

Series & Applications

Definitions

Sequence (Progression): a set of numbers that follow a pattern

Series: a set of numbers added together

a : the first term

T_n : the n th term

S_n : the sum of the first n terms

e.g. $T_n = n^2 + 2$, find;

$$(i) \quad T_5 = 5^2 + 2 \\ = \underline{27}$$

(ii) whether 42 is a term in the sequence

$$42 = n^2 + 2$$

$$n^2 = 40$$

$$n = \sqrt{40}, \text{ which is not an integer}$$

Thus 42 is not a term

Arithmetic Series

An arithmetic series is a sequence of numbers in which each term after the first is found by adding a constant amount to the previous term.

The constant amount is called the common difference, symbolised, d .

$$d = T_2 - a$$

$$= T_3 - T_2$$

$$d = T_n - T_{n-1}$$

$$T_1 = a$$

$$T_2 = a + d$$

$$T_3 = a + 2d$$

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

e.g.(i) If $T_3 = 9$ and $T_7 = 21$, find;

the general term.

$$a + 2d = 9$$

$$a + 6d = 21$$

$$4d = 12$$

$$d = 3 \therefore a = 3$$

$$T_n = 3 + (n-1)3$$

$$= 3 + 3n - 3$$

$$= \underline{3n}$$

$$(ii) T_{100} = 3(100) \\ = \underline{300}$$

(iii) the first term greater than 500

$$T_n > 500$$

$$3n > 500$$

$$n > \frac{500}{3}$$

$$\therefore n = 167$$

$$\underline{T_{167} = 501, \text{ is the first term } > 500}$$

Exercise 6C; 1aceg, 2bdf, 3aceg, 5, 7bd, 10, 13b, 15

Exercise 6D; 1adg, 2c, 3bd, 6a, 7, 9bd, 13