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Mathematics 9709/12

Paper 1 Pure Mathematics 1 **October/November 2022**

Question No (2)

2 The first, second and third terms of an arithmetic progression are a, $2a$ and a^2 respectively, where a is a positive constant.

Find the sum of the first 50 terms of the progression.

Solution:

nth term of arithmetic progression

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

sum of n terms of an A.P

$$S_n = \frac{1}{2}[2a + (n-1)d]$$

Given that $a, 2a, a^2$ are first three terms of an A.P.

common difference of two consecutive terms are equal

$\Rightarrow$ second term − first term = third term − second term

$$2a - a = a^2 - 2a$$

$$a^2 - 2a - 2a + a = 0$$

$$a^2 - 4a + a = 0$$

$$a^2 - 3a = 0$$

$$a(a-3) = 0$$

$$a = 0, \quad a - 3 = 0$$

$$a = 0, \quad a = 3$$

$a = 0$ ignore as a is +ve constant.

Therefore first three terms of AP are,

$a, 2a, a^2$

$3, 2(3), (3)^2 \quad \therefore a = 3$

$3, 6, 9$

$\Rightarrow a = 3, \quad d =$ second term $-$ First term

$= 6 - 3$

$d = 3$

$n = 50$

using $S_n = \frac{n}{2}[2a + (n-1)d]$

$= \frac{50}{2}[2 \times 3 + (50-1)3]$

$= 25[6 + (49)(3)]$

$= 25[6 + 147]$

$= 25(153)$

$S_{50} = 2825$