

Arithmetic Series Answers

0 min
0 marks

1. (a) attempt to find d (M1)
e.g. $\frac{u_3 - u_1}{2}$, $8 = 2 + 2d$
 $d = 3$ A1 N2 2
- (b) correct substitution (A1)
e.g. $u_{20} = 2 + (20 - 1)3$, $u_{20} = 3 \times 20 - 1$
 $u_{20} = 59$ A1 N2 2
- (c) correct substitution (A1)
e.g. $S_{20} = \frac{20}{2} (2 + 59)$, $S_{20} = \frac{20}{2} (2 \times 2 + 19 \times 3)$
 $S_{20} = 610$ A1 N2 2
2. (a) $d = 3$ (A1)
 evidence of substitution into $u_n = a + (n - 1) d$ (M1)
e.g. $u_{101} = 2 + 100 \times 3$
 $u_{101} = 302$ A1 N3

[6]

(b) correct approach (M1)
e.g. $152 = 2 + (n - 1) \times 3$
 correct simplification (A1)
e.g. $150 = (n - 1) \times 3$, $50 = n - 1$, $152 = -1 + 3n$
 $n = 51$ A1 N2

[6]

3. (a) (i) attempt to set up equations (M1)
 $-37 = u_1 + 20d$ and $-3 = u_1 + 3d$ A1
 $-34 = 17d$
 $d = -2$ A1 N2

(ii) $-3 = u_1 - 6 \Rightarrow u_1 = 3$ A1 N1

(b) $u_{10} = 3 + 9 \times -2 = -15$ (A1)
 $S_{10} = \frac{10}{2} (3 + (-15))$ M1
 $= -60$ A1 N2

[7]

4. (a) $u_1 = 1$, $u_2 = -1$, $u_3 = -3$ A1A1A1 N3

(b) Evidence of using appropriate formula M1
 correct values $S_{20} = \frac{20}{2} (2 \times 1 + 19 \times -2) (= 10(2 - 38))$ A1
 $S_{20} = -360$ A1 N1

[6]

5. (a) $u_1 = S_1 = 7$ (A1) (C1)

(b) $u_2 = S_2 - u_1 = 18 - 7$
 $= 11$ (A1)

$d = 11 - 7$ (M1)

$= 4$ (A1) (C3)

(c) $u_4 = u_1 + (n-1)d = 7 + 3(4)$ (M1)

$u_4 = 19$ (A1) (C2)

[6]

6. $17 + 27 + 37 + \dots + 417$

$17 + (n-1)10 = 417$ (M1)

$10(n-1) = 400$

$n = 41$ (A1)

$S_{41} = \frac{41}{2}(2(17) + 40(10))$ (M1)

$= 41(17 + 200)$

$= 8897$ (A1)

OR

$S_{41} = \frac{41}{2}(17 + 417)$ (M1)

$= \frac{41}{2}(434)$

$= 8897$ (A1) (C4)

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7. $S_5 = \frac{5}{2}\{2 + 32\}$

(M1)(A1)(A1)

$S_5 = 85$ (A1)

OR

$a = 2, a + 4d = 32$ (M1)

$\Rightarrow 4d = 30$

$d = 7.5$ (A1)

$S_5 = \frac{5}{2}(4 + 4(7.5))$ (M1)

$= \frac{5}{2}(4 + 30)$

$S_5 = 85$ (A1) (C4)

[4]

8. (a) $d = 2$

A1 N1

- (b) (i) $5 + 2n = 115$ (A1)
 $n = 55$ A1 N2
- (ii) $u_1 = 7$ (may be seen in above) (A1)
 correct substitution into formula for sum of arithmetic series (A1)
e.g. $S_{55} = \frac{55}{2}(7+115), S_{55} = \frac{55}{2}(2(7)+54(2)), \sum_{k=1}^{55} (5+2k)$
 $S_{55} = 3355$ (accept 3360) A1 N3

[6]

9. (a) common difference is 6 A1 N1
- (b) evidence of appropriate approach (M1)
e.g. $u_n = 1353$
 correct working A1
e.g. $1353 = 3 + (n-1)6, \frac{1353+3}{6}$
 $n = 226$ A1 N2
- (c) evidence of correct substitution A1
e.g. $S_{226} = \frac{226(3+1353)}{2}, \frac{226}{2}(2 \times 3 + 225 \times 6)$
 $S_{226} = 153\,228$ (accept 153\,000) A1 N1

[6]

10. (a) evidence of equation for u_{27} M1
e.g. $263 = u_1 + 26 \times 11, u_{27} = u_1 + (n-1) \times 11, 263 - (11 \times 26)$
 $u_1 = -23$ A1 N1
- (b) (i) correct equation A1
e.g. $516 = -23 + (n-1) \times 11, 539 = (n-1) \times 11$
 $n = 50$ A1 N1
- (ii) correct substitution into sum formula A1
e.g. $S_{50} = \frac{50(-23+516)}{2}, S_{50} = \frac{50(2 \times (-23) + 49 \times 11)}{2}$
 $S_{50} = 12325$ (accept 12300) A1 N1

[6]