**ANSWER** _____

**6** A geometric sequence has $a_1 = 64$ and $r = 1/2$. Find $S_5$.

**ANSWER** _____

## APPLY IT Show your work

**1** You put $7 in a savings jar during the first week. Each week after that, you put in twice as much as the week before. How much do you put in the jar altogether over five weeks?

WORK SPACE

**ANSWER** _____

**2** A student shares a music remix online. It gets 10 new shares on the first day. Each day after that, it gets three times as many new shares as the day before. How many new shares does it get altogether in the first four days?

WORK SPACE

**ANSWER** _____

## CHALLENGE One step up

A geometric sequence has $a_2 = 21$ and $a_4 = 189$. Its common ratio is positive. Find $S_4$ and explain how you found the first term and common ratio.

WORK SPACE AND ANSWER

# Patterns That Add Up



## PART 1 · PRACTICE

| # | PROBLEM | ANSWER |
|---|---|---|
| 1 | Use the points to find the sum of the first four terms. | **45** |
| 2 | The points show the first three terms. Find the sum of the first four terms. | **45/2** |
| 3 | A geometric sequence has $a_1 = 7$ and $r = 2$. Find $a_5$. | **112** |
| 4 | A geometric sequence has $a_1 = 81$ and $r = 1/3$. Find $a_4$. | **3** |
| 5 | A geometric sequence has $a_1 = 5$ and $r = 3$. Find $S_4$. | **200** |
| 6 | A geometric sequence has $a_1 = 64$ and $r = 1/2$. Find $S_5$. | **124** |

## PART 2 · APPLY IT

1. **$217** The five deposits are $7, $14, $28, $56, and $112. Their sum is $217.
2. **400 shares** The daily numbers of new shares are 10, 30, 90, and 270. Their sum is 400.

## CHALLENGE

**The common ratio is 3 because $a_4/a_2 = r^2 = 9$ and r is positive. The first term is 21/3 = 7, so $S_4 = 7 + 21 + 63 + 189 = 280$.**

Accept equivalent fractions or decimals, including 22.5 for problem 2. In the challenge, the explanation must use the positive-ratio condition to identify r = 3.