Name: _____

# IGCSE (9–1) Maths new topics: Sequences

**Date:**

**Time:** 50 minutes

**Total marks available:** 41

**Total marks achieved:** _____

**[Awards]**

**Q1.** Here are the first four terms of an arithmetic sequence.

8 11 14 17

(*a*) Write an expression, in terms of *n*, for the *n*th term of this sequence.

**(2)**

(*b*) Find the difference between the 62nd term and the 63rd term of this sequence.

**(1)**

(*c*) Find the sum of the first 20 terms of this sequence.

**(2)**

**(Total 5 marks)**

**[Awards]**

**Q2.** The *n*th term of an arithmetic series is $5n - 3$

(*a*) (i) Find the first term of this series.

(ii) Find the common difference of this series.

**(2)**

(*b*) Find an expression, in terms of *n*, for the sum of the first *n* terms of this series.

**(2)**

**(Total 4 marks)**

**[Awards]**

**Q3.** Here are the first five terms of an arithmetic series.

3 5.5 8 10.5 13

(*a*) Write down an expression, in terms of *n*, for the *n*th term of this series.

**(1)**

100.5 is a term in this series.

(*b*) Work out the sum of all the terms in this series up to and including 100.5

**(3)**

**(Total 4 marks)**

**[Awards]**

**Q4.** The first term of an arithmetic series is 4
The sum of the first 40 terms is 2500

Work out the common difference of the series.

**(Total 3 marks)**

**Q5.** The 4th term of an arithmetic series is 17
The 10th term of the same arithmetic series is 35

Find the sum of the first 50 terms of this arithmetic series.

**(Total 5 marks)**

**[Awards]**

**Q6.** The sum of the first two terms of an arithmetic series is 47.
The thirtieth term of this series is −62

(*a*) Find the first term of the series and the common difference.

First term .....

Common difference .....

**(3)**

(*b*) The sum of the first 60 terms of the series.

**(2)**

**(Total 5 marks)**

**[Awards]**

**Q7.** (*a*) The first term of an arithmetic series is 100
The common difference of the series is −4

Find an expression, in terms of *n*, for the *n*th term of this series.
Give your answer in its simplest form.

**(2)**

(*b*) The common difference of a different arithmetic series is 3
The sum of the first 50 terms of this series is 2500

Find the first term of this series.

**(3)**

**(Total 5 marks)**

**[Awards]**

**Q8.** The first term of an arithmetic series is 7.
The common difference is 4.

(*a*) Find the 60th term of this series.

**(2)**

The first term of a different arithmetic series is 3.
The sum of the first 30 terms of this series is −780.

(*b*) Work out the common difference of this series.

**(3)**

**(Total 5 marks)**

**[Awards]**

**Q9.** The first term of an arithmetic series is 5
The common difference of the same series is 2.5

(*a*) Work out the 100th term of this series.

**(2)**

The common difference of a different arithmetic series is −5
The sum of the first 40 terms of this arithmetic series is 6100

(*b*) Work out the first term of this series.

**(3)**

**(Total 5 marks)**

## Mark Scheme

### Q1.

| PAPER: AAL30_01 | | | | |
|---|---|---|---|---|
| **Question** | **Working** | **Answer** | **Mark** | **Notes** |
| (a) | | $3n + 5$ | 2 | M1 for $3n + c$<br>A1 for $3n + 5$ oe<br>(If M0, SC B1 for $n = 3n + 5$ oe) |
| (b) | | 3 | 1 | B1 cao |
| (c) | $\frac{20}{2}(2 \times 8+19 \times 3)$<br>OR<br>$\frac{20}{2}(8 + 65)$ | 730 | 2 | M1 for $\frac{n}{2}\{2a + (n - 1)d\}$ or $\frac{n}{2}\{a + l\}$ or correct substitution into the formula<br>A1 cao |

### Q2.

| PAPER: AAL30_01 | | | | |
|---|---|---|---|---|
| **Question** | **Working** | **Answer** | **Mark** | **Notes** |
| (a)(i) | | 2 | 1 | B1 cao |
| (ii) | | 5 | 1 | B1 cao |
| (b) | $\frac{1}{2} \times n \times (2 \times 2 + (n - 1) \times 5)$<br>$\frac{1}{2}n(5n - 1)$<br>OR<br>$\frac{1}{2} \times n \times (2 + 5n - 3) = \frac{1}{2}n(5n - 1)$ | $\frac{1}{2}n(5n - 1)$ | 2 | M1 for stating or using $S = \frac{1}{2}n(2a + (n - 1)d)$<br>A1 ft for $\frac{1}{2}n(5n - 1)$ oe<br>OR<br>M1 for stating or using $S = \frac{1}{2}n(a + l)$ and $l = a+(n-1)$<br>A1 ft for $\frac{1}{2}n(5n - 1)$ oe |

