Sequence -

Examples

1, -1, 1, -1, ...

2, 3, 5, 6, 8, 9, ...

2, 10, 34, ...

4, 6, 8, 10, ...

-3, -6, -9, ...

Definition of an arithmetic mean: sequence

Common difference

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a d = 3

2, 5, 8, 11, 14,...

a = value of the 1st term

a d = -7

-4, -11, -18,...

d = common difference

(value of 2nd term − value of 1st term

-4 + 0(-7)

-4, -4 + (-7), -4 + (-14)

-4 + 2(-7)

n = number of terms

$\overline{L_n = a + (n-1)d}$

$L_n = l$ = value of the n^{th} term

a, a+d, a+2d, a+3d, a+4d

... a+8d ... a+(n-1)d

$t_n = l = a + (n-1)d$

n = always +
= can never be a fraction

$t_n = ?$ $t_{20} = ?$
Find the 20th term value of

a = 4, d = -4, n =20

$l = a + (n-1)d$

$l = 4 + (20-1)(-4)$

$l = 4 + (19)(-4) = -72$

a = -3, d = -2, t_n = -21 n =

$t_n = a + (n-1)d$

$-21 = -3 + (n-1)(-2)$

$-18 = (n-1)(-2)$

$9 = (n-1)$

$10 = n$

a = 5, n = 20, l = -71 d = ?

$l = a + (n-1)d$

$-71 = 5 + (20-1)d$

$-76 = 19d$

$-4 = d$

n = 15, d = 3, l = 28 a = ?

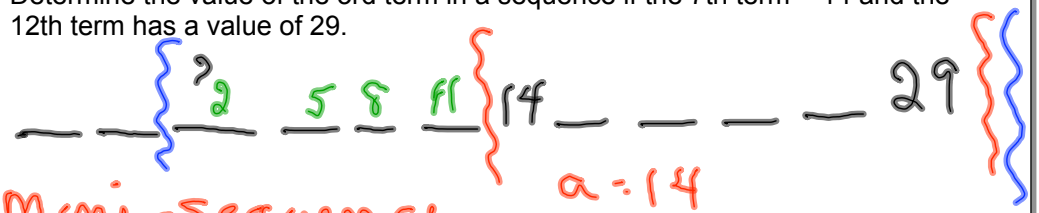
$l = a + (n-1)d$

$28 = a + (15-1)(3)$

$28 = a + 42$

$-14 = a$

Determine the value of the 3rd term in a sequence if the 7th term = 14 and the 12th term has a value of 29.



mini-sequence

$a =$ $n = 10$

$\ell = 29$ $d = 3$

$\ell = a + (n-1)d$

$29 = a + (10-1)(3)$

$29 = a + 27$

$2 = a$

$a = 14$

$\ell = 29$ $d =$

$n = 6$

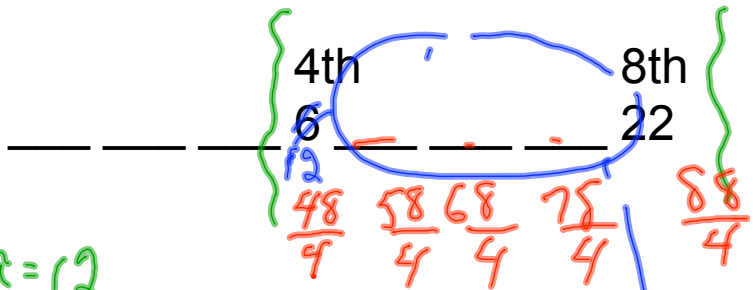
$\ell = a + (n-1)d$

$29 = 14 + (6-1)d$

$15 = 5d$

$3 = d$

Find the terms that are located between the fourth having a value of 12 and the eighth with a value of 22.



