Cambridge International AS & A Level

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Mathematics 9709/12

Paper 1 Pure Mathematics 1 **October/November 2020**

Question No (2)

2 The first, second and third terms of a geometric progression are $2p + 6$, $-2p$ and $p + 2$ respectively, where p is positive.

Find the sum to infinity of the progression.

Solution:

sum to infinity

$$\boldsymbol{S_\infty = \frac{a}{1-r}}$$

$$Given\ Terms\ of\ G.P\ ,$$

$$2p + 6, -2p, \quad p + 2$$

$$First\ Term\ , a = 2p + 6$$

$$Common\ Ratio\ , \quad r = \frac{second\ term}{First\ term} = \frac{-2p}{2p+6}$$

$$sum\ to\ infinity$$

$$S_\infty = \frac{a}{1-r}$$

$$= \frac{2p+6}{1-\left(\frac{-2p}{2p+6}\right)} = \frac{2p+6}{1+\frac{2p}{2p+6}}$$

$$= \frac{2p+6}{\frac{2p+6+2p}{2p+6}}$$

$$S_\infty = \frac{(2p+6)(2p+6)}{4p+6} \quad \rightarrow \ (1)$$

$$As\ consective\ common\ ratio\ are\ equal$$

$$=> \frac{-2p}{2p+6} = \frac{p+2}{-2p}$$

$$(-2p)(-2p) = (p+2)(2p+6)$$

$$4p^2 = 2p^2 + 6p + 4p + 12$$

$$4p^2 - 2p^2 - 10p - 12 = 0$$

$$2p^2 - 10p - 12 = 0$$

$$p^2 - 5p - 6 = 0$$

$$factorize$$

$$p^2 - 6p + p - 6 = 0$$

$$p(p-6) + 1(p-6) = 0$$

$$(p-6)(p+1) = 0$$

$$p - 6 = 0, \qquad p + 1 = 0$$

$$p = 6, -1$$

$$As\ P\ is + ve, So\ p = 6$$

$$put\ P = 6\ in\ equation\ (1)$$

$$S_\infty = \frac{(2 \times 6 + 6)(2 \times 6 + 6)}{4(6) + 6}$$

$$S_\infty = \frac{(18)(18)}{30} = 10.8$$

$$\boldsymbol{S_\infty = 10.8}$$