# Maths Memory Book

# Contents

# Useful Vocabulary

**acute angle** – an angle measuring less than 90 degrees.

**algebra** – an area of maths where numbers are represented by letters

**analogue clock** – a clock with the numbers 1 to 12.

**angle** – the amount of turning between two lines meeting at a common point.

**apex** – the highest point, the point at the top of a shape.

**approximate –** to estimate a number, amount or total, often rounding it off to the nearest 10 or 100.

**area** – the size a surface takes up. Measured in square units.

**ascending** – to increase/get bigger e.g. 1 2 3 4 5 6 7

**bisect** – to divide into two equal sections/to cut in half.

**capacity** – the amount a container can hold.

**circumference** – distance one around the circle (perimeter).

**common factor** – a whole number that divides two or more other numbers exactly.

**common multiples** – numbers that are in two sets of times tables or more. E.g. Common multiples of 4 and 5: 20, 40, 60

**commutativity** – in addition and multiplication, numbers may be added or multiplied together in any order.

**convert** – change the form of something.
**coordinates** – shown as pairs of letters and/or numbers e.g. (2,4)
Used to show position on a coordinate plane or map.

**cubed numbers** – to raise to the third power.
E.g. $2^3$ = 2 x 2 x 2)

**denominator** – bottom number in a fraction/the number of parts the whole is divided into.

**descending** – to decrease/get smaller e.g. 5 4 3 2 1

**diameter** – straight across the circle, through the centre.

**edge** – the side of a polygon or a line segment where two faces of a solid figure meet.

**equation** – a statement showing that two amounts equal each other. An equation must always have an equals sign.

**equivalent** – having the same value or amount.

**estimate** – (to make) an approximate or rough calculation, often based on rounding.

**expression** – one or a group of mathematical symbols representing a number or quantity. An expression may include numbers, variables, constants, operators and grouping symbols.

**face** – flat surface of a three-dimensional shape.

**factors** – numbers that divide into other numbers

**formula** – a mathematical rule written using symbols, usually as an equation describing a certain relationship between quantities.

**highest common factor** – the biggest number that will divide two or more other numbers exactly.

**horizontal** – parallel to the horizon (think of the sun rising).
**improper fraction** – a fraction larger than one whole. The numerator is larger than the denominator.

**integer** – a positive number, a negative number or zero but not a fraction or a decimal.

**interval** – distance between two points OR amount of time between two events.

**irregular** – a shape or mathematical object which is not regular.

**lowest common multiple** – the first multiple that appears in both times tables. E.g. The lowest common multiple for 4 and 5 is 20.

mixed number fraction

**multiples** – numbers that are in the times tables
E.g. Multiples of 4: 4 8 12 16 20 24 28

**non-unit fraction** – A fraction where the numerator is greater than one.

**numerator** – number above the line of a fraction, showing number of parts of the whole.

**obtuse angle** – any angle between 90 degrees and 180 degree.

**parallel** – lines that always stay the same distance apart and will never meet (like train tracks).

**parallelogram** – a square of rectangle at a slant (imagine it has been sat on). Parallel means lines that always stay the same distance apart. To find the area, multiply the base by the height.

**partition** – to divide into parts or shares. Splitting numbers into smaller units so they're easier to work with.

**perpendicular** – lines that meet at a right angle.

**polygon** – a shape having three or more straight sides.
**prime numbers** – only divisible by 1 and itself (has two factors).
E.g. 7 = 1, 7

**quadrant** – a quarter of a circle or its circumference. Any quarter of a plane divided by an x and y axis.

**quadrilateral** – a flat shape (2D) with four straight sides.

**radius** – distance from the centre of a circle to the circumference.

**ratio** – a ratio compares two or more parts of the whole.

**recurring decimal** – a decimal which has repeating digits or a repeating pattern of digits.

**reflect/reflection** – a mirror view.

**regular** – polygons with all sides equal and all angles equal are regular.

**remainder** – amount left over after dividing a number.

**right angle** – an angle that is 90 degrees.

**scale factor** – a scale factor says how many times bigger or smaller an object is than another one. The objects stay in the same proportion.

**simplify** – to reduce the numerator and denominator in a fraction to the smallest numbers possible.

**square numbers** – a number that results from multiplying an integer by itself. A number that can be represented in the shape of a square.

**three-dimensional (3D)** – having three dimensions: length, width and height.

**translate/translation** - move an item in any direction without rotating it.

**two-dimensional (2D)** - having two dimensions: length and width.
**unit fraction** - A fraction where the numerator is one.

**vertex (vertices – plural)** - a point where two or more rays or the arms of an angle meet; the adjacent sides of a polygon meet or the edges of a solid figure meet. The point at the top of a cone or pyramid.

**vertical** - At right angles to the horizon.

# Rounding Numbers

## We Will Round You!

Find your place,
Look next door,
5 or greater add 1 one more.
All digits in front, stay the same
All digits behind, zero's your name.

You may be asked to round to the nearest 10, 100, 1000 etc.
If your number is less than five, you leave the column which you are rounding the same.

Example:
If rounding 5478 to the nearest 10
*Find your place* - 547**8** – I'm rounding to the nearest 10 so I look at my tens column.
*Look next door* - 5478 - Look to the right of the 10s column.
*5 or greater add 1 one more* - 8 - 8 is larger than 5 so I'm going to add 1 to the 10s column so it becomes 8 (7+1)
*All digits in the front, stay the same* - 54**8**
*All digits behind, zero's your name* - 5480 - I need to put a zero in the ones column.

If rounding 76437 to the nearest 100
*Find your place* - 76**4**37 – I'm rounding to the nearest 100 so I look at my hundreds column.
*Look next door* - 76**4**37 - Look to the right of the 100s column.
*5 or greater add 1 one more* - 3 - 3 is smaller than 5 so I'm going to leave the hundreds column the same.
*All digits in the front, stay the same* - 76**4**
*All digits behind, zero's your name* - 76400 - I need to put a zero in the tens and one's column.

# Rounding Decimal Numbers to a Whole Number

The same rule applies.

Example:

If rounding 562.79 to a whole number.
*Find your place* - 562.79 – I look at my ones column.
*Look next door* - 562.79 - Look to the right of the 1s column.
*5 or greater add 1 one more* - 7 - 7 is larger than 5 so I'm going to add 1 to the 1s column so it becomes 3 (2+1)
*All digits in the front, stay the same* - 563
*All digits behind, zero's your name* - 563.00 - 563 - You don't need to write the decimal when it is 0.

# Rounding Decimal Numbers to 1/2/3 etc. Decimal Places

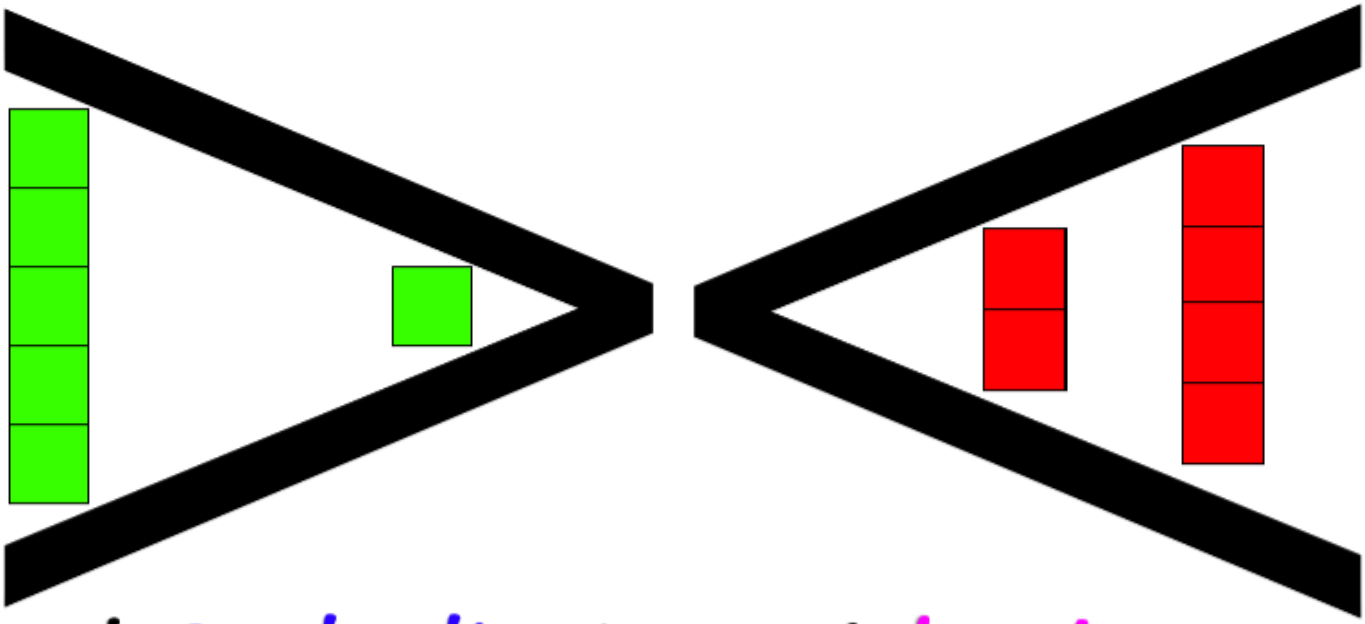
The same rule applies.