**Q3.**

| Question | | Working | Answer | Mark | Notes |
|---|---|---|---|---|---|
| | (a) | | $2.5n + 0.5$ | 1 | B1 for $2.5n + 0.5$ oe |
| | (b) | $a + (n - 1)d = 100.5$<br>$3 + (n - 1) \times 2.5 = 100.5$<br>$n = 40$<br><br>$½ \times 40 \times (2 \times 3 + (40 - 1) \times 2.5)$<br><br>OR<br><br>$½ \times 40 \times (3 + 100.5)$ | 2070 | 3 | B1 for ($n$ =) 40<br>M1 for substituting into $S = ½n(2a + (n - 1)d)$<br>A1 cao<br><br>OR<br><br>B1 for ($n$ =) 40<br>M1 for substituting into $S = ½n(a + l)$<br>A1 cao |

**Q4.**

| PAPER: AAL30_01 | | | | |
|---|---|---|---|---|
| **Question** | **Working** | **Answer** | **Mark** | **Notes** |
| | $\frac{40}{2}(2 \times 4 + 39 \times d) = 2500$<br>$20(8 + 39d) = 2500$<br>$8 + 39d = 125$<br>$39d = 117$<br>$d = 3$ | 3 | 3 | M1 for use of a correct formula for the sum<br>M1 for establishing a correct equation in $d$<br>A1 cao |

**Q5.**

| Question | Working | Answer | Mark | AO | Notes | |
|---|---|---|---|---|---|---|
| | $a + 3d = 17$ or $a + 9d = 35$ or | | | AO1 | M1 | M1 for $17 = 4p + q$ **and** $35 = 10p + q$ |
| | $35 - 17 = 6d$ | | | | A1 | $p = 3$ and $q = 5$ |
| | $d = 3$ | | | | A1 ft from $d = 3$ | $u_1 = 8$ and $u_{50} = 155$ |
| | $a = 8$ | | | | M1 | $\frac{1}{2} \times 50(8 + 155)$ |
| | $\frac{50}{2}(2 \times '8' + (50 - 1)'3')$ oe | 4075 | 5 | | A1 | |

**Q6.**

| Award in Algebra_AAL30 | | | | | |
|---|---|---|---|---|---|
| **Question** | | **Working** | **Answer** | **Mark** | **Notes** |
| | (a) | $2a+d=47$<br>$a+29d=-62$<br>$2a+d=47$<br>$2a+58d=-124$<br>$57d=-171$ $d=-171\div57$<br>$2a-3==47$ $2a=50$ | $a=25$<br>$d=-3$ | 3 | M1 for establishing $2a+d=47$ and $a+29d=-62$<br>M1 for solving to find $d$ (or $a$)<br>A1 for substituting to find $a$ (or $d$) |
| | (b) | S = 30 (2 × "25" + 59 × "–3") | –3810 | 2 | M1 for substituting into S = $\frac{1}{2}n(2a+(n-1)d)$<br>A1 |

**Q7.**

| AAL30_01 January 2016 Level 3 | | | | |
|---|---|---|---|---|
| **Question** | **Working** | **Answer** | **Mark** | **Notes** |
| (a) | | $-4n+104$ | 2 | M1 for $-4n$ + c or $100+(n-1)\times-4$<br>A1 for $-4n+104$<br>(If M0, SC B1 for $n=-4n+104$ on answer line ) |
| (b) | $\frac{50}{2}(2\times a+(50-1)\times3)=2500$<br>$25(2a+147)=2500$<br>$2a+147=100$<br>$2a=-47$ | –23.5 | 3 | M1 for stating $S=\frac{n}{2}\{2a+(n-1)d\}$ oe, may be implied by substitution<br>M1 for $\frac{50}{2}(2\times a+(50-1)\times3)=2500$ oe<br>A1 for –23.5 oe |

**Q8.**

| PAPER: AAL30_01 | | | | |
|---|---|---|---|---|
| **Question** | **Working** | **Answer** | **Mark** | **Notes** |
| (a) | $7 + (59 \times 4)$ or $60 \times 4 + 3$ | 243 | 2 | M1 for complete method e.g $7 + (59 \times 4)$ or $60 \times 4 + 3$<br>A1 cao |
| (b) | $\frac{30}{2}(6 + 29d) = -780$<br>$6 + 29d = -52$<br>$29d = -58$<br>$d = -2$<br>OR<br>$\frac{30}{2}(3 + (3 + 29d)) = -780$ | −2 | 3 | M1 for substitution of $a = 3$ and $n = 30$ and<br>$S = -780$ into a correct sum formula<br>M1 (dep M1) for correct method to isolate terms in $d$<br>A1 cao |

**Q9.**

| PRACTICE PAPER | | | | | |
|---|---|---|---|---|---|
| **Question** | | **Working** | **Answer** | **Mark** | **Notes** |
| | (a) | $5 + 99 \times 2.5$ | 252.5 | 2 | M1 for substituting into $a + (n - 1)d$, e.g. $5 + 99 \times 2.5$<br>A1 cao |
| | (b) | 6100<br>$= ½ \times 40 \times (2a + 39 \times -5)$ | 250 | 3 | M1 for using $d = -5$, $S = 6100$, $n = 40$<br>M1 for substituting into $S = ½n(2a + (n - 1)d)$ or for substituting into $S = ½n(a + l)$,<br>e.g. $6100 = ½ \times 40 \times (2a + 39 \times -5)$<br>A1 cao |