

## Level 3 Algebra – Arithmetic Series - Answers

## June 2013 - Question 16

Question	Working	Answer	Mark	Notes
16	(a)(i)	8	3	B1 cao
	(ii)	2652		M1 for $S = \frac{1}{2}n(2a + (n-1)d)$ A1 ft from (i) OR M1 for $S = \frac{1}{2}n(a + l)$ A1 ft from (i)
	OR Last term = $2 + 8 \times 25 = 202$ Sum = $\frac{1}{2} \times 26 \times (2 + 202)$ = $26 \times 102$			
	(b)	-51	3	M1 for writing down 2 simultaneous equations, eg $a + d = 40$ and $a + 5d = 12$ or for $4d = 12 - 40$ A1 for $a = 47, d = -7$ A1 cao
	$a + d = 40$ $a + 5d = 12$ $a = 47, d = -7$ $47 + 14 \times -7$			

## Jan 2014 - Question 16

Question	Working	Answer	Mark	Notes
16	(a)(i)	2	1	B1 cao
	(ii)	5	1	B1 cao
	(b)	$\frac{1}{2}n(5n-1)$	2	M1 for stating or using $S = \frac{1}{2}n(2a + (n-1)d)$ A1 ft for $\frac{1}{2}n(5n-1)$ oe  OR  M1 for stating or using $S = \frac{1}{2}n(a + l)$ and $l = a + (n-1)d$ A1 ft for $\frac{1}{2}n(5n-1)$ oe
	$\frac{1}{2} \times n \times (2 \times 2 + (n-1) \times 5)$ $\frac{1}{2}n(5n-1)$  OR  $\frac{1}{2} \times n \times (2 + 5n - 3)$ = $\frac{1}{2}n(5n-1)$			

## Jan 2015 - Question 14

14	(a)	$2.5n + 0.5$	1	B1 for $2.5n + 0.5$ oe
	(b)	2070	3	B1 for $(n =) 40$ M1 for substituting into $S = \frac{1}{2}n(2a + (n-1)d)$ A1 cao  OR  B1 for $(n =) 40$ M1 for substituting into $S = \frac{1}{2}n(a + l)$ A1 cao
	$a + (n-1)d = 100.5$ $3 + (n-1) \times 2.5 = 100.5$ $n = 40$  $\frac{1}{2} \times 40 \times (2 \times 3 + (40-1) \times 2.5)$  OR  $\frac{1}{2} \times 40 \times (3 + 100.5)$			

## June 2015 - Question 11

11	(a)	$7 + (59 \times 4)$ or $60 \times 4 + 3$	243	2	M1 for complete method e.g $7 + (59 \times 4)$ or $60 \times 4 + 3$ A1 cao
	(b)	$\frac{30}{2}(6 + 29d) = -780$ $6 + 29d = -52$ $29d = -58$ $d = -2$ OR $\frac{30}{2}(3 + (3 + 29d)) = -780$	-2	3	M1 for substitution of $a = 3$ and $n = 30$ and $S = -780$ into a correct sum formula M1 (dep M1) for correct method to isolate terms in $d$ A1 cao

## Jan 2016 - Question 12

Question	Working	Answer	Mark	Notes
12 (a)		$-4n + 104$	2	M1 for $-4n + c$ or $100 + (n - 1) \times -4$ A1 for $-4n + 104$ (If M0, SC B1 for $n = -4n + 104$ on answer line)
(b)	$\frac{50}{2}(2 \times a + (50 - 1) \times 3) = 2500$ $25(2a + 147) = 2500$ $2a + 147 = 100$ $2a = -47$	$-23.5$	3	M1 for stating $S = \frac{n}{2}\{2a + (n - 1)d\}$ oe, may be implied by substitution M1 for $\frac{50}{2}(2 \times a + (50 - 1) \times 3) = 2500$ oe A1 for $-23.5$ oe

## June 2016 - Question 13

Question	Working	Answer	Mark	Notes
13 (a)		9 4	3	M1 for $39 = \frac{3}{2}\{2a + (3 - 1)d\}$ oe or $a + 8d = 41$ oe A1 for $a = 9$ A1 for $d = 4$
(b)		$\frac{n}{2}(1 + 13n)$	3	B1 for $a = 7$ M1 for $\frac{n}{2}\{2 \times "7" + (n - 1) \times "13"\}$ oe or $\frac{n}{2}\{ "7" + 13n - 6\}$ oe A1 for $\frac{n}{2}(1 + 13n)$ or $\frac{13n^2 + n}{2}$

