

NAME: \_\_\_\_\_

# U1:L1 Arithmetic sequences

A sequence is a Set of things in order

3, 5, 7, 9 ...

1<sup>st</sup> term (aka element) ↑ ellipses (continues forever)

The first term of a sequence is  $t_1$  (aka "a"). This is read as "t subscript 1" or "t sub 1".



We refer to other terms the same way – substituting n for 1.

$t_n$  "n" represents the number of the term.

Sequences can be either:

FINITE	Has a finite amount of terms	1, 2, 3, 4, 5 10, 20, 30 100
INFINITE	Has an infinite number of terms...	5, 10, 15...

In an Arithmetic Sequence the difference between one term and the next is a constant.

In other words, we just add the same value each time ... infinitely.

1, 4, 7, 10, 13, 16 ...

$$d = +3$$

The common difference ("d") between terms can be represented as...

$$d = t_n - t_{n-1}$$

## General Terms

Consider the following sequence...

TERM	$t_1$	$t_2$	$t_3$	$t_4$
SEQUENCE	2	5	8	11
What is the common difference? $d = +3$				
SEQUENCE EXPRESSION (using term and difference)	2	$2 + 3$	$2 + 3 + 3$	$2 + 3 + 3 + 3$
★ General Sequence	$t_1$	$t_1 + d$	$t_1 + d + d$	$t_1 + d + d + d$
Simplify	$t_1$	$t_1 + d$	$t_1 + 2d$	$t_1 + 3d$

The **general** arithmetic sequence is then...

TERM	$t_1$	$t_2$	$t_3$	$t_4$
SEQUENCE	$t_1$	$t_1 + d$	$t_1 + 2d$	$t_1 + 3d$

Looking at the patterns in this relationship we can find the  
of any arithmetic sequence...

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

general term

$t_n$	general term of $n^{\text{th}}$ term
$t_1$	first term
$n$	number of terms
$d$	common difference

With this general sequence, we can find any of the above information by solving algebraically.

EXAMPLES:

Write the general term for the following sequence:

3, 8, 13, 18, 23, 28, 33, 38, ...

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

$$* t_n = 3 + (n-1)5$$

$$t_n - t_{n-1} = d$$
$$28 - 23 = d$$
$$5 = d$$

Find its 9<sup>th</sup> term:

$$t_n = 3 + (n-1)5$$

$$t_9 = 3 + (9-1)5$$

$$t_9 = 3 + (8)5$$

$$t_9 = 43$$

Find its 100<sup>th</sup> term:

$$t_n = 3 + (n-1)5$$

$$t_{100} = 3 + (100-1)5$$

$$t_{100} = 3 + (99)5$$

$$t_{100} = 3 + 495$$

$$t_{100} = 498$$

~~Medical officials encourage parents to keep track of their child's growth. The general guideline for the growth in height of a child between the ages of 3 and 10 years is an average increase of 5cm per year. Suppose a child was 70cm tall at age 3.~~

- Write the general term you could use to estimate the child's height at any age:

$$t_n = t_1 + (n-1)d$$
$$t_n = 70 + (n-1)5$$

70, 75, 80, 85, 90, ...  
3    4    5    6    7    ...    10  
 $t_1$     $t_2$     $t_3$     $t_4$     $t_5$    ...    $t_8$

- How tall is the child expected to be at age 10?

$$t_8 = 70 + (8-1)5$$

$$t_8 = 70 + (7)5$$

$$t_8 = 70 + 35$$

$$t_8 = 105 \text{ cm}$$

MORE EXAMPLES:

The first term of an arithmetic sequence is 4 and the tenth term is 67.

What is the common difference?

$$d = ?$$

$$d = t_n - t_{n-1}$$

$$t_1 = 4$$

$$t_{10} = 67$$

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

$$t_{10} = 4 + (10-1)d$$

$$67 = 4 + 9d$$

$$\begin{array}{r} -4 \quad -4 \\ \hline \end{array}$$

$$63 = 9d$$

$$\begin{array}{r} 9 \quad 9 \\ \hline \end{array}$$

$$7 = d$$

What is the thirty-second term of the arithmetic sequence  $-12, -7, -2, 3, \dots$

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

$$t_{32} = -12 + (32-1)5$$

$$t_{32} = -12 + (31)5$$

$$t_{32} = -12 + 155$$

$$t_{32} = 143$$

$$t_1 = -12$$

$$d = +5$$

Joe Bob has a job at Dancyt's. He has been tasked with creating a pyramid display of cereal boxes. The top six rows of his display are as shown below. The number of boxes in the rows make an arithmetic sequence. There are 16 boxes in the third row from the bottom and 6 boxes in the eighth row from the bottom.



- How many boxes are in the bottom row?

20!

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

$$t_n = 2 + (10-1)2$$

$$t_n = 2 + 9(2)$$

$$t_n = 2 + 18$$

$$t_n = 20$$

$$t_{10} = 20$$

- Determine the general term for the sequence

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

- What is the number of rows of boxes in his display?

10

from image + pattern

A plumber charges \$50 per visit, plus \$35 an hour (or portion of an hour).

- Generate a table to demonstrate the possible charges for the first 4 hours of time.

- What would the charge be for a 10 hour job?

## **PRACTICE TIME!**

Pages 16-21 (Q1-7 PICK 3; Q8-23 PICK 3; Q24-28 PICK 1)