Example:

If rounding 562.791 to 2 decimal places.
*Find your place* - 562.791 – I look at my hundredths column (2nd decimal number)
*Look next door* - 562.791 - Look to the right of the hundredths column.
*5 or greater add 1 one more* - 1 - 1 is smaller than 5 so I'm going to leave the hundredths column the same - 562.79
*All digits in the front, stay the same* - 562.79
*All digits behind, zero's your name* - 562.790 - 562.79 - You don't need to write the decimal when it is 0. It should only have two numbers after the decimal point because you have rounded to 2 decimal places.

# Comparing Numbers

## Greater Than  Less Than



5 is greater than 1

2 is less than 4

## Equal to

2 is equal to 2

# Adding and Subtracting Whole Numbers – Column Method

You can also use a number line to support you.

Addition:

| | | | | | |
|---|---|---|---|---|---|
| | 4 | 5 | 8 | 6 | 4 |
| + | 2 | 3 | 4 | 9 | 7 |
| | 6 | 9 | 3 | 6 | 1 |
| | | 1 | 1 | 1 | |

Starting with the ones, add each column in turn. Regroup tens, hundreds, thousands, ten thousands as required.

Subtraction:

| | | | | | |
|---|---|---|---|---|---|
| | 3 | 5 | $^{6}\not{7}$ | $^{13}\not{4}$ | $^{1}\not{2}$ |
| - | | 3 | 4 | 7 | 6 |
| | 3 | 2 | 2 | 6 | 6 |

Starting with the ones, subtract each column in turn. Exchange tens, hundreds, thousands and/or ten thousands as required.

# Multiply up to a 4-digit number by 2-digit

## 154 x 26 = 4004

| | | | |
|---|---|---|---|
| | 1 | 5 | 4 |
| x | | 2 | 6 |
| | $^{3}9$ | $^{2}2$ | 4 |
| $^{1}3$ | 0 | 8 | 0 |
| 4 | 0 | 0 | 4 |
| 1 | 1 | | |

Line up your place value columns accurately.

Multiply the first number by the digit in the ones column.
You must regroup any tens/ hundreds/ thousands.
Don't forget to add them to your multiplied number.

4 x 6 = 24  5 x 6 = 30 + 2 = 32  1 x 6 = 6 + 3 = 9

Put a zero as a place holder underneath. Now multiply the first number by the digit in the tens column.

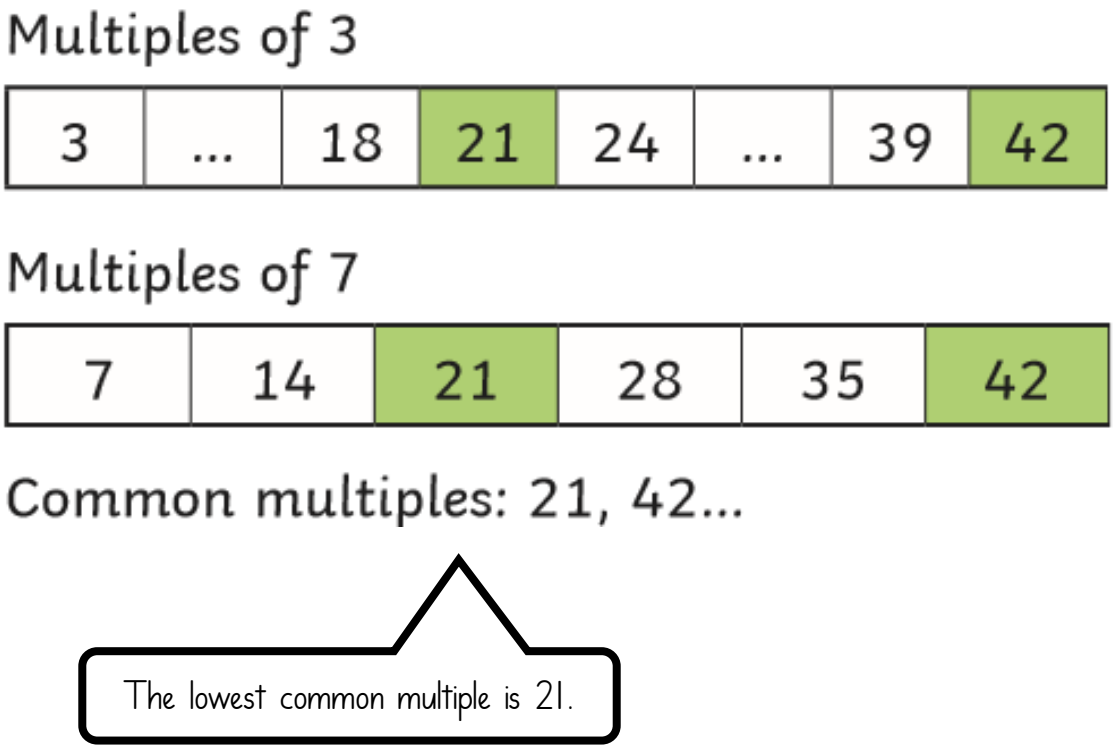
4 x 2 = 8  5 x 2 = 10  1 x 2 = 2 + 1 = 3

Now add the numbers together. Remember to regroup if needed.

# Multiples

**Multiples** are numbers in a times table.
**Common multiples** are numbers that appear in both times tables.
The **lowest common multiple** is the first multiple that appear in both times table.

Example:



# Factors and Prime Numbers

**Factors** are numbers that divide (go) into other numbers.

**Common factors** are all of the numbers that can divide into both numbers.

Factors of 48

| 1 | 2 | 3 | 4 | 6 | 8 | 12 | 16 | 24 | 48 |
|---|---|---|---|---|---|---|---|---|---|

Factors of 30

| 1 | 2 | 3 | 5 | 6 | 10 | 15 | 30 |
|---|---|---|---|---|---|---|---|

Common factors: 1, 2, 3, 6

The **highest common factor** is the largest common factor/number that divides into both numbers.
*E.g. the highest common factor of 16 and 40 is 8.*

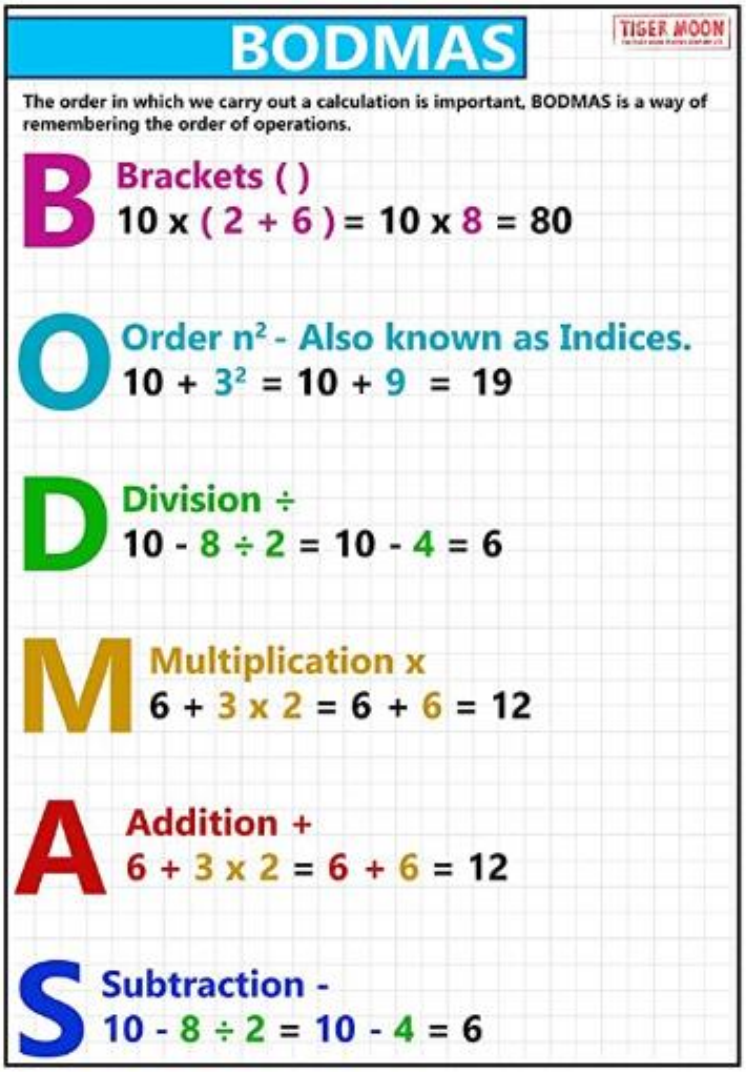
A **prime number** is a number that only has 2 factors and is only divisible by itself and 1.
*E.g. 7 can only be divided by 7 and 1.*

**Prime factors** are 2 prime numbers that when multiplied together give the original number.
*E.g. prime factors of 15 are 3 and 5. 3 and 5 are prime numbers and when multiplied together are 15.*

**Composite numbers** are numbers that have more than 2 factors.

# BODMAS/BIDMAS

BODMAS/BIDMAS is an acronym to help you to remember the order of operations in calculations.




