U7D2_T Arithmetic Sequences

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U7D2_T Arithmeti...

Warm Up.

a) 8, 12, 16, ... $t_n = 4n+4$

b) $-4, -1, 4, 11, \ldots$ $t_n = n^2 - 5$

c) 10, 50, 250, 1250, ... $t_n = 2(5)^n$

U7D2 **Arithmetic Sequences**

What is similar about the following sequences?

1. 3, 5, 7, 9, 11 (+2, +2, +2, +2)
2. -1, 4, 9, 14, 19 (+5, +5, +5, +5)
3. 20, 17, 14, 11, 8 (−3, −3, −3, −3)

All are linear (First differences are constant).

All of these sequences are classified as **arithmetic** sequences since each term is generated by adding a **COMMON DIFFERENCE** or ***d*** to the previous term. The first term is designated as ***a***.

An arithmetic sequence looks like :

$a, a+d, a+2d, a+3d, a+4d, \ldots$ or

In general,

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

note: $a-d$ is the y-int of a linear graph

t_n = the 'general term' or the n^{th} term

a = the first term (t_1)

n = the term number or the number of terms

d = the common difference (This is the same as the first difference column value; it is the slope of the linear function.)

Examples:

1. Determine t_n and t_{50} for the following arithmetic sequences:

a) 2, 6, 10, 14, ...

$a = 2 \quad d = 4$

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

$t_n = 2 + (n-1)(4)$

$t_n = 2 + 4n - 4$

$\boxed{t_n = 4n - 2}$

$t_{50} = 4(50) - 2$

$\boxed{t_{50} = 198}$

b) $10, \frac{19}{2}, 9, \frac{17}{2}, \ldots$ (Determine t_n and t_{50})

$a = 10 \quad d = -\frac{1}{2}$

$t_n = 10 + (n-1)\left(-\frac{1}{2}\right)$

$t_n = 10 - \frac{1}{2}n + \frac{1}{2}$

$t_n = -\frac{1}{2}n + \frac{21}{2}$

OR

$t_n = \frac{21-n}{2}$

$t_{50} = \frac{21-50}{2}$

$t_{50} = -\frac{29}{2}$

2. Determine the number of terms in the sequence 3, 7, 11, 15 . . . . 199.

$a = 3 \quad d = 4 \quad n = ? \quad t_n = 199$

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

$3 + (n-1)(4) = 199$

$(n-1)4 = 196$

$n-1 = 49$

$n = 50$

$\therefore$ there are 50 terms in this finite sequence.

3. Determine t_{50} if $t_4 = 5$ and $t_{11} = 26$ for an arithmetic sequence.

(4, 5) (11, 26) Using Gr. 9 math

$d = \frac{26-5}{11-4}$

$d = \frac{21}{7}$

$d = 3$

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

$5 = a + (4-1)(3)$

$5 = a + 9$

$a = -4$

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

$t_{50} = -4 + 49(3)$

$t_{50} = 143$

$t_n = 3n - 7$

Using Gr. 10 math:

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

① $a + 10d = 26$

② $a + 3d = 5$

$7d = 21$

$d = 3$

sub $d = 3$ into ②

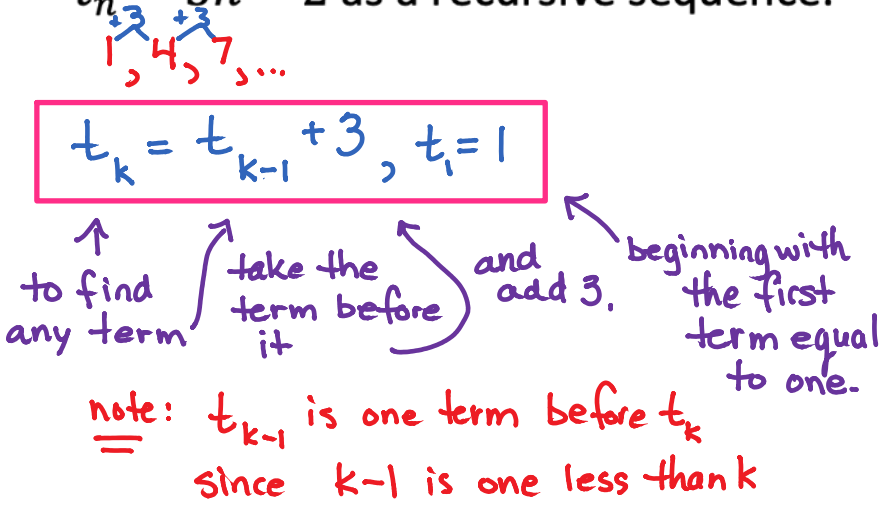
$a + 3(3) = 5$

$a = -4$

$t_{50} = -4 + 49(3)$

$t_{50} = 143$

4. Describe the arithmetic sequence $t_n = 3n - 2$ as a recursive sequence.



U7D2 Practice: p. 441 #1-8(eoo), 9, 10, 15, 23, **29**

NOTE: eoo means every other one in each question- a, c, e, etc.)