

# YEAR 7 — FRACTIONAL THINKING

## Addition and subtraction of fractions

@whisto\_maths

### 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 represent 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

### Odd/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

### Odd/Subtract from integers

$1 - \frac{2}{6} = \frac{4}{6}$

$3 + \frac{1}{6} = 3\frac{1}{6}$

The denominator indicates the number of parts a whole is made up of

### Equivalent fractions

Numerator and denominator have the same multiplier

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

$\frac{1}{3} = \frac{2}{6}$

### Odd/Subtraction fractions (common multiples)

Addition/Subtraction needs a common denominator

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

### Odd/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

### Odd/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

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

Apply inverse operations:  $k = 2 + \frac{5}{8}$

Form expressions with fractions:  $b + \frac{7}{9} \rightarrow b + \frac{7}{9}$

Substitution:  $\frac{p}{8} + \frac{1}{m} = \frac{5}{8} + \frac{1}{2}$

$p = 5 \quad m = 2$

### Fractions and decimals

Example:  $\frac{6}{10} + 0.3 = 0.6 + 0.3 = 0.9$

Remember to use equivalent fractions and common denominators

# YEAR 7 — DIRECTED NUMBER

## Operations with equations and directed numbers

@whisto\_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

### 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

$2 + -4 = -2$

Zero pair  $(-1 + 1 = 0)$

Two  $-1$ 's 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

$2 - -1 = 3$

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

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