## Jan 2017 - Question 10

10 (a)		$3n + 7$	2	M1 for $3n + c$ or $10 + (n - 1)3$ oe A1 for $3n + 7$ (If M0, SC B1 for $n = 3n + 7$ on answer line)
(b)	$\frac{n}{2}(2 \times 4 + (n - 1) \times 8) > 1000$ $n(8 + 8n - 8) > 2000$ $8n^2 > 2000$ $n^2 > 250$	16	3	M1 for $S = \frac{n}{2}\{2a + (n - 1)d\}$ , may be implied by substitution M1 for isolating terms in $n$ to solve $\frac{n}{2}(2 \times 4 + (n - 1) \times 8) =, > 1000$ A1 cao

## June 2017 - Question 16

16 (a)		40.5	2	M1 for $4.5 + (n - 1) \times 1.5$ oe used, eg $1.5n + 3$ A1 cao
(b)	$\frac{1}{2} \times 40 \times (8 + 39 \times 7)$ $\frac{1}{2} \times 40 \times 281$  OR $\frac{1}{2} \times 40 \times (4 + 277)$ $\frac{1}{2} \times 40 \times 281$	5620	3	B1 for $a = 4$ and $d = 7$ M1 for substituting into $S = \frac{1}{2}n(2a + (n - 1)d)$ A1 cao OR B1 for $a = 4$ and $l = 277$ M1 for substituting into $S = \frac{1}{2}n(a + l)$ A1 cao

## Jan 2018 - Question 14

Question	Working	Answer	Mark	Notes
14 (a)	$202.5 - 51 \times 2.5$	75	2	M1 for substitution of $a = 200$ , $d = -2.5$ , $n = 51$ into $a + (n - 1)d$ oe A1 cao
(b)	$\frac{80}{2}(2a + (80 - 1) \times 10) = 40000$ $40(2a + 790) = 40000$ $2a + 790 = 1000$ $a = 105$	105	3	M1 for $S = \frac{n}{2}\{2a + (n - 1)d\}$ , may be implied by substitution M1 for method to isolate terms in $a$ in $\frac{80}{2}(2a + (80 - 1) \times 10) = 40000$ A1 cao

## June 2018 - Question 15

15	(a)		-13, 520	4	M1 for using $t_n = a + (n-1)d$ , eg $338 = a + (15-1)d$ or $208 = a + (25-1)d$  M1 for eliminating one variable, eg $10d = -130$  M1 substituting into a correct equation to find the other variable, eg $a + 14 \times -13 = 338$  A1 for $a = 520, d = -13$
	(b)		9100	2	M1 for stating $S = \frac{n}{2}\{2a + (n-1)d\}$ oe or $S = \frac{n}{2}\{a + l\}$ , may be implied by substitution  A1 for 9100 or ft from (a)

## Jan 2019 - Question 7

Question	Working	Answer	Mark	Notes
7 (a)		-471	2	M1 for $a + (n-1)d$ oe ( may be seen with substituted values), eg $24 + 99 \times -5$ or $29 + 100 \times -5$ A1 cao
(b)		-94 700	2	M1 for substitution into $\frac{1}{2}n(2a + (n-1)d)$ or $\frac{1}{2}n(a + l)$ eg $\frac{1}{2} \times 200(2 \times 24 + (200-1) \times -5)$ or $\frac{1}{2} \times 200(24 + -971)$ A1 cao

## June 2019 - Question 21

Question	Working	Answer	Mark	Notes
21 (a)		$17k + 34$	3	M1 for finding the difference of $2k + 3$ , may be seen separately or $17k$ or $34$ M1 (dep M1) for a complete method A1 for $17k + 34$ oe
(b)		2650	3	B1 for using $n = 50, a = 4$ and $d = 2$ or $n = 50, a = 4$ and $l = 102$ M1 for using $S = \frac{n}{2}\{2a + (n-1)d\}$ or $S = \frac{n}{2}\{a + l\}$ , may be implied by substitution A1 cao