Example:

$$5 \text{ x } (6 + 59) - 32 =$$

Solve **brackets** first: $6+59 = 65$

$$5 \text{ x } 65 - 32 =$$

You need to **multiply before you subtract**: $5 \text{ x } 65 = 325$

$$325 - 32 =$$

Now complete the calculation: $325 - 32 = 293$

# Square and Cube Numbers

**Square numbers** result from a number being multiplied by itself.

*Example: 5 x 5 = 25*

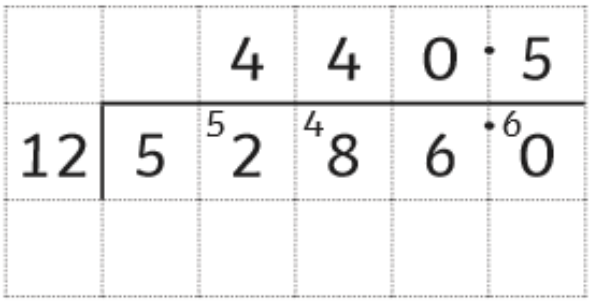
**Squared numbers up to 12 x 12:**

1, 4, 9, 16, 25, 36, 49, 64, 81, 100

**Cube numbers** result from a number being multiplied by itself twice.

*Example: 2 x 2 x 2 = 8*

# Short Division




Start from the left.

5 ÷ 12 = 0 r 5

52 ÷ 12 = 4 r 4

48 ÷ 12 = 4

6 ÷ 12 = 0 r 6

60 ÷ 12 = 5

# Simplifying Fractions

Find the **highest common factor** that divides exactly into both the **numerator** and the **denominator.**

Divide the **numerator** and the **denominator** by the **common factor.**

Write the fraction in its **simplest form**.

Example:

$$\frac{12}{20}$$

**Common factors** of $12$ and $20$ are: $1, 2, 4.$

The **highest common factor** is: $4$

$$12 \div 4 = 3$$

$$20 \div 4 = 5$$

**Simplified fraction**: $\frac{3}{5}$

# Converting Improper Fractions to Mixed Numbers

To **convert improper fractions** to **mixed numbers** you need to:

1. Divide the **numerator** by the **denominator**.
2. Write down the whole number answer.
3. Write down any **remainder** above the **denominator**.

Example:

$$\frac{59}{4} = 14\frac{3}{4}$$

$$59 \div 4 = 14 \text{ r } 3$$

$$4\overline{)5^{1}9} \quad 1\ 4\ \text{r}\ 3$$

# Converting Mixed Numbers to Improper Fractions

To **convert mixed numbers** to **improper fractions** you need to:

1. Multiply the whole number by the **denominator**.
2. Add your answer to the **numerator**.
3. Write the result on top of the **denominator**.

Example:

$$4\frac{4}{8}$$

Multiply the whole number (4) by the **denominator** (8).

$$4 \times 8 = 32$$

Add the answer (32) to the **numerator** (4).

$$32 + 4 = 36$$

$$\frac{36}{8}$$

# Adding and Subtracting Fractions

When fractions have the **same denominator,** you just add or subtract the **numerator**. The **denominator** stays the same.

Example:

$$\frac{5}{8} + \frac{6}{8} = \frac{11}{8} = 1\frac{3}{8}$$

When fractions have different **denominators**, you need to convert them so they are the same. Remember: whatever you do to the **denominator**, you must do to the **numerator**.

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

Multiply the fraction by the **denominator** from the other fraction.
Example:

$1 \times 3 = 3$
$2 \times 3 = 6$

$1 \times 2 = 2$
$3 \times 2 = 6$

$$\frac{3}{6} + \frac{2}{6} = \frac{5}{6}$$

Convert your answers from improper fractions to a mixed fraction or simplify if needed.

# Multiplying Fractions

## Multiplying fractions by fractions:

1. Multiply the **numerators** and write the answer.
2. Multiply the **denominators** and write the answer.
3. Simplify and convert the fraction if needed.

Example:

$$\frac{4}{6} \times \frac{3}{5} = \frac{12}{30} = \frac{2}{5}$$

## Multiplying fractions by whole numbers:

1. Turn the whole number into a fraction by putting 1 as a denominator.
2. Multiply the **numerators** and write the answer.
3. Multiply the **denominators** and write the answer.
4. Simplify and convert the fraction if needed.

$$\frac{4}{6} \times 7$$

$$\frac{4}{6} \times \frac{7}{1} = \frac{28}{6} = 4\frac{4}{6} = 4\frac{2}{3}$$

## Multiplying a mixed number by a proper/improper fraction:

1. Convert the **mixed number** to an **improper fraction.**
2. Multiply the **numerators** and write the answer.
3. Multiply the **denominators** and write the answer.
4. Simplify and convert the fraction if needed.

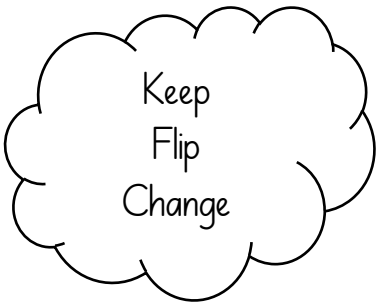
Example:

$$4\frac{4}{6} \times \frac{7}{10}$$

$$4\frac{4}{6} = 4 \times 6 = 24 + 4 = 28$$

$$\frac{28}{6} \times \frac{7}{10} = \frac{196}{60} = 3\frac{16}{60} = 3\frac{4}{15}$$

# Dividing Fractions by Whole Numbers




1. Turn the whole number into a fraction by putting a 1 as the **denominator.**
2. Keep the first fraction the same (the fraction which wasn't your whole number).
3. Flip the second fraction by swapping the **numerator** and **denominator** (the fraction which was your whole number).
4. Change the division symbol to multiply.
5. Multiply the **numerators** and write the answer.
6. Multiply the **denominators** and write the answer.
7. Simplify and convert the fraction if needed.

Example:

$$\frac{1}{5} \div 3 = \frac{1}{15}$$

Whole number to fraction: $\frac{1}{5} \div \frac{3}{1}$

$$\frac{1}{5} \div \frac{3}{1} \longrightarrow \frac{1}{5} \div \frac{1}{3} \longrightarrow \frac{1}{5} \times \frac{1}{3}$$

KEEP FLIP CHANGE

$$\frac{1}{5} \times \frac{1}{3} = \frac{1}{15}$$

# Ordering Fractions

## Ordering fractions with the same denominator:

If the denominators are the same, focus on the numerators. Make sure you read the question so you know how to order the fractions.

Example: Put the fractions in **ascending** order.

$\frac{4}{12}$ $\frac{8}{12}$ $\frac{1}{12}$ $\frac{3}{12}$ → $\frac{1}{12}$ $\frac{3}{12}$ $\frac{4}{12}$ $\frac{8}{12}$

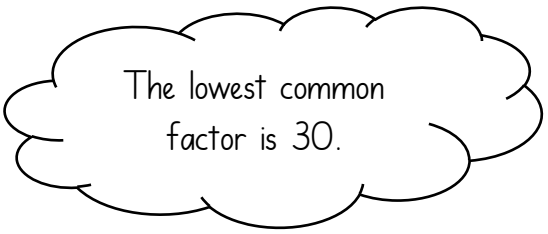
## Ordering fractions with the different denominators:

Example: Put the fractions in **ascending** order.

$\frac{4}{5}$ $\frac{1}{3}$ $\frac{3}{6}$

1. Find **lowest common multiple** of the denominators.

3 6 9 12 15 18 21 24 27 30
6 12 18 24 30
5 10 15 20 25 30




2. We know we need to make the **denominator** the **lowest common multiple** (30 in the example). Work out what you need to multiply the **denominator** by to get to the **lowest common multiple.**

*What do we need to multiply the original fraction by to get 30?*

$\frac{4}{5} \times \frac{\quad}{6} = \frac{\quad}{30}$ $\frac{1}{3} \times \frac{\quad}{10} = \frac{\quad}{30}$ $\frac{3}{6} \times \frac{\quad}{5} = \frac{\quad}{30}$

3. Apply the same rule to the numerator. Remember: whatever you do to the denominator, you must do to the numerator.

$\frac{4}{5} \times \frac{6}{6} = \frac{24}{30}$ $\frac{1}{3} \times \frac{10}{10} = \frac{10}{30}$ $\frac{3}{6} \times \frac{5}{5} = \frac{15}{30}$

4. Order the fractions using the method above. Focus on the numerator.

$\frac{24}{30}$ $\frac{10}{30}$ $\frac{15}{30}$ → $\frac{10}{30}$ $\frac{15}{30}$ $\frac{24}{30}$

5. Put the original fractions in order.

$\frac{4}{5}$ $\frac{1}{3}$ $\frac{3}{6}$ → $\frac{1}{3}$ $\frac{3}{6}$ $\frac{4}{5}$

# Multiplying and Dividing Decimals by 10, 100 and 1000

If you are multiplying by 10, you move one space to the left.
If you are dividing by 10, you move one space to the right.

