SEQUENCES

A sequence is a list of numbers that is a function of the natural number sequence.

Each number in the sequence is called a term of the sequence.

$$t_1, t_2, t_3, t_4, t_5, t_6, \ldots t_n$$

The first number sequence that you learned was probably the natural number sequence:

$$1, 2, 3, 4, 5, 6, \ldots$$

The natural number sequence is defined by

$$t_n = n, n \in N$$

$t_{13} = 13$
$t_{26} = 26$

t_n is the n^{th} term of a sequence. This is also called the **general term** of the sequence.

ex.1. Find the first five terms of this sequence: $t_n = 5n - 1, n \in N$ (substitute the natural numbers in order for n).

$t_1 = 5(1) - 1 = 4$ $t_2 = 9$ $t_3 = 14$ $t_4 = 19$ $t_5 = 24$

Write the sequence:

4, 9, 14, 19, 24, ... 5n - 1, ...

(list the general term at the end of the sequence followed by ...)

ex. 2. Find the first four terms of the sequence $t_n = 3(2^n)$. Then, write the sequence.

$6, 12, 24, 48, 96, \ldots 3(2^n) \ldots$

$t_1 = 6$
$t_2 = 12$
$t_3 = 3(2^3) = 3(8) = 24$
$t_4 = 48$
$t_5 = 96$

ex. 3. Find the first four terms of the sequence $t_n = 3n^2 - 2n + 1$. Then, write the sequence.

$2, 9, 22, 41, 66, \ldots 3n^2 - 2n + 1, \ldots$

$t_1 = 2$
$t_2 = 9$ (D_1: 7; D_2: 6)
$t_3 = 22$ (D_1: 13; D_2: 6)
$t_4 = 41$ (D_1: 19; D_2: 6)
$t_5 = 66$ (D_1: 25)

Homework - Sequences sheet (10.1) 1, 4

1. a) $t_n = 3n$ 3, 6, 9, 12

b) $t_n = 1 - n$ 0, -1, -2, -3

c) $t_n = 2^n$ 2, 4, 8, 16

d) $t_n = 3^{n-1}$ 1, 3, 9, 27

e) $t_n = 2n^2$ 2, 8, 18, 32

f) $t_n = 5(2^n)$ 10, 20, 40, 80

g) $f(n) = \sqrt{n+1}$ $\sqrt{2}, \sqrt{3}, 2, \sqrt{5}$

h) $g(n) = n^2$ 1, 4, 9, 16

i) $t_n = \dfrac{n+2}{n}$ $3, 2, \dfrac{5}{3}, \dfrac{3}{2}$

4. a) 1, 3, 5, 7, 9, 11, 13 $t_n = 2n - 1$

b) -10, -8, -6, -4, -2, 0, 2 $t_n = 2n - 12$

c) $\dfrac{-1}{2}, \dfrac{2}{3}, \dfrac{-3}{4}\ \dfrac{4}{5}, \dfrac{-5}{6}, \dfrac{6}{7}$

$t_n = \dfrac{(-n)^n}{n^n + n^{n-1}}$

$t_1 = \dfrac{(-1)^1}{1^1 + 1^0} = \dfrac{-1}{1+1} = \dfrac{-1}{2}$

$t_2 = \dfrac{(-2)^2}{2^2 + 2^1} = \dfrac{4}{4+2} = \dfrac{4}{6} = \dfrac{2}{3}$

$t_3 = \dfrac{(-3)^3}{3^3 + 3^2} = \dfrac{-27}{27+9} = \dfrac{-27}{36} = -\dfrac{3}{4}$