## Jan 2020 - Question 11

Question	Working	Answer	Mark	Notes
11 (a)		74 400	2	M1 for substitution into $\frac{1}{2}n(2a + (n-1)d)$ or $\frac{1}{2}n(a + l)$ eg $\frac{1}{2} \times 120(2 \times 25 + (120-1) \times 10)$ or $\frac{1}{2} \times 120(25 + 1215)$ A1 cao
(b)		99	3	M1 for setting up an equation or inequality, eg $25 + (n-1) \times 10 = 1000$ or $10n + 15 = 1000$ M1(dep M1) for $n = 98.5$ A1 cao

## Jan 2021 - Question 16

16	(a)		114	2	M1 for use of $a = 6$ and $d = 12$ in $a + (n-1)d$ oe or $12n-6$ A1 cao
	(b)		1670	3	B1 for stating or using values of $a$ and $d$ or $a$ and $l$ eg $a = -2$ and $d = 9$ or $a = -2$ and $l = 169$ M1 for using $S = \frac{n}{2}\{2a + (n-1)d\}$ or $S = \frac{n}{2}\{a + l\}$ , may be implied by substitution A1 cao

## Jan 2022 - Question 11

11	(a)		-202	2	M1 for substitution into $a + (n-1)d$ eg $-2 + (51-1) \times -4$ or substitution into $n$ th term eg $-4 \times 51 + 2$ A1 cao
	(b)		-5202	3	M1 for $\frac{1}{2}n(2a + (n-1)d)$ or $\frac{1}{2}n(a+l)$ M1 for substitution, eg $\frac{1}{2} \times 51 \times (2 \times -2 + (51-1) \times -4)$ A1 cao

## June 2022 - Question 11

Question	Working	Answer	Mark	Notes
11 (a)		$7n-3$	2	M1 for $a + (n-1)d$ oe ( may be seen with substituted values) eg $4 + 7(n-1)$  A1 cao
(b)		15	1	B1 cao
(c)		35 050	2	M1 for substitution into $\frac{1}{2}n(2a + (n-1)d)$ , eg $\frac{1}{2} \times 100(2 \times 4 + (100-1) \times 7)$ or for substitution into $\frac{1}{2}n(a+l)$ , eg $\frac{1}{2} \times 100(4 + 697)$ A1 cao

## Jan 2023 - Question 9

Question	Working	Answer	Mark	Notes
9 (a)	$a = 4, d = 10, n = 100$	994	2	M1 for $a + (n-1)d$ oe ( may be seen with substituted values) eg $10n-6$ A1 cao
(b)	$a = 4, d = 10, n = 100,$ $l = 994$ from (a)	49900	2	M1 for using $S = \frac{n}{2}\{2a + (n-1)d\}$ or $S = \frac{n}{2}\{a + l\}$ , may be implied by substitution, ft value for $l$ from part (a) A1 cao
(c)	$a = 3, n = 10, u_{10} = 102$	11	2	M1 for using an equation e.g. $a + (n-1)d = 102$ with at least one of $a$ or $n$ substituted and no incorrect substitution A1 cao

## June 2023 - Question 14

14	(a)		950	2	M1 for substitution into $a + (n-1)d$ oe eg $-50 + (51-1)20$  A1 cao
	(b)		15	3	M1 for use of $\frac{1}{2}n[2a + (n-1)d]$ or use of $\frac{1}{2}n(a+l)$  M1(dep M1) for setting up a correct equation in $a$ , eg $\frac{1}{2} \times 200(2 \times a + (200-1) \times 2) = 42800$  A1 cao

## Jan 2024 - Question 11

Question	Working	Answer	Mark	Notes
11 (a)		$5n + 1$	2	M1 for $a + (n - 1)d$ oe ( may be seen with substituted values) eg $6 + 5(n - 1)$ or for $5n + c, c \neq 1$  A1 cao
(b)		24	1	B1 cao
(c)		25 856	2	M1 for substitution into $\frac{1}{2}n(2a + (n - 1)d)$ eg $\frac{1}{2} \times 101(2 \times 6 + (101 - 1) \times 5)$ or for substitution into $\frac{1}{2}n(a + l)$ with $l = 6 + 100 \times 5$ eg $\frac{1}{2} \times 101(6 + 506)$ A1 cao