| Thousands | Hundreds | Tens | Ones | tenths | hundredths | thousandths |
|---|---|---|---|---|---|---|
| | | | 2 | 0 | 8 | |
| | | 2 | 0 | 8 | | |
| | | | 2 | 0 | 8 | |

× 10

÷ 10

If you are multiplying by 100, you move two spaces to the left.
If you are dividing by 100, you move two spaces to the right.

| Thousands | Hundreds | Tens | Ones | tenths | hundredths | thousandths |
|---|---|---|---|---|---|---|
| | | 4 | 3 | 5 | | |
| 4 | 3 | 5 | 0 | | | |
| | | 4 | 3 | 5 | | |

× 100

÷ 100

If you are multiplying by 1000, you move three spaces to the left.
If you are dividing by 1000, you move three spaces to the right.

| Thousands | Hundreds | Tens | Ones | tenths | hundredths | thousandths |
|---|---|---|---|---|---|---|
| | | | 1 | 3 | 5 | 1 |
| 1 | 3 | 5 | 1 | | | |
| | | | 1 | 3 | 5 | 1 |

× 1000

÷ 1000

# Multiplying Decimals by Integers

| | 3 . | 4 | 5 |
|---|---|---|---|
| × | | | 3 |
| 1 | 0 . | 3 | 5 |
| | 1 | 1 | |

3. 45 x 3 = 3 x 3.45

**Commutativity** allows you to order the calculation to what works for you. It is easier to multiply by the **integer.**

**Remember when multiplying you move from right to left.**

**Always line up your decimal point to ensure it is in the correct place.**

Example

5 x 3 = 15

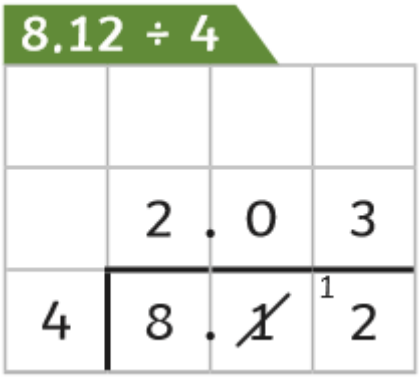
You need to regroup the ten underneath the tenths column.
(Always regroup to the left.)

4 x 3 = 12 12 + 1 = 13

(Don't forget the regrouped ten!)
Remember to regroup the ten underneath the ones column.

3 x 3 = 9 9 + 1 = 10

# Dividing Decimals by Integers




Start from the left.
Look at the integer (the number on the outside of the bus stop).

How many times does this number go into the first number?
*How many 4s go into 8? 8 ÷4 = 2*

Place the answer above the line. Be careful with where you position your numbers.
**The decimal point stays in the same place. Do not forget this!**

How many times does this number go into the second number?
*How many 4s go into 1? No 4s go into one.*
*Put a zero and regroup the one with the next number.*

How many times does this number go into the third number?
*How many 4s go into 12? 12 ÷4 = 3*

Place the answer above the line. Be careful with where you position your numbers.

# Converting Fractions to Decimals

$\frac{7}{20} = \frac{35}{100}$ or 0.35 (×5 above and below)

$\frac{7}{25} = \frac{28}{100}$ or 0.28 (×4 above and below)

$\frac{7}{50} = \frac{14}{100}$ or 0.14 (×2 above and below)

$\frac{8}{200} = \frac{4}{100}$ or 0.04 (÷2 above and below)

The easiest method if the denominator is a factor or multiple of 100 is to multiply the denominator so it becomes 100. **Remember you must always do the same to the numerator.**

When the denominator is 100 it is much simpler to convert the fraction to a decimal. You must divide the numerator by the denominator. When you divide by 100, you move two places to the right.

---

$\frac{7}{8} = 7 \div 8$

| | 0 | . | 8 | 7 | 5 |
|---|---|---|---|---|---|
| 8 | 7 | . | $^{7}0$ | $^{6}0$ | $^{4}0$ |

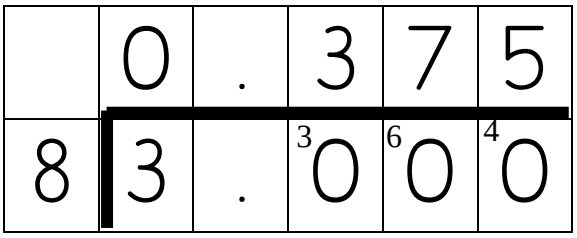
When the denominator is not a factor or multiple of 100, you must divide the numerator by the denominator.
You will need to place a decimal point after the integer (the one inside the bus stop) and continue to put zeros in the tenths, hundredths etc. columns until you have your answer. You usually don't have to go further than three decimal places so round if you need to.

Zero lots of 8 go into 7 so place a zero on top of the line and regroup the 7.
8 lots of 8 go into 70 and I have 6 left over. Place 8 above the line and regroup the 6.
7 lots of 8 go into 60 and I have 4 left over. Place 7 above the line and regroup the 4.
5 lots of 8 go into 40. Place 5 above the line. There was nothing left over to regroup.
My answer is 0.875.

# Convert a Fraction to a Percentage

$$\frac{3}{8}$$

Divide the numerator by the denominator.




3 ÷ 8 = 0 r 3
30 ÷ 8 = 3 r 6
60 ÷ 8 = 7 r 4
40 ÷ 8 = 5

Multiply the answer by 100 (two places to the left).

$$0.375 \times 100 = 37.5\%$$

Don't forget to place the percentage sign at the end.

To convert a decimal to a percentage, just multiply the decimal by 100.

# Convert Decimals to Fractions

Convert the decimal into a percentage by multiplying the decimal by 100.

$$0.3 \times 100 = 30$$

Percent means out of 100 so 100 becomes the denominator.

$$\frac{}{100}$$

The decimal becomes the numerator AFTER it has been multiplied by 100.

$$\frac{30}{100}$$

Simplify if able to.

$$\frac{30}{100}$$

(Both divisible by 10)

$$\frac{3}{10}$$

# Equivalent Fractions, Decimals and %

| Fraction | Decimal | Percentage |
|---|---|---|
| $\frac{1}{100}$ | 0.01 | 1% |
| $\frac{1}{10}$ | 0.1 | 10% |
| $\frac{1}{8}$ | 0.125 | 12.5% |
| $\frac{1}{5}$ | 0.2 | 20% |
| $\frac{1}{4}$ | 0.25 | 25% |
| $\frac{1}{3}$ | 0.333 | 33.3% |
| $\frac{1}{2}$ | 0.5 | 50% |
| $\frac{2}{3}$ | 0.666 | 66.6% |
| $\frac{3}{4}$ | 0.75 | 75% |
| $\frac{1}{1}$ | 1.0 | 100% |

# Finding a Percentage of an Amount

- To find 50% of an amount, divide the number by 2.

  *E.g. 50% of 628 = 628 ÷ 2 = 314*

  - To find 25% of an amount, divide the number by 4 or half and half again.

    *E.g. 25% of 628 = 628 ÷ 4 = 157*

    *OR find 50% = 314 - half again - 314 ÷ 2 = 157*

- To find 10% of an amount, divide the number by 10.

  *E.g. 10% of 628 = 628 ÷ 10 = 62.8*

- To find 5% of an amount, half what 10% is.

  *E.g. 10% of 628 = 62.8  5% = 62.8 ÷ 2 = 31.4*

- To find 1% of an amount, divide the number by 100.

  *E.g. 1% of 628 = 628 ÷ 100 = 6.28*

- To find any percentage, find 1% and multiply that number by the percentage amount you want to find.

  E.g. 36% of 628 = 628 ÷ 100 = 6.28

  6.28 x 36 = 226.08

  Or you can chunk it...

  E.g. 10% = 62.8

  30% = 62.8 x 3 = 188.4

  5% = 31.4

  1% = 6.28

  188.4 + 31.4 + 6.28 = 226.08

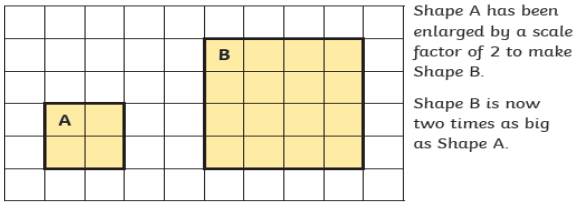
  - To find 99%, find 1% and subtract it from the number.

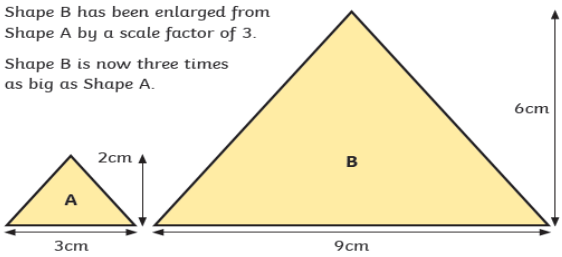
# Ratio

Ratio is simply comparing amounts (part to part).
For example:
If Billy has 12 sweets and James has 8 sweets, the ratio would be 12:8.

