

SEQUENCES + SERIES

1, 2, 3, 4, 5,

2, 4, 6, 8,

10, 20, 30,

1, 2, 4, 8,

1, 4, 9, 16,

Sequence - a list of numbers that follow a pattern

Series - the sum of the terms in a sequence

FIBONACCI SEQUENCE - Found in nature

1, 1, 2, 3, 5, 8, 13, 21 -

a_1, a_2, a_3

a_n
last term
or
unknown term

$n = \#$ of terms

$a_{n-1} = 2nd$ to last term

Find the 1st 4 terms

$$a_n = 4n + 2$$

$$a_1 = 4(1) + 2 = 6$$

$$a_2 = 4(2) + 2 = 10$$

$$a_3 = 4(3) + 2 = 14$$

$$a_4 = 4(4) + 2 = 18$$

$$a_n = \frac{n+2}{2n}$$

$$a_1 = \frac{1+2}{2(1)} = \frac{3}{2}$$

$$a_2 = \frac{2+2}{2(2)} = \frac{4}{4} = 1$$

$$a_3 = \frac{3+2}{2(3)} = \frac{5}{6}$$

$$a_4 = \frac{4+2}{2(4)} = \frac{6}{8} = \frac{3}{4}$$



SUMMATION NOTATION

$$\sum_{n=1}^5 (2n-3) = 2(1)-3 \quad 2(2)-3 \quad 2(3)-3 \quad 2(4)-3 \quad 2(5)-3 \\ -1 + 1 + 3 + 5 + 7 \\ = \boxed{15}$$

$$\sum_{j=22}^{50} (4j+7)$$

ARITHMETIC SEQUENCES

= add the same value to each term.

$$2, 4, 6, 8, \dots \quad d=2$$

$$2.4, 3.6, 4.8, 6.0, \dots \quad d=1.2$$

$$100, 93, 86, 79, \dots \quad d=-7$$

Common difference = d
amount added to each term

$$d = a_2 - a_1$$

$$3, 11, 19, 27, \dots$$

$$d=8$$

$$3 + 8(199)$$

$$= 3 + 1592$$

$$= 1595$$

Find the 200th term.
 a_{200}

$$a_n = a_1 + d(n-1)$$

$$\frac{17}{12}, \frac{5}{6}, \frac{1}{4}, \dots$$

$$\frac{17}{12}, \frac{10}{12}, \frac{3}{12}$$

$$d = -\frac{7}{12}$$

Find the 8th term.

$$a_8 = \frac{17}{12} - \frac{7}{12}(\cancel{8-1})$$

$$= \frac{17}{12} - \frac{49}{12}$$

$$= -\frac{32}{12} = \boxed{-\frac{8}{3}}$$

ARITHMETIC SERIES (sum)

$$S_4 = 5 + 8 + 11 + 14$$

$$+ S_4 = \frac{14 + 11 + 8 + 5}{19 + 19 + 19 + 19}$$

$$= 38 \quad S_n = \text{sum of terms}$$

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

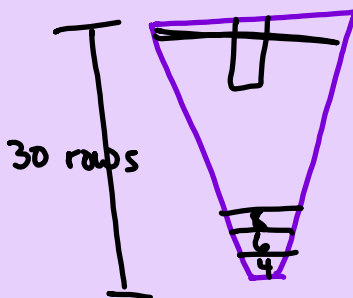
$$2S_4 = 4 \cdot (19)$$

$$\frac{2S_4}{2} = \frac{76}{2}$$

$$S_4 = 38$$

$$a_n = a_1 + d(n-1)$$

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



How many seats in the 30th row?

$$a_{30} = 4 + 2(30-1)$$

$$= 4 + 2 \cdot 29$$

$$= 4 + 58$$

$$= 62$$

How many seats in the section?

$$4 + 6 + 8 \dots + 62$$

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

$$S_n = \frac{30}{2}(4 + 62)$$

$$= 15 \cdot 66$$

$$= 990 \text{ seats}$$

$$52 + 64 + 76 + \dots + 1816.$$

 a_n
Find S_n .

$$d = 12$$

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

$$S_n = \frac{148}{2} (52 + 1816)$$

$$= 138,232$$

$$a_n = a_1 + d(n-1)$$

$$1816 = 52 + 12(n-1)$$

$$\frac{1764}{12} = \frac{12(n-1)}{12}$$

$$147 = n-1$$

$$148 = n$$