Mixed Arith Geo Series

0 min
0 marks

1. (a) For taking three ratios of consecutive terms (M1)

$\frac{54}{18} = \frac{162}{54} = \frac{486}{162}$ $(=3)$ A1

hence geometric AG N0

(b) (i) $r = 3$ (A1)

$u_n = 18 \times 3^{n-1}$ A1 N2

(ii) For a valid attempt to solve $18 \times 3^{n-1} = 1062882$ (M1)

eg trial and error, logs

$n = 11$ A1 N2

[6]

2. (a) $u_1 = 7$, $d = 2.5$ (M1)

$u_{41} = u_1 + (n - 1)d = 7 + (41 - 1)2.5$

$= 107$ (A1) (C2)

(b) $S_{101} = \frac{n}{2}[2u_1 + (n-1)d]$

$= \frac{101}{2}[2(7) + (101-1)2.5]$ (M1)

$= \frac{101(264)}{2}$

$= 13332$ (A1) (C2)

[4]

3. $a = 5$

$a + 3d = 40$ (may be implied) (M1)

$d = \frac{35}{3}$ (A1)

$T_2 = 5 + \frac{35}{3}$ (A1)

$= 16\frac{2}{3}$ or $\frac{50}{3}$ or 16.7 (3 sf) (A1) (C4)

[4]

4. For using $u_3 = u_1 r^2 = 8$ (M1)

$8 = 18r^2$ (A1)

$r^2 = \frac{8}{18}\left(=\frac{4}{9}\right)$

$r = \pm\frac{2}{3}$ (A1)(A1)

$S_\infty = \frac{u_1}{1-r}$,

$S_\infty = 54, \frac{54}{5}(=10.8)$ (A1)(A1)(C3)(C3)

[6]

5. (a) $a_1 = 1000$, $a_n = 1000 + (n-1)250 = 10000$ (M1)

$n = \frac{10000 - 1000}{250} + 1 = 37.$

She runs 10 km on the 37th day. (A1)

(b) $S_{37} = \frac{37}{2}(1000 + 10000)$ (M1)

She has run a total of 203.5 km (A1)

[4]

6. (a) For taking an appropriate ratio of consecutive terms (M1)

$r = \frac{2}{3}$ A1 N2

(b) For attempting to use the formula for the n^{th} term of a GP (M1)

$u_{15} = 1.39$ A1 N2

(c) For attempting to use infinite sum formula for a GP (M1)

$S = 1215$ A1 N2

[6]

7. (a) $u_4 = u_1 + 3d$ or $16 = -2 + 3d$ (M1)

$d = \frac{16-(-2)}{3}$ (M1)

$= 6$ (A1) (C3)

(b) $u_n = u_1 + (n-1)6$ or $11998 = -2 + (n-1)6$ (M1)

$n = \frac{11998+2}{6} + 1$ (A1)

$= 2001$ (A1) (C3)

[6]

8. (a) (i) Area B = $\frac{1}{16}$, area C = $\frac{1}{64}$ (A1)(A1)

(ii) $\frac{\frac{1}{16}}{\frac{1}{4}} = \frac{1}{4}$ $\frac{\frac{1}{64}}{\frac{1}{16}} = \frac{1}{4}$ (Ratio is the same.) (M1)(R1)

(iii) Common ratio = $\frac{1}{4}$ (A1) 5

(b) (i) Total area (S_2) = $\frac{1}{4}+\frac{1}{16}=\frac{5}{16}$ = (= 0.3125) (0.313, 3 sf) (A1)

(ii) Required area = S_8 = $\frac{\frac{1}{4}\left(1-\left(\frac{1}{4}\right)^8\right)}{1-\frac{1}{4}}$ (M1)

= 0.333328 2(471...) (A1)

= 0.333328 (6 sf) (A1) 4

Note: *Accept result of adding together eight areas correctly.*

(c) Sum to infinity = $\frac{\frac{1}{4}}{1-\frac{1}{4}}$ (A1)

= $\frac{1}{3}$ (A1) 2

[11]

9. Arithmetic sequence $d = 3$ (may be implied) (M1)(A1)

n = 1250 (A2)

$S = \frac{1250}{2}(3 + 3750)$ $\left(\text{or } S = \frac{1250}{2}(6+1249\times 3)\right)$ (M1)

= 2 345 625 (A1) (C6)

[6]