
Warm-Up

1. $-13, -43, -73, -103, \dots$
Find a_{37}

2. $\sum_{k=1}^5 (2k - 4)$

Sequences and Series

2 types:

Arithmetic: Pattern progresses by adding/subtracting (Common difference)

Geometric: Pattern progresses by multiplying/dividing (Common ratio)

Equation for Arithmetic Sequence:

specific term \longrightarrow $a_n = a_1 + (n-1)d$

a_n is the n^{th} term of the sequence

a_1 is the first term

d is the common difference

Arithmetic Series

Equation for arithmetic series:

$$S_n = n \left(\frac{a_1 + a_n}{2} \right)$$

S_n is the sum of the first n terms of the series

Geometric Sequences and Series

Equation for Geometric Sequence:

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

a_n is the n^{th} term of the sequence

a_1 is the first term

r is the common ratio

specific
term

What you are
multiplying by

Examples

1. Write the next term of the sequence.
Then write a rule for the n^{th} term

a. 4, -8, 16, -32, ...

b. 20, 10, 5, $5/2$, ...

c. $-1, 2, -4, 8, -16, \dots$

d. $36, 12, 4, \frac{4}{3}, \dots$

2.

a. Write a rule for the n^{th} term of the sequence 5, 2, 0.8, 0.32, Then find a_{12} .

$$a_n = a_1 r^{n-1}$$
$$a_n = 5 \cdot .4^{n-1} \quad \text{rule}$$

$$a_{12} = 5 \cdot .4^{12-1}$$

$$a_{12} = 2.097152 \times 10^{-4}$$

$$a_{12} = 0.00021$$

b. Write a rule for the n^{th} term of the sequence 1, 3, 9, 27, Then find a_{12} .

$$a_n = 1 \cdot 3^{n-1}$$

$$a_{12} = 1 \cdot 3^{12-1} = 177,147$$

Geometric Series

Equation for Geometric Series:

Sum ————— $S_n = a_1 \left(\frac{1-r^n}{1-r} \right)$

S_n is the sum of the first "n" terms of the series

1. Consider the geometric series $1+4+16+64+\dots$
Find the sum of the first 10 terms.

$$r=4$$

$$S_n = a_1 \left(\frac{1-r^n}{1-r} \right)$$

$$S_{10} = 1 \left(\frac{1-4^{10}}{1-4} \right)$$

$$S_{10} = 1 \left(\frac{-1048575}{-3} \right)$$

$$S_{10} = 1 (349,525)$$

$$S_{10} = 349,525$$

2. Consider the geometric series:

$$2+(-4)+8+(-16)+\dots$$

Find the sum of the first 16 terms.

$$\begin{aligned} S_{16} &= a_1 \left(\frac{1-r^n}{1-r} \right) \\ &= 2 \left(\frac{1-(-2)^{16}}{1-(-2)} \right) = -43,690 \end{aligned}$$

