

# Sequences + Series

10-1-14  
# of terms

Arithmetic sequences:

$a_1, a_2, a_3, a_4, a_5, a_6, a_7, \dots$   
5, 8, 11, 14, 17, 20, 23, ...  
+3 +3 +3

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

↑  
The sum of a #

★ A sequence is a series of numbers that share a Difference ★

Example 2:

40, 47, 54, 61, 68, ...

+7

$$a_1 = 40$$
$$\text{diff} = 7$$

$$a_{1,2} = 12 \cdot 7 + 33$$

$$a_{1,2} = 117$$

Geometric Sequences

$a_1, a_2, a_3, a_4, a_5, a_6, \dots, a_7$   
3, 6, 12, 24, 48, 96, ...

x2 x2

$$S_n = a_1 + a_1 r + a_1 r^2 + a_1 r^3 + a_1 r^4$$

$$S_n \cdot r = a_1 r + a_1 r^2 + a_1 r^3 + a_1 r^4$$

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

$$S_6 = \frac{3(2^6 - 1)}{1} = \boxed{189}$$

Find the 12<sup>th</sup> term:

7, 9.5, 12, 14.5, 17, ...  
+2.5

$$a_1 = 7$$
$$\text{diff} = 2.5$$

$$a_{1,2} = 7 + (12 - 1)(2.5)$$
$$7 + 11 \cdot 2.5$$

$$\boxed{a = 34.5}$$

Find the Sum of all numbers between 1 and 49:

$$1 + 5 + 9 + 13 + \dots + 49$$

+4   +4   +4

$$49 = 1 + (n-1)4$$

$$49 = 1 + 4n - 4$$

$$n = 13$$

$$a_1 = 1$$

$$a_n = 49$$

$$N = 13$$

$$S_{13} = \frac{(1+49)13}{2}$$

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Find the Sum:

$$\frac{5}{1} + \frac{10}{3} + \frac{20}{9} + \frac{40}{27} + \dots$$

2/3   2/3

$$\text{ratio} = 2/3$$

$$a_1 = 5$$

$$N = \infty$$

$$S_N = \frac{5(2/3^\infty - 1)}{2/3 - 1}$$