Arithmetic series Ans

0 min
0 marks

1. (a) The sixth number is 22 (C1)

(b) $u_{200} = 2 + 199 \times 4$ (M1)(A1)(A1)
$= 798$ (A1) (C4)

Note: *Award (A1) for $a = 2$ stated or used, (A1) for $d = 4$ stated or used.*

(c) $S_{90} = \frac{90}{2}(2 \times 2 + 89 \times 4)$ or $\frac{90}{2}(2 + 358)$ (M1)(A1)
$= 16\,200$ (A1) (C3)

[8]

2. (a) $7 + 5d = 22$ (M1)

Note: *Award (M1) for correct substitution in the AP formula. Accept list of numbers as solution.*

$d = 3$ (A1) (C2)

(b) $u_{12} = 7 + 11 \times 3$ (M1)
$= 40$ (A1)(ft) (C2)

Note: *Accept list of numbers.*

(c) $S_{100} = \frac{100}{2}(2 \times 7 + 99 \times 3)$ (M1)

Note: *Award (M1) for correct substitution in the AP formula.*

$= 15550$ (A1)(ft) (C2)

Note: *Accept 15600*

[6]

3. (a) $3 = 57 + (n - 1) \times (-2)$

OR

$57 = 3 + (n - 1) \times (2)$ (A1)(M1)

Note: *Award (A1) for 3* ***or*** *57 seen as u_n, (M1) for correctly substituted formula or list of values seen*

$n = 28$ (A1) (C3)

(b) $S_{28} = \frac{28}{2}(57 + 3)$

OR

$S_{28} = \frac{28}{2}(2(57) + (28 - 1) \times -2)$

OR

$S_{28} = \frac{28}{2}(2(3) + (28 - 1) \times 2)$ (M1)(A1)(ft)

Note: *(A1)(ft) for 28 seen.*
Award (M1) for correctly substituted formula or list of values seen.

$S_{28} = 840$ (A1)(ft) (C3)

[6]

4. (a) $20 = u_1 + 3d$ (A1)

$32 = u_1 + 7d$ (A1)

Note: *Award (A1) for each equation, (A1) for correct answer.*

OR

$d = \frac{32 - 20}{4}$ (A1)(A1)

Note: *Award (A1) for numerator, (A1) for denominator.*

$d = 3$ (A1) (C3)

(b) $\frac{10}{2}(2 \times 11 + 9 \times 3)$ ***or*** $\frac{10}{2}(11 + 38)$ (M1)(A1)(ft)

Note: *Award (M1) for correct substituted formula, (A1) for correct substitution, follow through from their answer to part (a).*

OR

11 + 14 + ... + 38 (M1)(A1)(ft)

Note: *Award (M1) for attempt at the sum of a list, (A1)(ft) for all correct numbers, follow through from their answer to part (a).*

= 245 (A1)(ft) (C3)

[6]

5. (a) $u_1 = d = 1$. (A1)(A1) 2

(b) Sum is $\frac{1}{2}n(2u_1 + d(n-1))$ **or** $\frac{1}{2}n(u_1 + u_n)$ (M1)

Notes: *Award (M1) for either sum formula seen, even without substitution.*

So sum is $\frac{1}{2}n(2+(n-1)) = \frac{1}{2}n(n+1)$ (A1)(AG) 2

Note: *Award (A1) for substitution of $u_1 = 1 = d$ or $u_1 = 1$ and $u_n = n$ with simplification where appropriate.*

$\frac{1}{2}n(n+1)$ *must be seen to award this (A1).*

(c) $\frac{1}{2}(200)(201) = 20100$ (M1)(A1)(G2) 2

Notes: *(M1) is for correct formula with correct numerical input. Original sum formula with u, d and n can be used.*

[6]

6. (a) (i) $u_s = u_1 + 4d = 20$

$u_{12} = u_1 + 11d = 41$ (M1)

Note: *(M1) for both equations correct (or (M1) for $20 + 7d = 41$)*

$7d = 21$

$d = 3$ (A1) (C2)

(ii) $u_1 + 12 = 20$

$u_1 = 8$ (A1)(ft) (C1)

(b) $u_{84} = 8 + (84 - 1)3$

$= 257$ (A1)(ft) (C1)

(c) $S_{200} = 100(16 + 199 \times 3)$ (M1)

$= 61300$ (A1)(ft) (C2)

[6]

7. (a) $4n - 3$ (A1)

(b) 397 (A1)

(c) $S_{100} = \frac{100}{2}[(2 \times 1) + (99 \times 4)]$ or $50(1 + 397)$ (M1)

$= 19\,900$ (A1)

[4]

8. (a) $d = -7$ (A1) (C1)

(b) $S_{50} = \frac{50}{2}(2(124) + 49(-7))$ (M1)

Note: *(M1) for correct substitution.*

$= -2375$ (A1)(ft) (C2)

(c) $124 - 7(k - 1) < 0$ (M1)
$k > 18.7$ *or 18.7 seen* (A1)(ft)
$k = 19$ (A1)(ft) (C3)

Note: *(M1) for correct inequality or equation seen or for list of values seen or for use of trial and error.*

[6]

9. (a) $u_6 = u_1 + 5d = 24$
$u_1 + 5 \times 8 = 24$ (M1)(A1)
$u_1 = 24 - 40$
$= -16$ (A1) (C3)

(b) $S_n = \frac{n}{2}(2 \times -16 + (n - 1)8)$ (M1)(A1)

$600 = \frac{n}{2}(-32 + 8n - 8)$ (A1)

$1200 = -40n + 8n^2$
$150 = -5n + n^2$ (A1)
$(n - 15)(n + 10) = 0$
$n = 15$ or -10 (A1) (C5)

Note: *Not all the steps of working out need to be shown.*

[8]

10. (a) $a = 100 \quad d = 25$
$T_{17} = 100 + (17 - 1) \times 25$ (M1)
$= \$500$ (A1) (C2)

(b) $S_n = \frac{n}{2}(a + l)$

$S_{17} = \frac{17}{2}(100 + 500)$ (M1)

= \$5100 (A1)

Note: *Allow follow through from candidate's answer for T_{17}, which is l*

OR

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

$S_{17} = \frac{17}{2}\{2\times100 + (17 - 1)\times25\}$ (M1)

= \$5100 (A1) (C2)

OR

Table

[4]