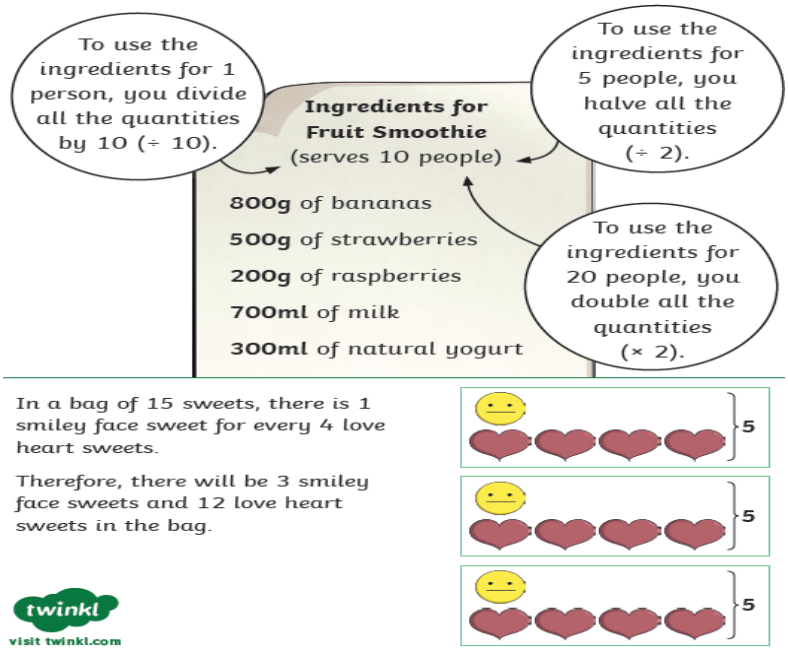
We can also simplify this in its lowest term by finding the lowest common factor (4).
The ratio could be simplified to 3:2. For every 3 of Billy's sweets, James has 2.

Scale factors:




Ratio and Proportion problem solving:



# Mean, Mode, Median, Range

The **mean** is the average of a set of data. To find the mean/average, add up all of the values to find the total. Divide the total by the number of values that you added together. E.g.

| 12 | 15 | 10 | 8 | 15 |
|---|---|---|---|---|

12 + 15 + 10 + 8 + 15 = 60

60 ÷ 5 = 12

The mean of this data is 12.

The **mode** is the most common number.

*E.g. 2,1,6,4,2,3,7,3,2. Mode = 2*

The **range** is the difference between the largest and the smallest number.

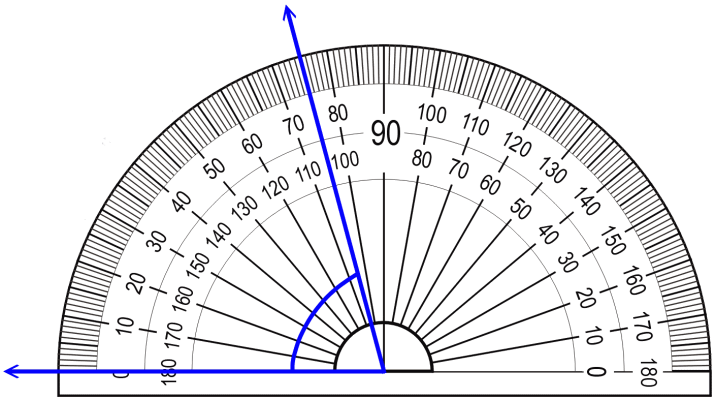
*E.g. 7,2,6,4,1,9 = 9 - 1 = 8. The range is 8.*

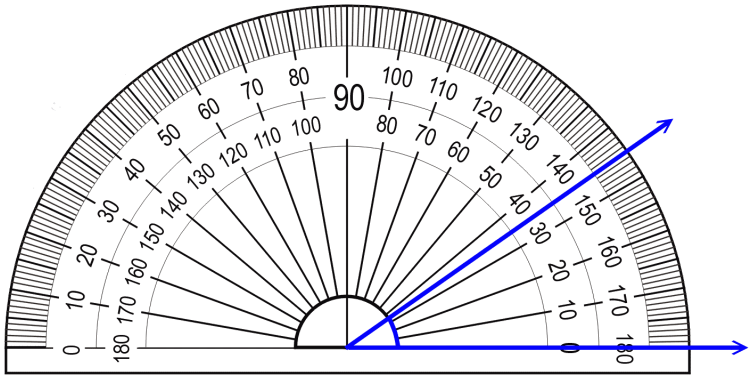
The **median** is where you order the set of numbers and find the middle number. When there are two middle numbers, you average them.

*E.g. 9,3,1,8,3,6 - 1, 3, 3, 6, 8, 9*
*3 and 6 are both in the middle - 3 + 6 = 9*
*9 ÷ 2 = 4.5*

# Using a Protractor

Place the cross or circle at the point (vertex) of the angle you are measuring.
Read from the zero on the outer scale of your protractor. If you use the right side to measure, read the inside numbers on the protractor.
Count the degree lines carefully.



# Angle Types

**Acute angles:** any angle that measures less than 90 degrees is called an acute angle.

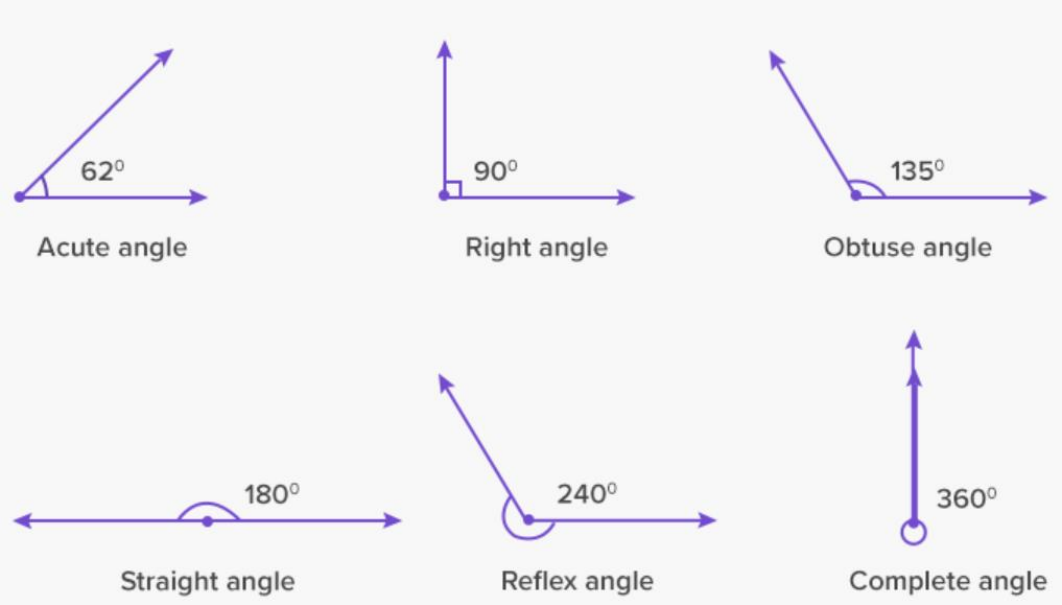
**Obtuse angles:** any angle that measures greater than 90 degrees and less than 180 degrees is called an obtuse angle.

**Reflex angles:** any angle that measures greater than 180 degrees is called a reflex angle.

**Right angles**: an angle that measures 90 degrees is a right angle. (A right angle makes an L shape.)

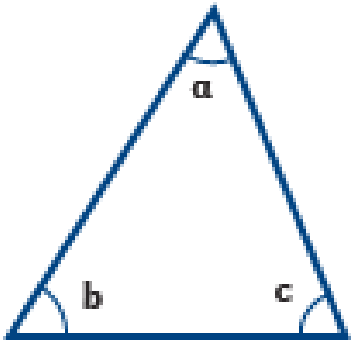
**Straight lines:** Straight lines are 180 degrees.

**Complete angles:** Complete angles are 360 degrees.



# Angles - Triangles and Quadrilaterals

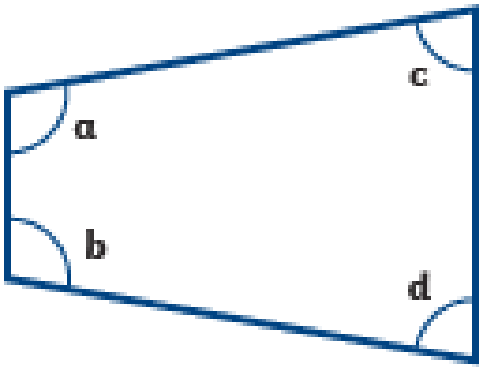
## Angles in a Triangle




$$a + b + c = 180°$$

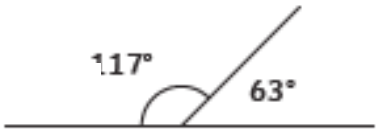
(All angles in an equilateral triangle are equal.)

## Angles in a Quadrilateral




$$a + b + c + d = 360°$$

# Calculating Angles

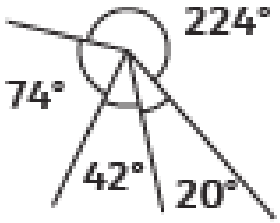



**Angles on a straight line always total 180 degrees.**

E.g. I know one angle is 117 degrees. I can solve the other angle by subtracting 117 from 180.

