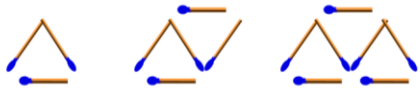# SEQUENCES

Key Concept

Types of Sequence

Sequence as pictures:

Linear sequence:

4, 7, 10, 13, 16, …
+3 +3 +3 +3

Fibonacci sequence:
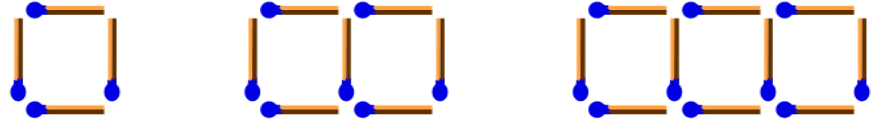(add the previous two terms)

1, 1, 2, 3, 5, 8, …

Key Words

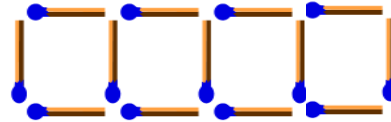**Sequence:** A list which is in a particular order following a pattern.
Term: Each particular part of a sequence.
Linear sequence: A sequence which is formed by adding or subtracting the same amount each time.
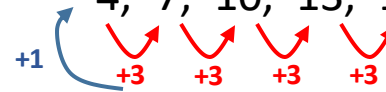
Examples

Next pattern is:

Sequence = 4, 7, 10, 13, ….
Term to term rule = + 3
Nth term   4, 7, 10, 13, 16, …   **= 3n + 1**
+1   +3   +3   +3   +3

sparx

M241, M381, M991

Tip

If a sequence is decreasing, the 'n' term will be negative.
Eg, 15, 11, 7, 3, …
Nth term = -4n + 19

Questions

1) Find the next two terms and the term to term rule
a) 9, 13, 17, 21, …   b) 7, 12, 17, 22, …   c) 9, 7, 5, 3, …   d) 3, 4, 7, 11, 18
2) Find the nth term   a) 7, 9, 11, 13, …   b) 8, 13, 18, 23, …
c) 15, 12, 9, 6, …   d) 1, -3, -7, -11, …

ANSWERS: 1) a) 25, 29 Rule = +4 b) 27, 32, Rule = +5 c) 1, -1 , Rule = - 2 d) 29, 47, Rule = add previous 2 numbers   2) a) 2n + 5   b) 5n + 3   c) -3n + 18   d) –4n + 5

Algebraic Notation

Key Concept

Formula
$$v = u + at$$

Expression
$$f^2 + f^2 + f^2$$

Equation
$$34 = 12 + 6t$$

Identity
$$c \times c = c^2$$

sparx

Key Words

Formula: A rule written using symbols that describe a relationship between different quantities.
Expression: Shows a mathematical relationship whereby there is no solution.
Equation: A mathematical statement that shows that two expressions are equal.
Identity: A relation which is true. No matter what values are chosen.

Tip
When expanding brackets be careful with negatives.

Examples

Simplify:

4a + 3b − a + 2b

= 3a + 5b

Expand and simplify:

$$9a - 2(3a - 4)$$
$$9a - 6a + 8$$
$$3a + 8$$

Factorise:

$$9x^2 + 6x$$

Factorising is the opposite of expanding brackets

$3x$ is common to both terms

$$3x(3x + 2)$$

Expand and simplify:

$$2(4a + 2b) - 2(a + 3b)$$

8a + 4b − 2a − 6b

$$6a - 2b$$

Questions
1) $5x + 3y - 2x + 4y$ 2) $2p - 6q + 2q + 4p$ 3) $12b - 3(2b + 5)$
4) Factorise a) $4x + 10$ b) $8a^2 - 10a$

ANSWERS: 1) $3x + 7y$ 2) $6p - 4q$ 3) $6b - 15$ 4) a) $2(2x + 5)$ b) $2a(4a - 5)$

Equality and Equivalence

Key Concept

Inverse Operations

Operation	Inverse
$+$	$-$
$-$	$+$
$\times$	$\div$
$\div$	$\times$
x^2	$\sqrt{x}$

Key Words

Unknown: A letter which represents a number we do not know the value of.
Terms: The numbers and letters in the expression or equation.
Inverse: The operation which will do the opposite.

Examples

$x + 9 = 16$ $-9 \quad -9$ $x = 7$	$x - 12 = 20$ $+12 \quad +12$ $x = 32$	$\dfrac{x}{3} = 5$ $\times 3 \quad \times 3$ $x = 15$	$2x + 5 = 14$ $-5 \quad -5$ $2x = 9$ $\div 2 \quad \div 2$ $x = 4.5$

$\dfrac{x}{4} - 2 = 4$ $+2 \quad +2$ $\dfrac{x}{4} = 6$ $\times 4 \quad \times 4$ $x = 24$	$2(3x + 5) = -14$ expand $6x + 10 = -14$ $-10 \quad -10$ $6x = -24$ $\div 6 \quad \div 6$ $x = -4$	$2x + 7 = 5x + 1$ $-2x$ (smallest x term) $+7 = 3x + 1$ $-1 \quad -1$ $6 = 3x$ $\div 3 \quad \div 3$ $2 = x$

sparx

M707, M509, M554

Tip

Answers can be:
- Integers
- Decimals
- Fractions
- negatives

Questions

1) $x + 8 = 19$

2) $y - 25 = 15$

3) $2y = 82$

4) $\dfrac{t}{4} = 7$

5) $\dfrac{p}{2} - 6 = 2$

6) $3(2x - 3) = 15$

7) $4x - 8 = 2x + 1$

ANSWERS: 1) x = 11, 2) y = 40, 3) y = 41, 4) t = 28, 5) p = 16, 6) x = 4, 7) x = 4.5