SEQUENCES + SERIES

Sequences – a list of #'s that follow a pattern.

1, 1, 2, 3

Arithmetic: 1, 2, 3, 4, 5, ...

10, 20, 30, 40, . . .

Geometric: 2, 4, 8, 16, 32, . . .

Series – the sum of the #'s in a sequence.

Leonardo de Fibonacci

0, 3, 8, 15, 24, . . .

1^2-1, 2^2-1, 3^2-1, 4^2-1, 5^2-1

FIBONACCI SEQUENCE

1, 1, 2, 3, 5, 8, 13, 21, 34, . . . 55, 89

a_1 a_2 a_3 a_n

first term

last term or unknown term

n = # of terms

Find the first 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

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

$$= -1 + 1 + 3 + 5$$

$$= \boxed{8}$$

$$\sum_{i=1}^{\#} \overset{d}{p}i+q$$

Arithmetic

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

a_n

a_1

$n=50-22+1$

$n=29$

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

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

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

$$S_n = \frac{29}{2}(95+207)$$

$$= 4379$$

ARITHMETIC SEQUENCES = adds the same value to each term

1, 2, 3, 4, 5, ...

2, 4, 6, 8, 10, ...

2.4, 3.6, 4.8, 6.0

$d = 1.2$

100, 93, 86, 79, ...

$d = 93 - 100 = -7$

Common difference $= d$

$d = a_2 - a_1$

3, 11, 19, 27, . . . $d = 8$ Find the 200th term.

$3 + 199(8) = 1595$

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

$\frac{17}{12}, \frac{5}{6}, \frac{1}{4}, \ldots$ Find 8th term.

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

$d = a_2 - a_1$

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

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

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

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

Arithmetic Series (sum of all terms)

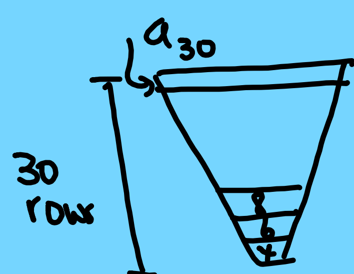
$S_4 = 5 + 8 + 11 + 14 \boxed{= 38}$ $\quad S_n = $ sum of terms

$$
\begin{array}{rcl}
 & S_4 = & 5 + 8 + 11 + 14 \\
+ & S_4 = & 14 + 11 + 8 + 5 \\
\hline
 & 2S_4 = & 19 + 19 + 19 + 19
\end{array}
$$

$2S_4 = 4(19) \longrightarrow S_n = \frac{n}{2}(a_1 + a_n)$

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

$S_4 = 38$



How many seats in top row?

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

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

$= 4 + 58$

$= 62$

How many seats in the whole section?

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

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

$= 990$ seats

Find S_n.

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

$d=12$

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

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

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

$-52 \quad -52$

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

$147 = n-1$

$148 = n$

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

$S_n = \frac{148}{2}(1868)$

$S_n = 74(1868)$

$S_n = 138{,}232$