180 - 117 = 63

The other angle is 63 degrees. Make sure you write the degree symbol.




**Angles around a point always total 360 degrees.**

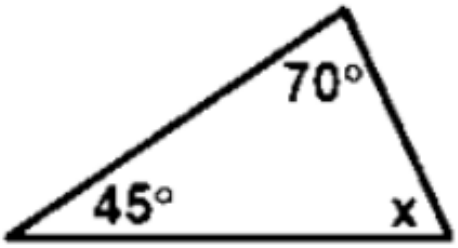
E.g. I need to add all the angles together.

224 + 74 + 20 = 318

Now subtract from 360.

360 - 318 = 42

The missing angle is 42 degrees.



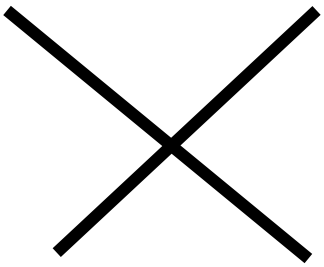

**Angles of a triangle always total 180 degrees.**

E.g. I need to add 70 and 45 together.

70 + 45 = 115

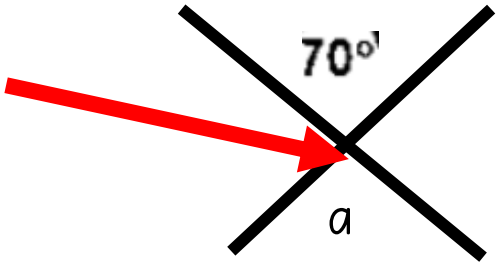
180 - 115 = 65

The missing angle is 65 degrees.



This is a cross section.
When angles are opposite on a cross section, they are equal.

Angle 'a' is also 70 degrees.




## Angles in Regular Polygons

As the number of sides of a polygon increases by one, the total of the interior angles increases by 180 degrees.

When n is equal to the number of the sides, this formula can be used to find the size of each angle in a regular polygon.

**Sum of Interior Angles = (n − 2) × 180°**  **Each Angle = $\frac{(n-2) \times 180°}{n}$**

**Pentagon**
n = 5
(5 - 2) × 180° = 540°
540° ÷ 5 = 108°

**Hexagon**
n = 6
(6 - 2) × 180° = 720°
720° ÷ 6 = 120°

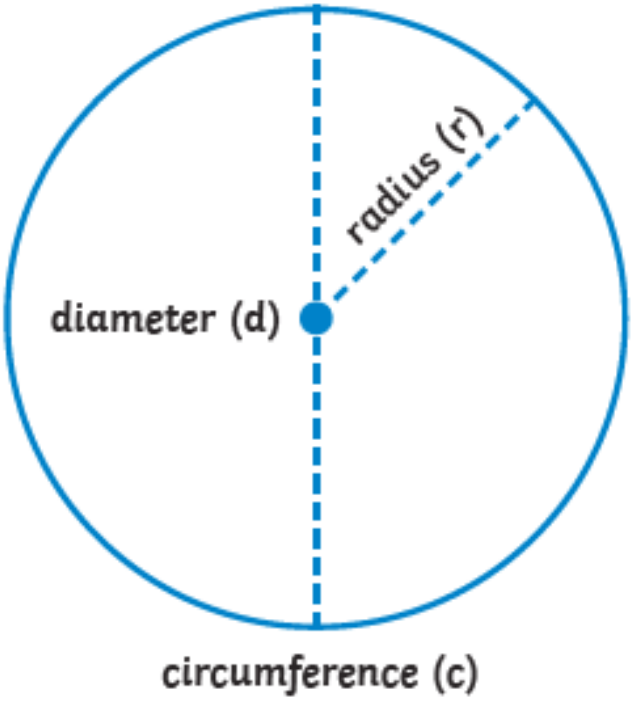
# Parts of Circles

A circle is a 2D shape. The perimeter of a circle is called the **circumference (c)**. The distance across the circle, passing through the centre, is called the **diameter (d)**.

The distance from the centre of the circle to the circumference is called the **radius (r)**.

$$r \times 2 = d$$

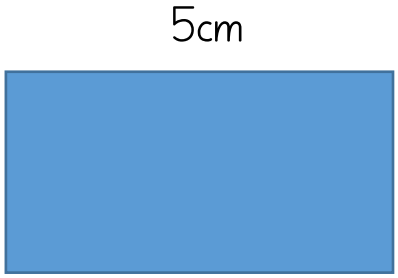
$$d \div 2 = r$$



# Perimeter

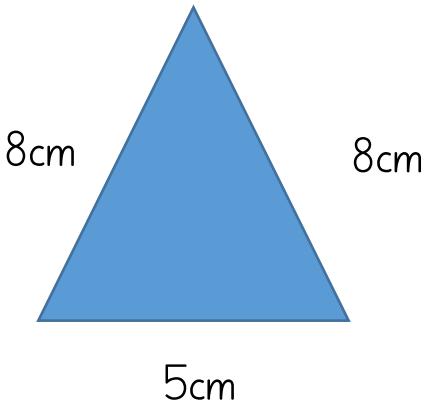
The perimeter measures the distance around a shape.
To find the perimeter if shapes, add together all the lengths and widths of the shape.

Tip: if it is a rectangle or square, add the length and the width then multiply by 2.




5cm + 4cm + 5cm + 4cm =
18cm

(5cm + 4cm) x 2 = 18cm

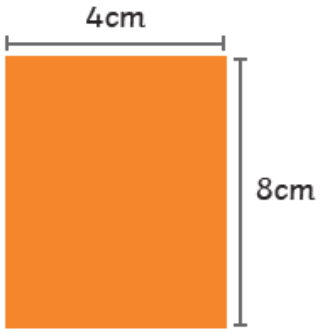



8cm + 8cm + 5cm =
21cm

# Area

## Area of Rectangles

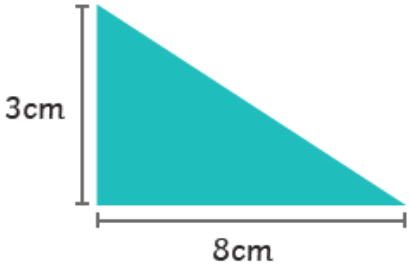
length x width = area of a rectangle




8cm × 4cm area = 32cm²

## Area of Triangles

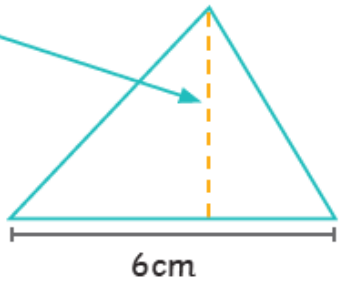
base x perpendicular height ÷ 2 = area of a triangle




8cm × 3cm ÷ 2
area = 12cm²

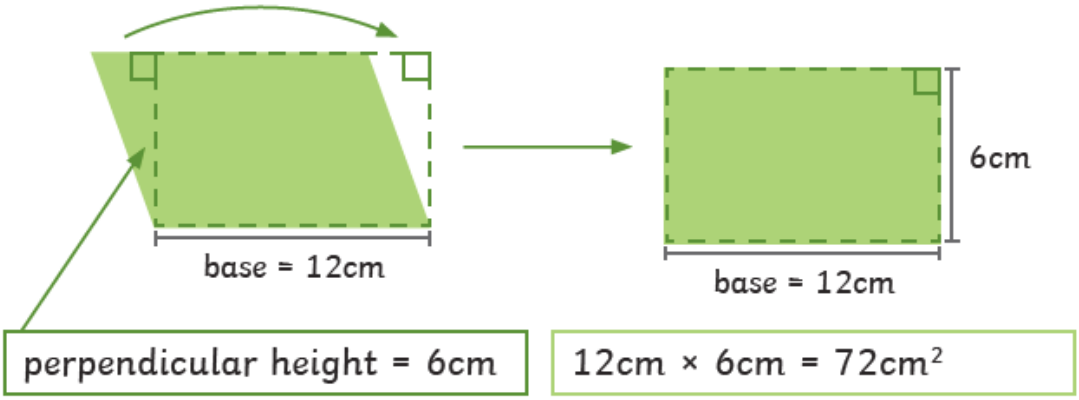
**perpendicular height** = 5cm

6cm × 5cm ÷ 2



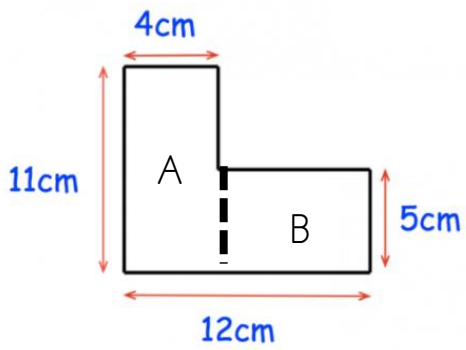
## Area of Parallelograms

base x perpendicular height = area of a parallelogram




## Compound Shapes

Break the shape into smaller shapes. Work out the area for each shape and then add the totals together.




