# Arithmetic Sequences

Tuesday, May 14, 2019 10:19 AM

The first Thursday in May is the 2nd. What is the date of the 2nd Thursday of May?

Thursdays in May 2, 9, 16, 23, 30

+7 +7 +7 +7

An arithmetic sequences has a unique starting number. Each subsequent number in the sequence is found by adding the same value each time. That value is called the **common difference**.

are terms of the sequence.

Eg $-2, 1, 4, 7, \ldots$

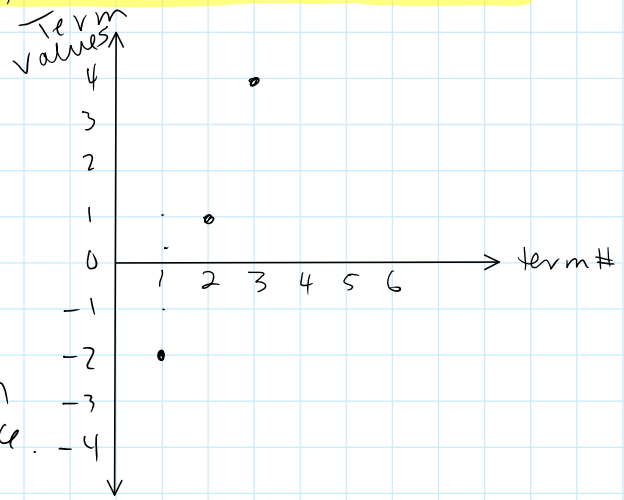
↑ unique starting #.

common difference ($d$) = $4-1 = 3$.

| term # | value of term |
|---|---|
| 1 | $-2$ |
| 2 | $1$ |
| 3 | $4$ |
| 4 | $7$ |

$+1$ ( ) $+3$

$+1$ ( ) $+3$




$\text{slope} = \frac{\Delta y}{\Delta x} = \frac{3}{1}$ = common difference.

Eg 10, 6, 2, $-2$... common difference? $6-10=-4$ ($d$).

Eg $2, 2\frac{1}{3}, 2\frac{2}{3}, 3, \ldots$ $d = \frac{1}{3}$.

Let $n$ = # of terms

$d$ = common difference

$t_1$ = 1st term
$t_2$ = 2nd term
$t_3$ = 3rd term
$t_n$ = nth term

$t_1, t_2, t_3, t_4, \ldots$

Eg 2, 6, 10, 14, ... Find $t_8$

+4 +4

$t_8 = 2 + 4(7)$.
$= 2 + 28$
$= 30$

$t_n = t_1 + d(n-1)$

Eg For 7, 4, 1, -2, ... find $t_{25}$

-3 -3

$t_{25} = 7 - 3(25-1)$
$t_{25} = 7 - 3(24)$
$= 7 - 72$.
$t_{25} = -65$

Try For -5, -1, 3, 7, ... find $t_{30}$.

$t_n = t_1 + d(n-1)$.

$t_{30} = -5 + 4(30-1)$.
$= -5 + 4(29)$
$= -5 + 116$
$= 111$

Eg 2, 8, 14, 20, ... Find $t_{10}$, $t_{25}$, $t_{100}$

$t_n = t_1 + d(n-1)$
$t_n = 2 + 6(n-1)$
$t_n = 2 + 6n - 6$
$t_n = 6n - 4$

is called the general term of the sequence.

$t_n = 2 + 6n - 6$

$t_n = 6n - 4$ ← general term of the sequence.

slope-intercept form.

$t_{10} = 6(10) - 4$
$= 60 - 4$
$= 56.$

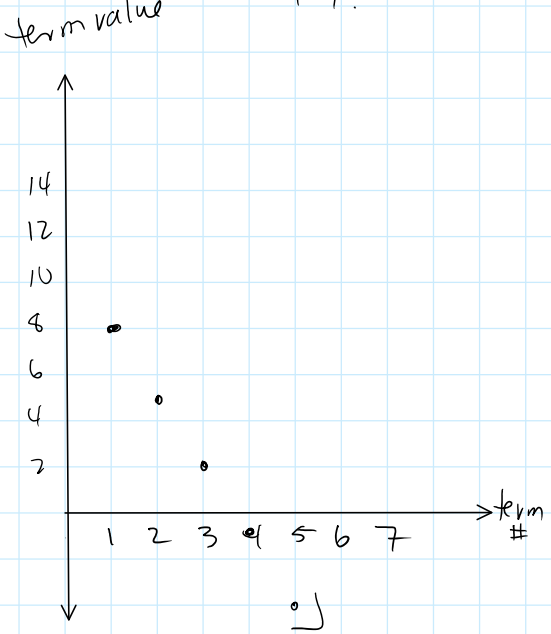
$t_{25} = 6(25) - 4$
$= 150 - 4$
$= 146$

$t_{100} = 6(100) - 4$
$= 600 - 4$
$= 596.$

Try Find the general term for $8, 5, 2, -1, \ldots$ Then use it to find $t_{20}$.

$t_n = t_1 + d(n-1).$
$t_n = 8 + -3(n-1)$
$t_n = 8 - 3n + 3.$
$t_n = -3n + 11.$
slope, y-int

$t_{20} = -3(20) + 11$
$= -60 + 11$
$= -49.$




Eg For the sequence $6, 1, -4, -9, \ldots$ what term is $-194$?
$-5 \quad -5$

$t_n = t_1 + d(n-1)$
$-194 = 6 + -5(n-1)$
$-194 = 6 - 5n + 5$
$-194 = 11 - 5n$
$-11 \quad -11$

$$\frac{-205}{-5} = \frac{-5n}{-5}$$

$$41 = n$$

$-194$ is the 41st term in the sequence.

For an arithmetic sequence the 3rd term is 2 and the 6th term is 11. Find the missing terms.

$-4, -1, 2, 5, 8, 11$ (+d +d +d)

$2 + 3d = 11$

$-2 \quad -2$

$3d = 9$

$d = 3.$

Insert 2 numbers between 3 and 24 to form an arithmetic sequence.

$3, 10, 17, 24$ (+7 +7 +7; +d +d +d)

$3 + 3d = 24$

$-3 \quad -3$

$3d = 21$

$d = 7.$

Handout