



1 Here is the sequence of odd numbers.

1 3 5 7 9 ...

- Write down the two odd numbers that come after 23.
- Write down the 10th even number.
- Kai says, "The 20th odd number is 40." Explain why Kai is wrong.

(3 marks)

a)

$$23 + 2 = 25, 25 + 2 = 27$$

25 and 27

b)

$$n\text{th even number} = 2n$$

$$2 \times 10 = 20$$

20

c)

40 is even, so it cannot be an odd number

$$n\text{th odd number} = 2n - 1$$

$$2 \times 20 - 1 = 39$$

The 20th odd number is 39

2 $T = 4x + 3y$

Work out the value of T when $x = 5$ and $y = 2$.

(2 marks)

Substitution means replacing each letter with its given value. Numbers next to letters mean multiplication, so $4x$ becomes 4×5 . Multiply before adding
Substitute the values

$$T = 4 \times 5 + 3 \times 2$$

$$T = 20 + 6 = 26$$

26

3 Fill in the missing numbers in each sequence.

a. 4, 9, __, 19, __

b. 50, __, 36, 29, __

c. 3, 6, 12, __, 48

(3 marks)

a) rule: + 5

$$9 + 5 = 14, 19 + 5 = 24$$

b) rule: - 7

$$50 - 7 = 43, 29 - 7 = 22$$

c) rule: $\times 2$

$$12 \times 2 = 24 \text{ (check: } 24 \times 2 = 48 \text{)}$$

14, 24; 43, 22; 24

4 The n th term of a sequence is $6n - 1$

Write down the first three terms of the sequence.

(2 marks)

$$\text{When } n = 1: 6(1) - 1 = 5$$

$$\text{When } n = 2: 6(2) - 1 = 11$$

$$\text{When } n = 3: 6(3) - 1 = 17$$

5, 11, 17

5 The n th term of a sequence is $20 - 4n$

a. Write down the first four terms of the sequence.

b. Work out the 10th term of the sequence.

(2 marks)

a)

$$n = 1: 20 - 4 \times 1 = 16$$

$$n = 2: 20 - 4 \times 2 = 12$$

$$n = 3: 20 - 4 \times 3 = 8$$

$$n = 4: 20 - 4 \times 4 = 4$$

16, 12, 8, 4

b)

$$20 - 4 \times 10 = 20 - 40 = -20$$

-

6

- a. Work out the value of $3x^2 + 4$ when $x = -2$
 b. Work out the value of $2x^3$ when $x = 3$
 c. Work out the value of $2x^3$ when $x = -1$

(3 marks)

Power first, then multiply

a)

$$(-2)^2 = 4$$

$$3 \times 4 + 4 = 16$$

$$\boxed{16}$$

b)

$$3^3 = 27$$

$$2 \times 27 = 54$$

$$\boxed{54}$$

c)

$$(-1)^3 = -1$$

$$2 \times -1 = -2$$

$$\boxed{-}$$

7

Here are the first four terms of an arithmetic sequence.

5 9 13 17

Find an expression, in terms of n , for the n th term of the sequence.

(2 marks)

n is the position in the sequence, starting with $n = 1$. The n th-term rule lets you calculate a term directly from its position

The common difference is 4, so the n th term contains $4n$

The sequence $4n$ gives 4, 8, 12, 16, which is 1 less than each term

The n th term is $4n + 1$

Check

$$\text{when } n = 3, 4(3) + 1 = 13$$

$$\boxed{4n + 1}$$

8

$$F = 5v + 20$$

- Work out the value of F when $v = 6$.
- Work out the value of v when $F = 95$.

(4 marks)

$$a) F = 5 \times 6 + 20 = 30 + 20 = 50$$

$$b) \text{ Substitute } F = 95: 95 = 5v + 20$$

b) Subtract 20

$$5v = 75, \text{ so } v = 15$$

Check

$$5 \times 15 + 20 = 95$$

9

The n th term of a sequence is $5n - 3$

- Work out the 12th term of the sequence.
- Is 122 a term of the sequence? You must show how you get your answer.

(3 marks)

$$a) 5(12) - 3 = 60 - 3 = 57$$

$$b) \text{ Solve } 5n - 3 = 122: 5n = 125, \text{ so } n = 25$$

$n = 25$ is a whole number, so 122 is the 25th term of the sequence

10

Here are the first three patterns in a sequence made from matchsticks.

- How many matchsticks are needed for Pattern 4?
- Find an expression, in terms of n , for the number of matchsticks in Pattern n .
- Which pattern uses 31 matchsticks?



Pattern 1



Pattern 2



Pattern 3

(4 marks)

4, 7, 10 (+3 each time)

a)

$$10 + 3 = 13$$

13

b)

goes up in 3s, so $3n$

$n = 1$: $3 \times 1 = 3$, need 4, so +1

$3n + 1$

c)

$$\begin{array}{rcl} 3n + 1 & = & 31 \\ - & & - \\ 3n & = & 30 \\ \div 3 & & \div 3 \\ n & = & 10 \end{array}$$

Pattern 10

11

The perimeter, P , of a rectangle is given by the formula

$$P = 2(l + w)$$

A rectangular football pitch for Year 7 has a perimeter of 34 m and a length of 11 m.

Work out the width of the pitch.

(3 marks)

$$\begin{array}{rcl} 34 & = & 2(11 + w) \\ \div 2 & & \div 2 \\ 17 & = & 11 + w \\ - & & - \\ 6 & = & w \end{array}$$

6 m

12

Here are the first four terms of an arithmetic sequence.

8 15 22 29

- Find an expression, in terms of n , for the n th term of the sequence.
- Explain why 150 is not a term of the sequence.

(4 marks)

a) The common difference is 7, and $7n$ gives 7, 14, 21, 28, which is 1 less than each term

The n th term is $7n + 1$

b) If $7n + 1 = 150$ then $7n = 149$

149 divided by 7 is not a whole number, so 150 is not a term