

Knowledge Organiser: Mathematics Year 7 Spring 2

Suggested websites: Maths Genie, Save My Exams and Corbett Maths



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

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

$5 - 5 = 0$

Subtract directed numbers

• = -1
• = 1

Representations

"Subtract" - means take away or remove

Representation for calculation

$2 - 1 = 3$

Take away one

Start with the representation of 2

$2 - 3 = 5$

Generalisation

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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)

Add directed numbers

• = -1
• = 1

Representations

$2 + -4 = -2$

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

+ - = -

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

$x \rightarrow x4 \rightarrow +2 \rightarrow 10$

Inverse operations to find x

$x \rightarrow x \rightarrow 2$

Use order of operations

Brackets around negative substitutions helps remove calculation errors

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

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

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What do I need to be able to do?

By the end of this unit you should be able to:

- Convert between mixed numbers and fractions
- Add/Subtract unit fractions (same denominator)
- Add/Subtract fractions (same denominator)
- Add/Subtract fractions from integers
- Use equivalent fractions
- Add/Subtract any fractions
- Add/Subtract improper fractions and mixed numbers
- Use fractions in algebraic contexts

Keywords

Numerator: the number above the line on a fraction. The top number. Represents how many parts are taken.

Denominator: the number below the line on a fraction. The number represents the total number of parts.

Equivalent: of equal value.

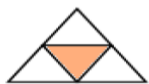
Mixed numbers: a number with an integer and a proper fraction.

Improper fractions: a fraction with a bigger numerator than denominator.

Substitute: replace a variable with a numerical value.

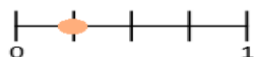
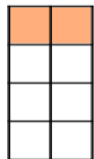
Place value: the value of a digit depending on its place in a number. In our decimal number system, each place is 10 times bigger than the place to its right.

Representing Fractions



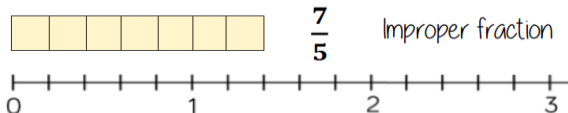
$$\frac{1}{4}$$

is represented in all the images

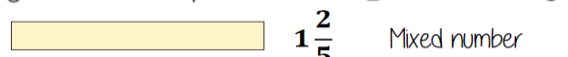


$$1 \div 4$$

Mixed numbers and fractions



$\frac{7}{5}$ Improper fraction



$1\frac{2}{5}$ Mixed number

In this model 5 parts make up a whole

Fractions can be bigger than a whole

Add/Subtract unit fractions Same denominator

$$\frac{1}{12} + \frac{1}{12} - \frac{1}{12} = \frac{2}{12}$$

$$\frac{1}{4} + \frac{1}{4} = \frac{2}{4}$$

With the same denominator ONLY the numerator is added or subtracted

Add/Subtract fractions Same denominator

$$\frac{2}{7} + \frac{3}{7} = \frac{5}{7}$$

Sequences

$$\frac{1}{3}, 1, 1\frac{2}{3}, 2\frac{1}{3}, 3, \dots$$

Represent this on a number line to help

Fractions and decimals

$$\frac{1}{10} = 0.1$$

Example $\frac{6}{10} + 0.3 \rightarrow 0.6 + 0.3$

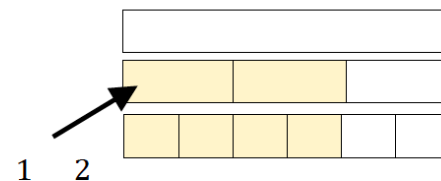
$$\frac{6}{10} + \frac{3}{10}$$

Remember to use equivalent fractions and common denominators

Equivalent fractions

Numerator and denominator have the same multiplier

$$\frac{2}{3} = \frac{4}{6}$$



Add/Subtraction fractions (common multiples)

$$\frac{3}{5} + \frac{7}{10} = \frac{6}{10} + \frac{7}{10} = \frac{13}{10}$$

Addition/Subtraction needs a common denominator

Add/Subtraction any fractions

$$\frac{4}{5} - \frac{2}{3} = \frac{12}{15} - \frac{10}{15} = \frac{2}{15}$$

Use equivalent fractions to find a common multiple for both denominators

Add/Subtraction fractions (improper and mixed)

$$2\frac{1}{5} - 1\frac{3}{10} = 2\frac{2}{10} - 1\frac{3}{10} = \frac{22}{10} - \frac{13}{10} = \frac{9}{10}$$

- Convert to an improper fraction
- Calculate with common denominator

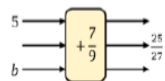
Partitioning method

$$2\frac{1}{5} - 1\frac{3}{10} = 2\frac{2}{10} - 1\frac{3}{10} = 2\frac{2}{10} - 1 - \frac{3}{10} = 1\frac{2}{10} - \frac{3}{10} = \frac{9}{10}$$

Fractions in algebraic contexts

$$p = 5 \quad m = 2$$

$$k - \frac{5}{8} = 2$$



$$p + \frac{1}{m}$$

Substitution

$$\frac{5}{8} + \frac{1}{2}$$

Apply inverse operations

Form expressions with fractions

$$k = 2 + \frac{5}{8}$$

$$b + \frac{7}{9} \rightarrow b + \frac{7}{9}$$