$a = 12$

$\ell = 22$

$n = 5$

$d = ?$

$\ell = a + (n-1)d$

$22 = 12 + (5-1)d$

$10 = 4d$

$\frac{10}{4} = d$

Arithmetic Means

Insert 7 am's between -4 and 17

$-4, -\frac{11}{8}, -\frac{3}{8}, \frac{5}{8}, \frac{13}{8}, \frac{21}{8}, \frac{29}{8}, 17$

$-\frac{32}{8}$ $\quad \frac{136}{8}$

$a = -4$

$l = 17 \quad d = ?$

$n = 9$

$l = a + (n-1)d$

$17 = -4 + 8d$

$\frac{21}{8} = d$

What is the average of the following:
4 and 30,
-7 and 31

$\frac{-7+31}{2} = \frac{24}{2} = 12$ $\quad \frac{4+30}{2} = \frac{34}{2} = 17$

If the first term of the sequence is 8 and the third term is 20, find the second term.

$a = 8 \quad n = 3$

$l = 20 \quad d = ?$

$l = a + (n-1)d$

$20 = 8 + 2d$

$6 = 2d$

$8, (14), 20$

$+6$

If the first term of the sequence is -7 and the third term is 31, find the second term.

$-7, (12), 31$

$a = -7 \quad l = 31$

$n = 3 \quad d = ?$

$l = a + (n-1)d$

$31 = -7 + (2)d$

$38 = 2d$

$19 = d$

Definition of an arithmetic mean: average

Formula: $\frac{a+l}{2}$

Insert 2 ams between 4 and 12

4 _ _ 12

Insert 1 am between 4 & 12

$\frac{4+12}{2}$

Series

$S_n = 2 + 4 + 6 + 8 + 10$

$S_n = 10 + 8 + 6 + 4 + 2$

$2S_n = 12 + 12 + 12 + 12 + 12$

$2S_n = 5(12)$

$S_n = \frac{5}{2}(12) = 30$

$S_n = a + (a+d) + (a+2d) + \ldots + a+(n-1)d$

$S_n = [a+(n-1)d] + [a+(n-2)d] + \ldots + a$

$2S_n = [2a+(n-1)d] + \ldots + [2a+(n-1)d]$

$2S_n = n[2a+(n-1)d]$ $\quad S_n = \frac{n}{2}[2a+(n-1)d]$

$S_n = \frac{n}{2}[2a+(n-1)d]$

$S_n = \frac{n}{2}[a + a+(n-1)d]$ (a → a, $a+(n-1)d$ → $t_n = l$)

$S_n = \frac{n}{2}[a+l]$

Value of the 1ST term is 2 and the value of $t_{34} = 206$, find S_n

$a=2 \quad d \quad n=34 \quad t_n=206 \quad S_n=?$

$S_n = \frac{n}{2}[a+l] = \frac{34}{2}[2+206] = 17(208) = 3536$ (1)

Determine the missing variables

if $l = 42$, $n = 30$, $S_n = 400$

$d =$ $a =$

$S_n = \frac{n}{2}[a+l]$ $\quad 400 = \frac{30}{2}[a+42]$

$400 = 15[a+42]$

$400 = 15a + 630$

$-230 = 15a \quad a = -\frac{230}{15}$

$l = a+(n-1)d$ (15)

$42 = -\frac{230}{15} + 29d$ (15)

$630 = -230 + 435d$

$860 = 435d$

$\frac{860}{435} = d$

If a lecture hall has 20 seats in the 1st row, and 22 seats on the 2nd and 24 seats in the 3rd and there are 40 rows, find all missing info.

$a = 20, d = 2, n = 40, l$ S_n

$l = a + (n-1)d$

$l = 20 + (40-1)2$

$l = 20 + 78$

$l = 98$

$S_n = \frac{n}{2}[a + l]$

$= \frac{40}{2}[20 + 98]$

$= 20(118) = 2360$

Summation Notation

term 9 starts with $2 + 4 + 6 + 8 + 10$

$$\sum_{n=1}^{5} 2 + (n-1)2$$

Sigma

formula $a + (n-1)d$

where 9 starts with

$5 + (-2) + (-9) + \ldots$ to 30 terms

$$\sum_{n=1}^{30} 5 + (n-1)(-7)$$