



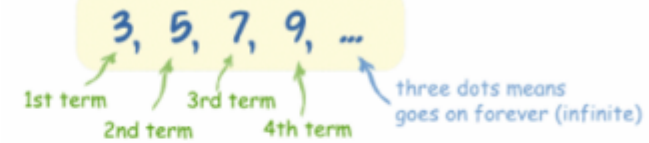
Sequences & Nth Term

Square Numbers	Square Roots	Cube Numbers
$1 \times 1 = 1$	$\sqrt{1} = 1$	$1 \times 1 \times 1 = 1$
$2 \times 2 = 4$	$\sqrt{4} = 2$	$2 \times 2 \times 2 = 8$
$3 \times 3 = 9$	$\sqrt{9} = 3$	$3 \times 3 \times 3 = 27$
$4 \times 4 = 16$	$\sqrt{16} = 4$	$4 \times 4 \times 4 = 64$
$5 \times 5 = 25$	$\sqrt{25} = 5$	$5 \times 5 \times 5 = 125$
$6 \times 6 = 36$	$\sqrt{36} = 6$	Cube Roots
$7 \times 7 = 49$	$\sqrt{49} = 7$	
$8 \times 8 = 64$	$\sqrt{64} = 8$	
$9 \times 9 = 81$	$\sqrt{81} = 9$	
$10 \times 10 = 100$	$\sqrt{100} = 10$	
$11 \times 11 = 121$	$\sqrt{121} = 11$	
$12 \times 12 = 144$	$\sqrt{144} = 12$	$\sqrt[3]{125} = 5$

Knowledge Organiser

Sequences & Nth Term

Sequence:



("term", "element" or "member" mean the same thing)

Example

Find the nth term rule:

$$8 \quad 10 \quad 12 \quad 14$$

$\underbrace{\quad\quad}_{+2}$ $\underbrace{\quad\quad}_{+2}$ $\underbrace{\quad\quad}_{+2}$

$$a = 2 \quad 2 + b = 8$$

$$b = 6$$

$$\text{nth term} = 2n + 6$$

Your turn...

Find the nth term rule:

$$7 \quad 11 \quad 15 \quad 19$$

$\underbrace{\quad\quad}_{+4}$ $\underbrace{\quad\quad}_{+4}$ $\underbrace{\quad\quad}_{+4}$

$$a = 4 \quad 4 + b = 7$$

$$b = 3$$

$$\text{nth term} = 4n + 3$$

FIBONACCI SEQUENCE

A series of numbers, starting from 0 where every number is the sum of the two numbers preceding it.

0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55... and so on



Expanding & Factorising

Key Words

Expanding

Factorising

Expanding & Factorising Single Brackets

Expand $2(x + 1)$

$$= 2x + 2$$

Expand $3(2x - 4)$

$$= 6x - 12$$

Expand $4x(2x - 5)$

$$= 8x^2 - 20x$$

Factorise $6x + 12$

$$= 6(x + 2)$$

Factorise $x^2 + 3x$

$$= x(x + 3)$$

Factorise $30x + 40$

$$= 10(3x + 4)$$

Expanding Double Brackets

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

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

$$= x^2 + 3x + 2x + 6$$

$$= x^2 + 5x + 6$$

$$(x+5)(x-7)$$

$$(x+5)(x-7)$$

$$= x^2 - 7x + 5x - 35$$

$$= x^2 - 2x - 35$$

$$(x+4)^2$$

$$(x+4)^2$$

$$= (x+4)(x+4)$$

$$= x^2 + 4x + 4x + 16$$

$$= x^2 + 8x + 16$$

$$(x-7)(x-3)$$

$$(x-7)(x-3)$$

$$= x^2 - 3x - 7x + 21$$

$$= x^2 - 10x + 21$$

Find the area



$x - 2$

$$4x + 3$$

To find the area of a rectangle we need to multiply

$$(4x+3)(x-2)$$

$$(4x+3)(x-2)$$

$$= 4x^2 - 8x + 3x - 6$$

$$= 4x^2 - 5x - 6$$

Knowledge Organiser

Factorising Double Brackets

Factorise $x^2 + 7x + 10$

We need to find two numbers that multiply to give 10 and add to give 7. List the factors of 10:

