

# Sequences and Series

Jan. 12 / 16

## (A) Arithmetic Sequences

↳ pattern

$2, 5, 8, 11, \dots$       Add 3  
 $4, 8, 16, 32, \dots$       Multiply by 2  
 $1, 1, 2, 3, 5, \dots$       add two previous terms  
 $25, 19, 13, 7, \dots$       Subtract 6 or Add -6

Arithmetic

Arithmetic Sequence - a pattern of numbers where each term is obtained by adding a consistent number to the previous term

Common Difference (d) - the number that is consistently added to get each new term.

$2, 5, 8, 11, \dots \rightarrow$  Add 3       $d = 3$   
 $25, 19, 13, 7, \dots \rightarrow$  Add -6       $d = -6$

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

$t_1 = 2, t_2 = 5, t_3 = 8, t_4 = 11, \dots, t_{10} = 29$  in  $\rightarrow$  Place in the sequence

$t_n \rightarrow$  value of the term in the 'n<sup>th</sup>' place

$15, 4, -7, -18, \dots$

a) What is  $t_5$ ?  $-29$

b) If  $t_n = 4$ , what is  $n$ ?  $n = 2$

General Term: a formula used to find any term in a sequence. (also called the 'n<sup>th</sup>' term or generating formula)

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

Ex.  $2, 5, 8, 11$        $t_n = 2 + 3(n-1)$

$t_1 = 2$      $d = 3$        $t_n = 2 + 3n - 3$

$t_n = 3n - 1$

Ex: For the sequence:

$$19, 15, 11, 7, \dots$$

a) Write the simplified general term

$$t_n = 19 - 4(n-1) \quad t_n = -4n + 23$$

$$t_n = 19 - 4n + 4$$

b) Use the general term to find term 10 and term 22.

Term 10:

$$t_{10} = -4(10) + 23$$

$$t_{10} = -40 + 23$$

$$t_{10} = -17$$

Term 22:

$$t_{22} = -4(22) + 23$$

$$t_{22} = -88 + 23$$

$$t_{22} = -65$$

Finding  $n$  when given  $t_n$ :

Ex: For the sequence:  $-5, 2, 9, \dots$

Find  $n$  if  $t_n = 51$

① Find General Term

$$t_n = -5 + 7(n-1)$$

$$t_n = -5 + 7n - 7$$

$$t_n = 7n - 12$$

② Replace  $t_n$  with 51 and solve for  $n$

$$51 = 7n - 12$$

$$63 = 7n$$

$$\boxed{9 = n}$$

p. 16-18 #1-7, 11, 16