# 2.3 Algebra: Sequences and Graphs: Test Pack

Calculator allowed · about 60 minutes

Name: _____ Date: ____ / ____ / _____

**Answer ALL questions. Show all your working.**

**1** For each sequence, write down the next two terms and describe the term-to-term rule.

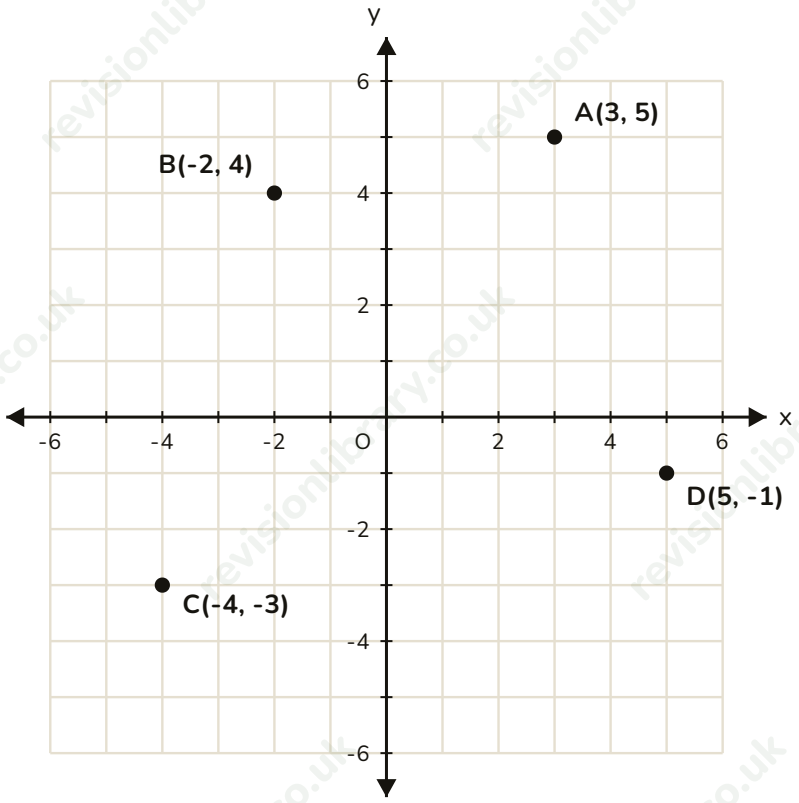
**(a)** 3, 7, 11, 15, ... **(2)**

**(b)** 800, 400, 200, 100, ... **(2)**

**(c)** 2, 5, 11, 23, 47, ... **(2)**


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**2** Four points are given: A(3, 5), B(-2, 4), C(-4, -3), D(5, -1).




**(a)** State which quadrant point A lies in. **(1)**

**(b)** State which quadrant point C lies in. **(1)**

**(c)** Write down the coordinates of the reflection of point B in the y-axis. **(1)**

.....

**(d)** M is the midpoint of A and D. Find the coordinates of M. **(2)**

.....


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**3** A straight line has equation $y = 3x + 2$. Write down the gradient of the line.

**(1)**

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**4** A pattern of pentagons is made from straws. Pattern 1 uses 5 straws, Pattern 2 uses 9 straws and Pattern 3 uses 13 straws (each new pentagon shares one straw with the previous one).

**(a)** Write down the number of straws in Pattern 4. **(1)**

.....

**(b)** Find an expression, in terms of n, for the number of straws in Pattern n. **(2)**

.....

**(c)** Priya has 100 straws. By forming an inequality, find the largest pattern number she can build. **(2)**

.....

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**5** Here are the first five terms of an arithmetic sequence.
6, 9, 12, 15, 18
Find an expression for the nth term.

**(2)**

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**6** Complete a table of values for $y = -5x$ for $x = -3$, $x = 2$ and $x = 5$.

**(2)**


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**7** Here are the first five terms of an arithmetic sequence.
-5, -7, -9, -11, -13
Find an expression for the nth term.

**(2)**

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**8** The nth term of a sequence is 6n - 1.
Write down the first three terms of the sequence.

**(2)**


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**9** The first term of a sequence is 3 and each term is found by adding 4 to the previous term. Write down the first four terms.

**(2)**

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**10** A quadratic sequence has nth term of the form $an^2 + b$. The sequence is 3, 6, 11, 18, 27, ...

**(a)** Show that the second difference of the sequence is 2. **(2)**

**(b)** Hence find the value of a. **(1)**

.....

**(c)** Find the value of b. **(2)**

.....

**(d)** Find an expression for the nth term of the sequence. **(1)**

.....

**(e)** Use your expression to work out the 15th term of the sequence. **(2)**

.....


