SEQUENCES + SERIES

Arithmetic:
1, 2, 3, 4, . . . +1
2, 4, 6, 8, . . . +2
10, 8, 6, 4, . . . + -2

3, 6, 12, 24 . . . * 2

1, 2, 4, 7, 11 . . . .
+1, +2, +3, +4

Sequence – a list of #'s that follow a pattern

Arithmetic seq. – adds the <u>same</u> value to each term

FIBONACCI SEQUENCE

– Leonardo de Fibonacci
– adds the two previous numbers

1, 1, 2, 3, 5, 8, 13, 21, 34, 55, ... a_n

a_1 a_2

↑ last or unknown term

n = # of terms

a_{n-1} = the next to the last term

Find the 1st 4 terms.

$a_n = 4n + 2$

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

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

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

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

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

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

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

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

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

SUMMATION NOTATION

Sigma = sum

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

$$-1 + 1 + 3 + 5 = \boxed{8}$$

$$* \sum_{j=22}^{50}(4j+7) = \qquad S_n = \frac{n}{2}(a_1+a_n) \qquad a_n = a_1 + d(n-1)$$

$$S_n = \frac{29}{2}(95+207) \qquad S_n = \frac{n}{2}(a_1+a_n)$$

$+1 = 29$

$$= \boxed{4379}$$

$a_1 = 4(22)+7 = 95$

$a_n = 4(50)+7 = 207$

$n = 50-22$

$$\sum_{i=2}^{5}\left(3^{i-1}\right) = 3^{1} + 3^{2} + 3^{3} + 3^{4}$$

$2-1 \qquad 3-1$

$$3 + 9 + 27 + 81 = 120$$

Geometric - multiply by same value

Arithmetic Sequences — add the same value to each term.

$1, 2, 3, 4, 5, \ldots$

$2, 4, 6, 8, \ldots$

$2.4, 3.6, 4.8, 6.0, \ldots$

$\frac{1}{2}, \frac{11}{10}, \frac{17}{10},$

$+\frac{3}{5}$

$100, 93, 86, 79 \ldots \quad d = {}^{-}7$

$d =$ Common difference = the same value added to each term

$d = a_2 - a_1$

$3, 11, 19, 27, \ldots$

$3+8 \quad 3+16 \quad 3+24$

$3+(8\cdot1) \quad 3+(8\cdot2) \quad 3+(8\cdot3)$

Find $\underset{n=?}{200^{th}}$ term.

$3+(8\cdot199) = 1595$

$$\boxed{a_n = a_1 + d(n-1)}$$

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

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

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

Find the 8^{th} term.

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

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

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

Arithmetic Series

Series = sum of terms in a sequence.

S_n = sum of n terms

$S_4 = 5 + 8 + 11 + 14$ $\boxed{= 38}$

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

$2S_4 = 19 + 19 + 19 + 19$

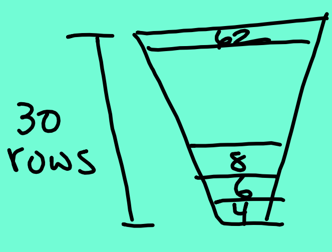
$2S_4 = 4(19)$

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

$S_4 = 38$

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

$$\boxed{\begin{array}{l} S_n = \frac{n}{2}(a_1 + a_n) \\ a_n = a_1 + d(n-1) \end{array}}$$



How many seats will be in the 30^{th} row?

$a_{30} = 4 + 2(30 - 1) = 62$

How many seats in section?

$S_{30} = \frac{30}{2}(4 + 62) = 990$ seats

Find S_n.

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

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

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

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

$S_n = 138{,}232$

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

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

$-52 \quad -52$

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

$147 = n - 1$

$148 = n$