

## 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
- Add/ Subtract directed numbers
- Multiply/ Divide directed numbers
- Evaluate algebraic expressions
- Solve two-step equations
- Use order of operations with directed number

## Keywords

**Subtract:** taking away one number from another.

**Negative:** a value less than zero.

**Commutative:** changing the order of the operations does not change the result.

**Product:** multiply terms.

**Inverse:** the opposite function.

**Square root:** a square root of a number is a number when multiplied by itself gives the value (symbol  $\sqrt{\quad}$ )

**Square:** a term multiplied by itself.

**Expression:** a maths sentence with a minimum of two numbers and at least one math operation (no equals sign)

### 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

$2 + -4 = -2$

Representations: 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

Representation for calculation:  $2 - -1 = 3$

"Subtract" - means take away or remove

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

$-2 \times -3$

This is the negative of  $2 \times -3$

$-2 \times -3 = 6$

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  $-4 \times -4$

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

Order of operations: Brackets, Indices or roots, Multiplication or division, Addition or subtraction

Remember square roots have a positive and negative value

Brackets around negative substitutions helps remove calculation errors

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