Split into two shapes.

Shape A = 11cm x 4 cm = 44cm

Shape B = 8cm x 5cm = 40cm

I need to work out the width for shape B. 12cm – 4cm = 8cm

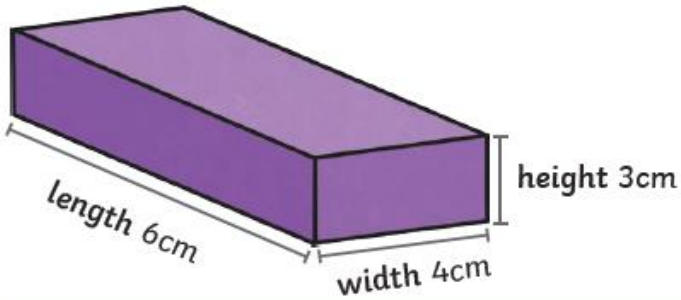
# Volume

## Counting Cubes

= 1cm³ | 11cm³ | 27cm³

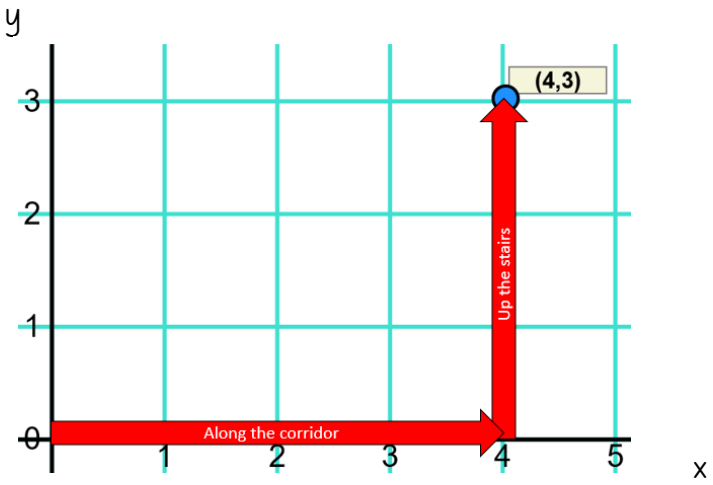
## Volume of Cuboids

length x width x height = volume of a cuboid



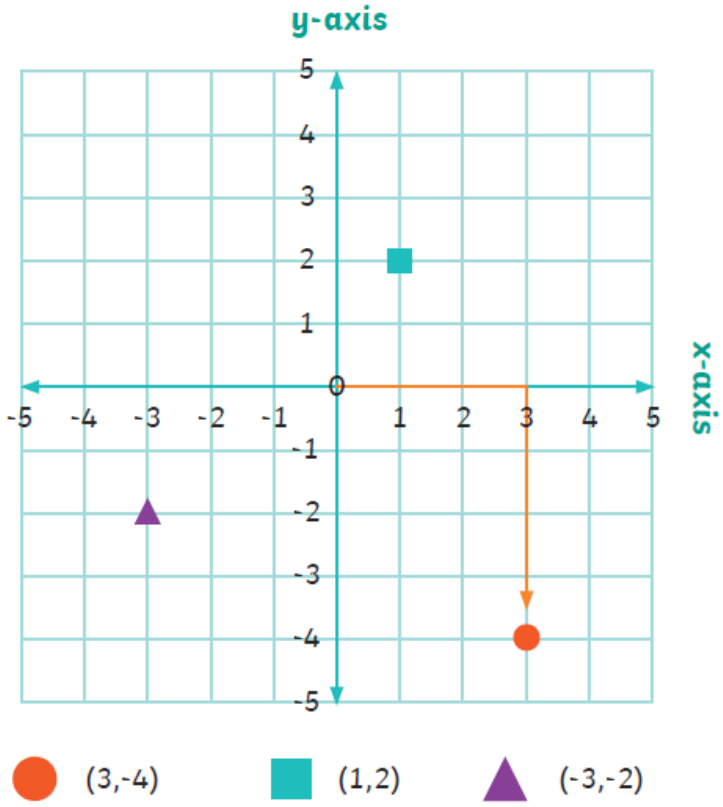

Multiply dimensions in **any** order:
3cm × 6cm × 4cm
volume = 72cm³

# Coordinates



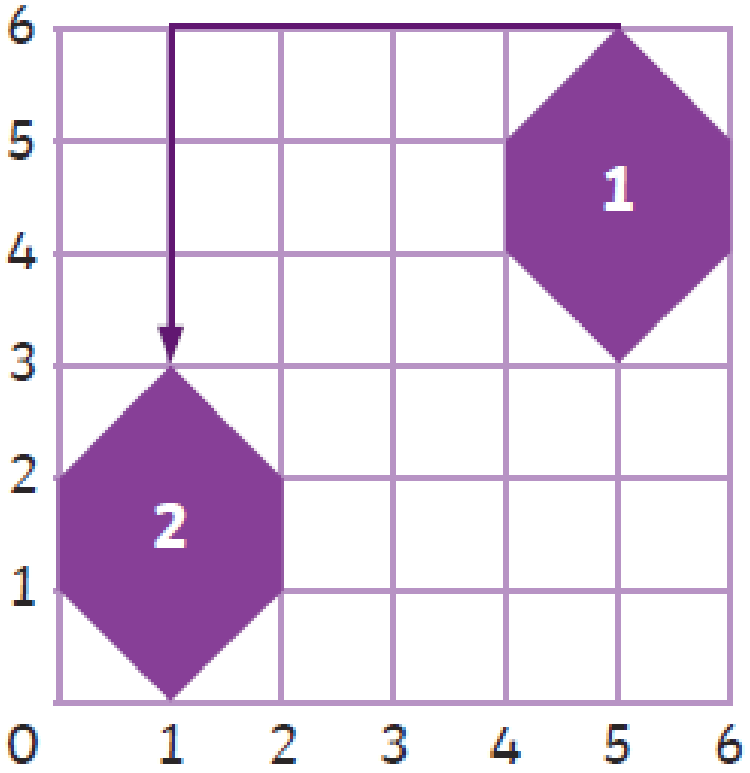

Along the corridor (x axis) and up the stairs (y axis).

Coordinates can use positive and negative numbers. Whether positive or negative, the x-axis coordinate is written first, followed by the y-axis coordinate



# Translating Shapes

A shape is translated when it is moved without being rotated or resized. Every point of the shape moves the same distance and in the same direction.

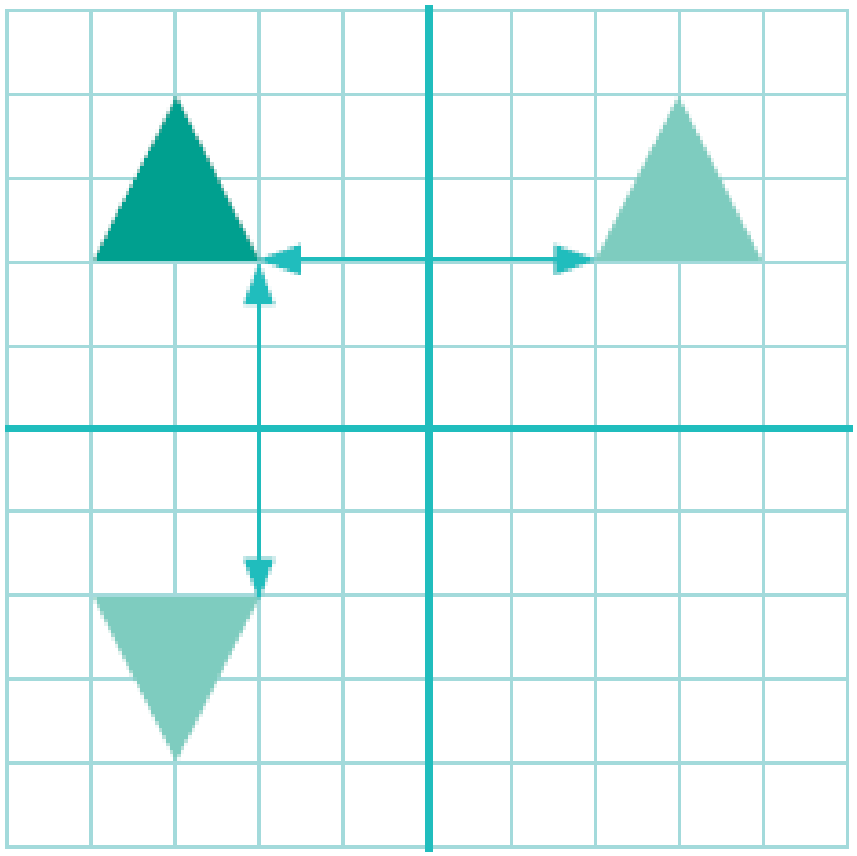



Shape 1 has been translated 4 units left and 3 units down.