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**11** A plumber charges a call-out fee plus an hourly rate. The total charge, C pounds, for a job lasting h hours is modelled by C = 35h + 60.

**(a)** Write down the call-out fee (the fixed charge before any hours are worked). **(1)**

.....

**(b)** Write down the hourly rate charged. **(1)**

.....

**(c)** Calculate the total charge for a job lasting 3.5 hours. **(2)**

.....

**(d)** A customer is charged £235 for a job. Work out how many hours the job lasted. **(2)**

.....

**(e)** A second plumber charges according to the sequence of costs for whole numbers of hours: 90, 120, 150, 180, ... (for h = 1, 2, 3, 4 hours). By finding the nth term of this sequence, write down an equation for the second plumber's charge, C pounds, in terms of h hours, and state which plumber is cheaper for a 6-hour job. **(4)**


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# Mark scheme · 2.3 Algebra: Sequences and Graphs: Test Pack

## Question 1

(a) correct next two terms 19 and 23 **B1**

(a) correct rule stated, oe (add 4 each time) **B1**

(a) Answer: **19, 23; rule: add 4 to the previous term**

(b) correct next two terms 50 and 25 **B1**

(b) correct rule stated, oe (divide by 2 / halve each time) **B1**

(b) Answer: **50, 25; rule: divide the previous term by 2**

(c) correct next two terms 95 and 191 **B1**

(c) correct rule stated, oe (multiply the previous term by 2 and add 1) **B1**

(c) Answer: **95, 191; rule: multiply the previous term by 2, then add 1**

## Question 2

(a) first quadrant (oe top right, both coordinates positive) **B1**

(a) Answer: **First quadrant**

(b) third quadrant (oe bottom left, both coordinates negative) **B1**

(b) Answer: **Third quadrant**

(c) (2, 4) cao **B1**

(c) Answer: **(2, 4)**

(d) correct method, e.g. ((3+5)/2, (5+(-1))/2) **M1**

(d) (4, 2) cao **A1**

(d) Answer: **(4, 2)**

## Question 3

3 cao **B1**

Answer: **3**

## Question 4

(a) 17 cao **B1**

(a) Answer: **17**

(b) common difference of 4 identified and used **M1**

(b) 4n + 1 oe **A1**

(b) Answer: **4n + 1**

(c) correct inequality, e.g. $4n + 1 \leq 100$ **M1**

(c) n = 24 cao **A1**

(c) Answer: **Pattern 24**

## Question 5

common difference 3 identified (or 3n in the expression) **M1**

3n + 3 cao **A1**

Answer: **nth term = 3n + 3**

## Question 6

at least one value of y correct **M1**

all three values correct **A1**

Answer: **x = -3: y = 15, x = 2: y = -10, x = 5: y = -25**

## Question 7

common difference -2 identified (or -2n in the expression) **M1**

-2n - 3 cao **A1**

Answer: **nth term = -2n - 3**

## Question 8

substitutes n = 1, 2 or 3 correctly for at least one term **M1**

5, 11, 17 cao **A1**

Answer: **5, 11, 17**

## Question 9

applies the term-to-term rule correctly at least once **M1**

3, 7, 11, 15 cao **A1**

Answer: **3, 7, 11, 15**

## Question 10

(a) first differences 3, 5, 7, 9 found **M1**

(a) cso: second differences shown to be 2, 2, 2, confirming a constant second difference of 2 **A1**

(a) Answer: **Second difference = 2 (shown)**

(b) a = 1 **B1**

(b) Answer: **a = 1**

(c) substitution into $n^2 + b$ using a known term, e.g. 1 + b = 3 **M1**

(c) b = 2 **A1**

(c) Answer: **b = 2**

(d) $n^2 + 2$ oe, ft **B1**

(d) Answer: **$n^2 + 2$**

(e) substitution of n = 15 into their expression **M1**

(e) 227 cao **A1**

(e) Answer: **227**

## Question 11

(a) £60 **B1**

(a) Answer: **£60**

(b) £35 per hour **B1**

(b) Answer: **£35 per hour**

(c) correct substitution 35 x 3.5 + 60 **M1**

(c) £182.50 cao **A1**

(c) Answer: **£182.50**

(d) correct equation 235 = 35h + 60 rearranged **M1**

(d) h = 5 hours cao **A1**

(d) Answer: **5 hours**

(e) common difference of 30 identified **M1**

(e) first term used to find constant term of 60, e.g. 30(1) + 60 = 90 **M1**

(e) C = 30h + 60 oe **A1**

(e) correct comparison: second plumber charges £240 versus first plumber's £270 for 6 hours, so the second plumber is cheaper **A1**

(e) Answer: **C = 30h + 60; the second plumber is cheaper for a 6-hour job (£240 vs £270)**


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