2.3 Algebra: Sequences and Graphs: 1-hour Pack

Calculator allowed · about 60 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 A sequence starts 40, 35, 30, 25, ... Write down the next term.

(1)

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2 The nth term of a sequence is 5n - 2. Work out the 1st term.

(1)

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3 A straight line has equation y = 3x + 2. Write down the y-intercept of the line.

(1)

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4 Work out the gradient of the line that passes through (0, 0) and (2, 8).

(1)

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5 Priya opens a savings account with £50. She then pays in £15 at the end of each month (no interest is paid).

(a) Write down the amount in the account at the end of month 1, month 2 and month 3. **(1)**

.....

(b) Find an expression for the amount, A pounds, in the account at the end of month n. **(2)**

.....

(c) Work out the amount in the account at the end of month 12. **(1)**

.....

(d) Work out after how many months the amount in the account will first exceed £300. **(2)**

.....

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6 Here are the first five terms of an arithmetic sequence.
17, 24, 31, 38, 45
Find an expression for the nth term.

(2)

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7 The nth term of a sequence is 6n + 9.
Work out the 27th term.

(2)

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8 Here are the first five terms of an arithmetic sequence.
13, 5, -3, -11, -19
Find an expression for the nth term.

(2)

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9 A straight line has gradient 6 and passes through the point (5, 24). Find the equation of the line.

(3)

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10 Complete a table of values for $y = 3x + 2$ for $x = -2$, $x = -1$ and $x = 3$.

(2)

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11 Here are the first five terms of an arithmetic sequence.
-4, -2, 0, 2, 4
Find an expression for the nth term.

(2)

---

12 A straight line has equation $2y = 2x + 8$.
Write down (a) the gradient (b) the y-intercept.

(2)

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13 A pattern uses 8 matchsticks in pattern number 1, 12 in pattern number 2 and 16 in pattern number 3, and continues in the same way.
How many matchsticks are needed for pattern number 15?

(3)

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14 The nth term of a sequence is 4n + 3.
Is 139 a term of this sequence? Show your working.

(3)

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15 Find an expression, in terms of n, for the nth term of each sequence.

(a) 5, 9, 13, 17, ... **(2)**

.....

(b) 2, 8, 14, 20, ... **(2)**

.....

(c) 30, 25, 20, 15, ... **(2)**

.....

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16 A sequence has nth term 4n - 3.

(a) Work out the first three terms of the sequence. **(1)**

(b) Determine whether 100 is a term in this sequence. You must show your working. **(2)**

(c) Work out the smallest term in the sequence that is greater than 200. **(2)**

17 Two graphs are drawn. Graph P has equation $y = 3x + 4$. Graph Q has equation $y = x^2 + 4$.

(a) State the value of y for each graph when x = 0. What do you notice? **(1)**

(b) Work out the value of y on each graph when x = 5. **(2)**

(c) Explain why Graph Q increases more quickly than Graph P for large positive values of x. **(1)**

(d) State whether Graph Q is a straight line or a curve, giving a reason. **(1)**

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Mark scheme · 2.3 Algebra: Sequences and Graphs: 1-hour Pack

Question 1

20 cao — B1

Answer: **20**

Question 2

3 cao — B1

Answer: **3**

Question 3

2 cao — B1

Answer: **2**

Question 4

4 cao — B1

Answer: **4**

Question 5

(a) 65, 80, 95 all correct — B1

(a) Answer: **£65, £80, £95**

(b) common difference of 15 identified and used — M1

(b) A = 15n + 50 oe — A1

(b) Answer: **A = 15n + 50**

(c) £230 ft from their expression in part (b) — B1

(c) Answer: **£230**

(d) correct inequality, e.g. 15n + 50 > 300 — M1

(d) 17 months cao — A1

(d) Answer: **17 months**

Question 6

common difference 7 identified (or 7n in the expression) — M1

7n + 10 cao — A1

Answer: **nth term = 7n + 10**

Question 7

substitutes n = 27: 6 x 27 + 9 — M1

171 cao — A1

Answer: **171**

Question 8

common difference -8 identified (or -8n in the expression) — M1

-8n + 21 cao — A1

Answer: **nth term = -8n + 21**

Question 9

y = 6x + c with (5, 24) substituted — M1

c = -6 found — M1

y = 6x - 6 cao — A1

Answer: **y = 6x - 6**

Question 10

at least one value of y correct — M1

all three values correct — A1

Answer: **x = -2: y = -4, x = -1: y = -1, x = 3: y = 11**

Question 11

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

2n - 6 cao — A1

Answer: **nth term = 2n - 6**

Question 12

(a) 1 — B1

(b) 4 — B1

Answer: **(a) 1, (b) 4**

Question 13

identifies the common difference 4 — M1

nth term 4n + 4 or continues the pattern correctly — M1

64 cao — A1

Answer: **64**

Question 14

4n + 3 = 139 written as an equation — M1

solves to get n = 34 — M1

Yes, it is the 34th term — A1

Answer: **Yes, it is the 34th term**

Question 15

(a) common difference of 4 identified and used — M1

(a) 4n + 1 oe — A1

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

(b) common difference of 6 identified and used — M1

(b) 6n - 4 oe — A1

(b) Answer: **6n - 4**

(c) common difference of -5 identified and used — M1

(c) 35 - 5n oe — A1

(c) Answer: **35 - 5n**

Question 16

(a) 1, 5, 9 all correct — B1

(a) Answer: **1, 5, 9**

(b) correct equation 4n - 3 = 100 solved (n = 25.75) — M1

(b) correct conclusion that 100 is not a term, with reason (n is not a whole number) — A1

(b) Answer: **No, 100 is not a term (n = 25.75)**

(c) correct inequality 4n - 3 > 200 solved (n > 50.75) — M1

(c) 201 cao — A1

(c) Answer: **201**

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Question 17

(a) both equal to 4 identified, with correct observation that the graphs share the same y-intercept (0, 4) **B1**

(a) Answer: **Both give y = 4; the graphs have the same y-intercept, (0, 4)**

(b) Graph P: 19 **B1**

(b) Graph Q: 29 **B1**

(b) Answer: **Graph P: 19; Graph Q: 29**

(c) correct explanation referencing the x^2 term causing Q to grow faster than the constant gradient of P for large x **B1**

(c) Answer: **Graph Q has an x^2 term, so as x increases its y-values grow at an increasing rate, whereas Graph P increases at a constant rate (gradient 3)**

(d) curve, with reason that it contains an x^2 term so is not of the form y = mx + c **B1**

(d) Answer: **Graph Q is a curve, because it contains an x^2 term and so is not a straight line of the form y = mx + c**

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