



KS2.M-Y6N6 Algebra: Formulae, Sequences and Equations

Calculators not allowed · about 60 minutes

Total Marks

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Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

- 1** Write the next number in this sequence: 7, 10, 13, 16, ...

(1)

- 2** The rule for a sequence is "start at 4, then add 5 each time". Write the first five terms of this sequence.

(2)

- 3** Find the rule of the sequence and write the next term: 12, 9, 6, 3, ...

(2)

- 4** Complete the function machine. Input $\rightarrow$ multiply by 3 $\rightarrow$ add 4 $\rightarrow$ output.
What is the output when the input is 5?

(2)

- 5** A formula gives the perimeter P of a rectangle: $P = 2(l + w)$. Lila has a rectangle with length 7 cm and width 3 cm. Use the formula to find the perimeter.

(3)

- 6** The n th term of a sequence is $6n - 2$. Find the 5th term.

(2)

- 7** Complete these equations. $a + 8 = 21$. Find a .
Then solve: $5b = 45$. Find b .

(2)

- 8** Sofia writes a rule: Take a number, subtract 6, then double the result. For input 10 she gets output 8. Check whether Sofia is correct and explain your answer.

(2)

- 9** Write an equation for this word rule and then solve it: Three times a number minus 4 equals 11.

(2)

- 10** A sequence starts 2, 5, 8, 11, ...
(a) What is the rule? (b) What is the 12th term?

(2)

- 11** Explain why the n th term $4n + 1$ always gives an odd number. Give a short written explanation.

(3)

- 12** Fill in the missing number: $n + 7 = 19$. Find n .

(1)

- 13** The rule is: multiply by 2 then subtract 5. What is the output when the input is 9?

(2)

- 14** Solve this equation: $4 + 3x = 19$. Find x .

(2)

- 15** A sequence is 5, 10, 20, 40. Explain whether this is an arithmetic sequence. Give a short explanation.

(2)

16 Find the n th term for the sequence 2, 5, 8, 11, ... Then find the 20th term.

(2)

17 Frank uses the formula $A = l + w$ to find the area of a rectangle with length 6 m and width 4 m. Is Frank correct? Explain your answer.

(2)

18 Solve the equation $n/4 + 3 = 10$. Find n .

(2)

Mark scheme · KS2.M-Y6N6 Algebra: Formulae, Sequences and Equations

Question 1

- **B1** 19 cao
- Answer: **19**

Question 2

- **B1** first three terms correct oe
- **B1** all five terms correct cao
- Answer: **4, 9, 14, 19, 24**

Question 3

- **B1** rule subtract 3 each time or -3 oe
- **B1** next term 0 cao
- Answer: **0**

Question 4

- **M1** correct method shown $5 \times 3 = 15$ and $15 + 4 = 19$
- **A1** 19 cao
- Answer: **19**

Question 5

- **M1** substitution seen: $l + w = 7 + 3$ or equivalent
- **M1** $2 \times (10) = 20$ or equivalent working
- **A1** 20 cm cao
- Answer: **20 cm**

Question 6

- **M1** substitution $n = 5$ seen giving $6 \times 5 - 2$
- **A1** 28 cao
- Answer: **28**

Question 7

- **B1** $a = 13$ cao
- **B1** $b = 9$ cao
- Answer: **$a = 13$; $b = 9$**

Question 8

- **M1** correct method: $(10 - 6) \times 2 = 4 \times 2 = 8$ or equivalent
- **A1** Yes; output is 8 with brief explanation cao
- Answer: **Yes. $(10 - 6) \times 2 = 8$**

Question 9

- **M1** equation $3x - 4 = 11$ or equivalent
- **A1** $x = 5$ cao
- Answer: **$3x - 4 = 11$; $x = 5$**

Question 10

- **M1** rule add 3 each time or nth term $3n - 1$ seen
- **A1** 12th term $3 \times 12 - 1 = 35$ cao
- Answer: **Rule: add 3; 12th term = 35**

Question 11

- **M1** states $4n$ is even (because $4 \times n$ is multiple of 2) or equivalent
- **M1** adds 1 to even number gives odd (link made to $4n + 1$)
- **A1** clear conclusion that $4n + 1$ is odd for any integer n cao
- Answer: **Because $4n$ is always even ($4n = 2 \times 2n$). Adding 1 to an even number gives an odd number, so $4n + 1$ is always odd.**

Question 12

- **B1** $n = 12$ cao
- Answer: **12**

Question 13

- **M1** method: $9 \times 2 = 18$ then $18 - 5$
- **A1** 13 cao
- Answer: **13**

Question 14

- **M1** shows $3x = 15$ or equivalent
- **A1** $x = 5$ cao
- Answer: **$x = 5$**

Question 15

- **B1** states it is not arithmetic (differences are not equal) or equivalent
- **B1** gives reason eg differences 5, 10, 20 are not constant; sequence is geometric with $\times 2$
- Answer: **No. The differences are 5, 10 and 20 so they are not constant; it is a geometric sequence multiplying by 2.**

Question 16

- **M1** n th term identified as $3n - 1$ or equivalent
- **A1** 20th term = $3 \times 20 - 1 = 59$ cao
- Answer: **n th term = $3n - 1$; 20th term = 59**

Question 17

- **M1** states formula is incorrect and gives correct formula $A = l \times w$ or equivalent
- **A1** brief explanation e.g. $A = 6 \times 4 = 24 \text{ m}^2$ and not $l + w$ cao
- Answer: **No. Area = $l \times w$, so $A = 6 \times 4 = 24 \text{ m}^2$; using $l + w$ is incorrect.**

Question 18

- **M1** shows $n/4 = 7$ or equivalent
- **A1** $n = 28$ cao
- Answer: **28**