# Reflections

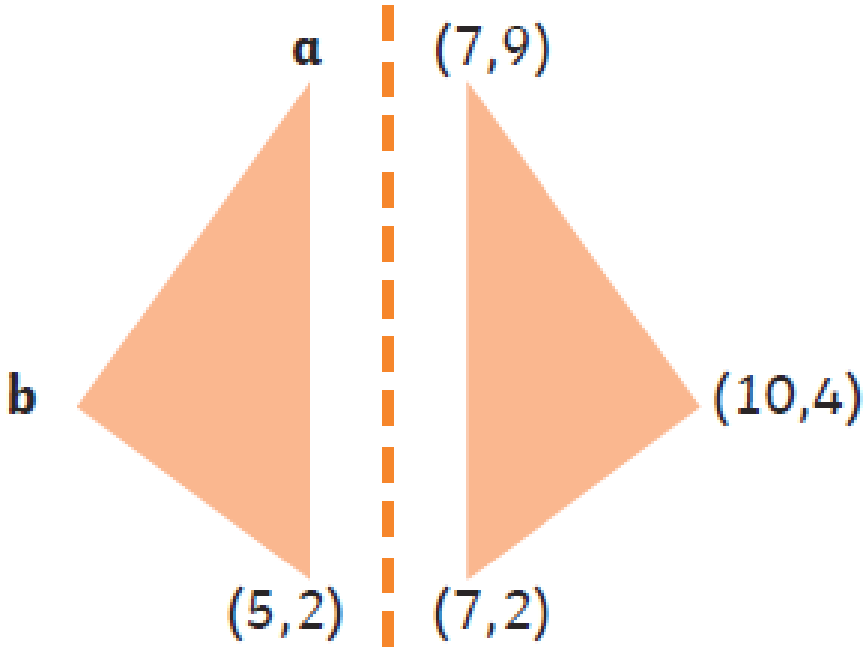
A shape is reflected when it is flipped over a line which acts as a mirror. Every point on the original shape is the same distance from the mirror line as the same point on the reflected shape.

The original triangle has been reflected in the x-axis and in the y-axis.



# Missing Coordinates

Shapes can be shown on unmarked grids.




Point a is in the same position along the x-axis as (5,2) and in the same position on the y-axis as (7,9).

**Point a** (5,9)

Point b is in the same position on the y-axis as (10,4). Both triangles will have the same width. The width of the right-hand triangle is 3. This means that the width of the left-hand triangle is also 3.

**Point b** (2,4)

# Converting Units

## Converting mass

1 tonne = 1000kg

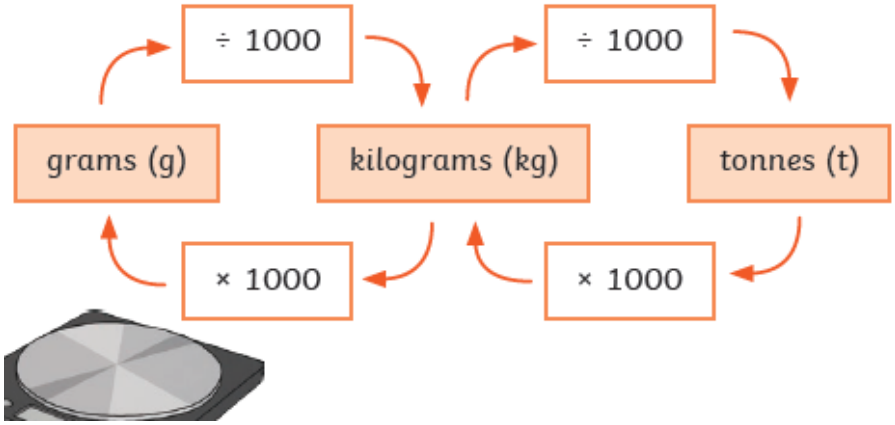
1000g = 1kg

$\frac{1}{10}$ kg = 0.1kg = 100g

$\frac{1}{4}$ kg = 0.25kg = 250g

$\frac{1}{2}$ kg = 0.5kg = 500g

$\frac{3}{4}$ kg = 0.75 = 750g






## Converting capacity

1000ml = 1l

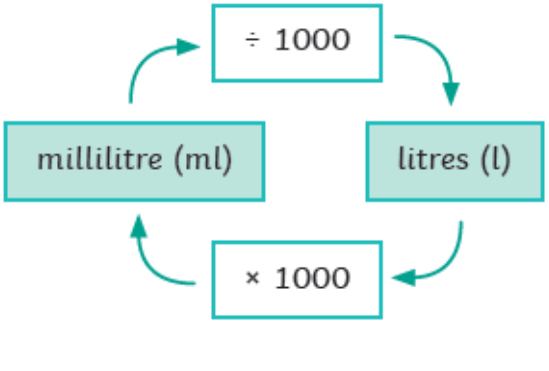
$\frac{1}{10}$ l = 0.1l = 100ml

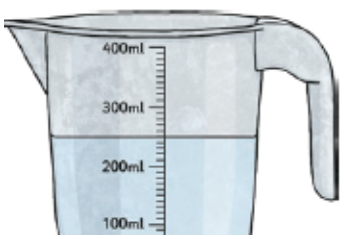
$\frac{1}{4}$ l = 0.25l = 250ml

$\frac{1}{2}$ l = 0.5l = 500ml

$\frac{3}{4}$ l = 0.75l = 750ml

$\frac{1}{100}$ l = 0.01l = 10ml



## Converting length

1000m = 1km

100cm = 1m

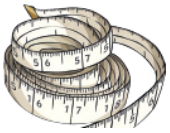
10mm = 1cm

$\frac{1}{2}$m = 0.5m = 50cm

$\frac{1}{4}$m = 0.25m = 25cm

$\frac{3}{4}$m = 0.75m = 75cm

$\frac{1}{10}$m = 0.01m = 10cm



millimetres (mm) ÷ 10 centimetres (cm) ÷ 100 metres (m) ÷ 1000 kilometres (km)

kilometres (km) × 1000 metres (m) × 100 centimetres (cm) × 10 millimetres (mm)

## Miles to kilometres

You might measure the length of a road or the distance between two cities in miles or kilometres.

miles (m) ÷ 5 × 8 kilometres (km)

kilometres (km) × 5 ÷ 8 miles (m)

5 miles ≈ 8 kilometres

≈ means approximately equal to

## Time

**Minute** 1 minute = 60 seconds

**Hour** 1 hour = 60 minutes

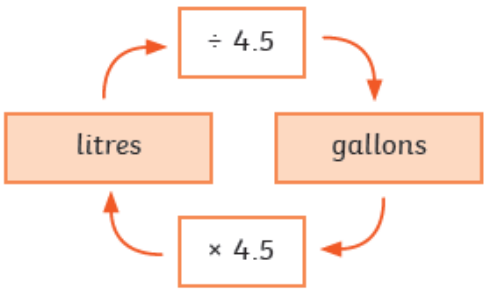
**Day** 1 day = 24 hours

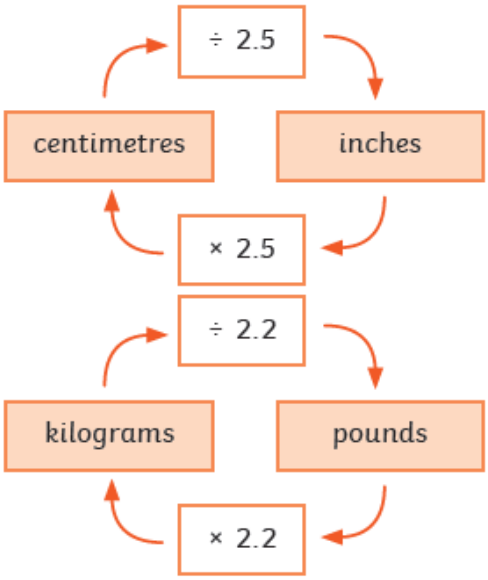
**Week** 1 week = 7 days

**Year** 1 year = 12 months = 52 weeks = 365 days

## Metric to imperial conversions

| metric (new) | imperial (old) |
|---|---|
| 2.5 centimetres | 1 inch |
| 1 kilogram | 2.2 pounds |
| 4.5 litres | 1 gallon |




## Imperial measures

Things that could be measured using imperial units:

- Someone's height in feet and inches
- The mass of a bag of sugar in ounces
- The mass of a sack of potatoes in pounds
- A person's mass in stones
- A carton of milk in pints
- The amount of water in a bath in gallons

1 foot = 12 inches

1 pound = 16 ounces

1 stone = 14 pounds

1 gallon = 8 pints

# Algebra

## Forming expressions

An expression is a group of numbers, letters and operation symbols.

| | |
|---|---|
| Add 14 to $a$ | $a + 14$ |
| Subtract 20 from $b$ | $b - 20$ |
| Multiply $c$ by 4 | $4c$ |
| 12 more than $d$ | $d + 12$ |
| Multiply $e$ by 3 and subtract 5 | $3e - 5$ |
| Add 12 to $f$ and then multiply by 2 | $2(f + 12)$ |

## Forming equations

$$a + 14 = 20$$

$$b - 20 = 15$$

$$4c = 28$$

$$d + 12 = 30$$

$$3e - 5 = 10$$

$$2(f + 12) = 44$$

An equation is a number statement with an equal sign (=). Expressions on either side of the equal sign are of equal value.