



YEAR 7
KNOWLEDGE ORGANISERS



BLOCK: DIRECTED NUMBER

Operations with equations and directed
numbers

"MATHS OPENS DOORS"

YEAR 7 — DIRECTED NUMBER

Operations with equations and directed numbers

What do I need to be able to do?

- By the end of this unit you should be able to:
- Perform calculations that cross zero
 - Odd/ Subtract directed numbers
 - Multiply/ Divide directed numbers
 - Evaluate algebraic expressions
 - Solve two-step equations
 - Use order of operations with directed number

Keywords

- Commutative:** a mathematical process is commutative if the numbers may be inputted in any order.
Expression: one or a group of numbers, variables and mathematical operations representing a number or quantity
Inverse (operation): the opposite or reverse operation
Negative: any number less than zero, written with a minus sign
Product: the result when two numbers are multiplied together
Square: (v) to multiply a number, term or expression by itself
Square root: a number which when multiplied by itself gives the original number
Subtract: to take one quantity away from another

Perform calculations that cross zero

Number lines are useful to help you visualise the calculation crossing 0

$4 - 6 = -2$

Use the number line to guide subtraction of 6

Start at 4

Find the difference between 6 and -4

From 6 to 0
6
From 0 to -4
4
10 beads between them

$-5 + 5 = 0$ Rearrangements of the same equation $5 - 5 = 0$

Add directed numbers

$2 + -4 = -2$

Red = -1, Yellow = 1

Zero pair (-1 + 1 = 0)

Two '-1' left = -2

$8 + -3 = 5$

Partitioning

$8 + -3 = 5$ $5 + 3 + -3 = 5$

Partition the value to create a zero pair calculation

Generalisation: $+ - = -$

Subtract directed numbers

Red = -1, Yellow = 1

Representation for calculation

"Subtract" — means take away or remove

$2 - -1 = 3$

Take away one

Start with the representation of 2

$2 - -3 = 5$

Generalisation: $- - = +$

Multiply/ Divide directed numbers

Two representations of the same calculation: $2 \times -3 = -6$

Negative, Negative calculation

-2×-3

This is the negative of 2×-3

$-2 \times -3 = 6$

The act of making counters into their negative is turning them over

Divisions are the inverse operations

Evaluate algebraic expressions

$a = 5$ $b = -4$

$a^2 = 5^2$ $b^2 = (-4)^2$

$a^2 = 25$ $b^2 = 16$

With negative numbers the brackets are important so that it performs -4×-4 .

Brackets around negative substitutions helps remove calculation errors

$2a - b = 2 \times 5 - (-4) = 10 + 4 = 14$

$3b - 2a = 3(-4) - 2(5) = -12 - 10 = -22$

Two-step equations

Bar Model

$4x + 2 = 10$

Representing the same question (use fact families)

$10 - 4x = 2$

Function machine

$x \rightarrow \times 4 \rightarrow +2 \rightarrow 10$

Inverse operations to find x

Use order of operations

Brackets

Indices or roots

Multiplication or division

Addition or subtraction

Remember square roots have a positive and negative value

x	-3	-2	-1	0	1	2	3
-3	9	6	3	0	-3	-6	-9
-2	6	4	2	0	-2	-4	-6
-1	3	2	1	0	-1	-2	-3
0	0	0	0	0	0	0	0
1	-3	-2	-1	0	1	2	3
2	-6	-4	-2	0	2	4	6
3	-9	-6	-3	0	3	6	9