$$1 \times 10$$

$$5 \times 2 \dots (5 + 2 = 7)$$

$$\text{Answer} = (x + 2)(x + 5)$$

Factorise $x^2 + 2x - 8$

We need to find two numbers that multiply to give -8 and add to give 2. List the factors of -8:

$$1 \times -8$$

$$-1 \times 8$$

$$2 \times -4$$

$$4 \times -2 \dots (4 + -2 = 2)$$

$$\text{Answer} = (x + 4)(x - 2)$$



Inequalities

Key Words

equation

solve

inequalities

Solving Equations

Solve $2x + 1 = 7$

$$\begin{array}{r} -1 \quad -1 \\ 2x = 6 \\ \div 2 \quad \div 2 \\ x = 3 \end{array}$$

Solve $2x + 3 = x + 6$

$$\begin{array}{r} -3 \quad -3 \\ 2x = x + 3 \\ -x \quad -x \\ x = 3 \end{array}$$

Solve $3x - 2 = x + 6$

$$\begin{array}{r} +2 \quad +2 \\ 3x = x + 8 \\ -x \quad -x \\ 2x = 8 \\ +2 \quad +2 \\ x = 4 \end{array}$$

Solving Harder Equations

$$\begin{array}{l} \text{Solve } \frac{2x+1}{3} = 7 \\ x3 \quad x3 \\ 2x + 1 = 21 \\ -1 \quad -1 \\ 2x = 20 \\ \div 2 \quad \div 2 \\ x = 10 \end{array}$$

$$\begin{array}{l} \text{Solve } \frac{x}{4} + 1 = 6 \\ -1 \quad -1 \\ \frac{x}{4} = 5 \\ x4 \quad x4 \\ x = 20 \end{array}$$

Solving Inequalities

Solve inequalities the same way you would solve a normal equation but remember to include the inequality symbol in your answer.

Solve $3x + 4 \leq 7$

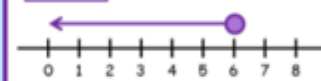
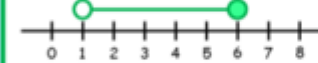
$$\begin{array}{r} -4 \quad -4 \\ 3x \leq 3 \\ \div 3 \quad \div 3 \\ x \leq 1 \end{array}$$

Solve $2x + 4 > x + 9$

$$\begin{array}{r} -4 \quad -4 \\ 2x > x + 5 \\ -x \quad -x \\ x > 5 \end{array}$$

Inequalities

On a number line

An open circle means that the value is **not** included: $x > 2$ x is greater than 2 $x < 5$ x is less than 5A filled in circle means that the value is **included**: $x \geq 3$ x is greater than or equal to 3 $x \leq 6$ x is less than or equal to 6If x is **between** two values, use **two circles**: $1 < x \leq 6$ x is greater than 1, but less than or equal to 6.

Writing inequalities as integers

Write down the integers represented by $2 < x \leq 7$

3, 4, 5, 6, 7

Write down the integers represented by $1 \leq x \leq 4$

1, 2, 3, 4

Write down the integers represented by $4 < x < 9$

5, 6, 7, 8



Averages

Knowledge Organiser

Key Words

mean

mode

median

range

Mode

The most common number

Example:

Find the mode of 2, 2, 4, 5, 6

The answer = 2

Mean

The middle number, but remember to put the numbers in order first!

Example:

Find the median of 2, 4, 1, 5, 6

Order them first: 1, 2, 4, 5, 6

The middle is 4

Example:

Find the median of 3, 7, 1, 2, 6, 8

Order them first: 1, 2, 3, 6, 7, 8

The middle is half way between 3 and 6

The answer = 4.5

Median

Add all of your numbers up and divide by how many numbers you have.

Example:

Find the mean of 2, 2, 4, 5, 6

$$2 + 2 + 4 + 5 + 6 = 19$$

$$19 \div 5$$

The answer = 3.8

Range

The biggest number - the smallest number

Example:

Find the range of 2, 2, 4, 5, 6

$$6 - 2$$

The answer = 4