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Affordable GCSE Maths Tutoring Available

GCSE MATHS EDEXCEL FOUNDATION FLASHCARDS

EXAM INFO

Bring a couple, just in case!

Necessary Equipment:

Black Pen

Pencil

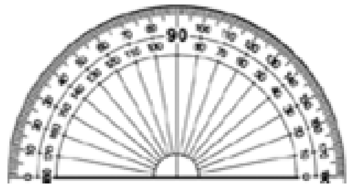
Rubber

Pencil Sharpener

Scientific Calculator

Ruler

Protractor



(Pair of) Compasses

ADD & SUBTRACT (NON CALC)

What is 2874 + 8962 + 513 ?

1. Line up the units, tens, hundreds etc
2. Add the columns, from **right** to **left**

```
 2 1
 2 8 7 4
 8 9 6 2
   5 1 3
 -------
1 2 3 4 9
```

1st: 4+2+3=9

2nd: 7+6+1=14

(Carry the 1 to the next column)

3rd: 1+8+9+5=23

(Carry the 2 to the next column)

4th: 2+2+8=12

What is 2736 – 1854?

1. Line up the units, tens, hundreds etc
2. Subtract the columns, from **right** to **left**

```
 1 16 1
 2 7 3 6
 1 8 5 4
 -------
 0 8 8 2
```

1st: 6 - 4=2

2nd: Instead of trying to do 3 - 5, borrow 1 from the 7 (making it 6), to turn your 3 into 13.

13 - 5 = 8

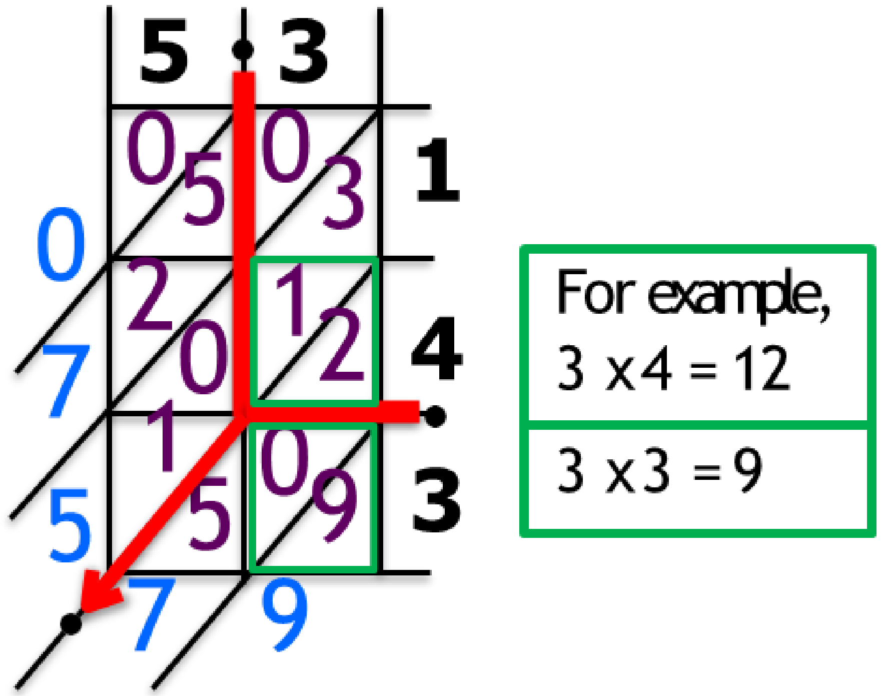
3rd: Instead of trying to do 6 - 8, borrow 1 from the 2 (making it 1), to turn your 6 into 16.

16 - 8 = 8

4th: 1 - 1 = 0

MULTIPLY & DIVIDE (NON CALC)

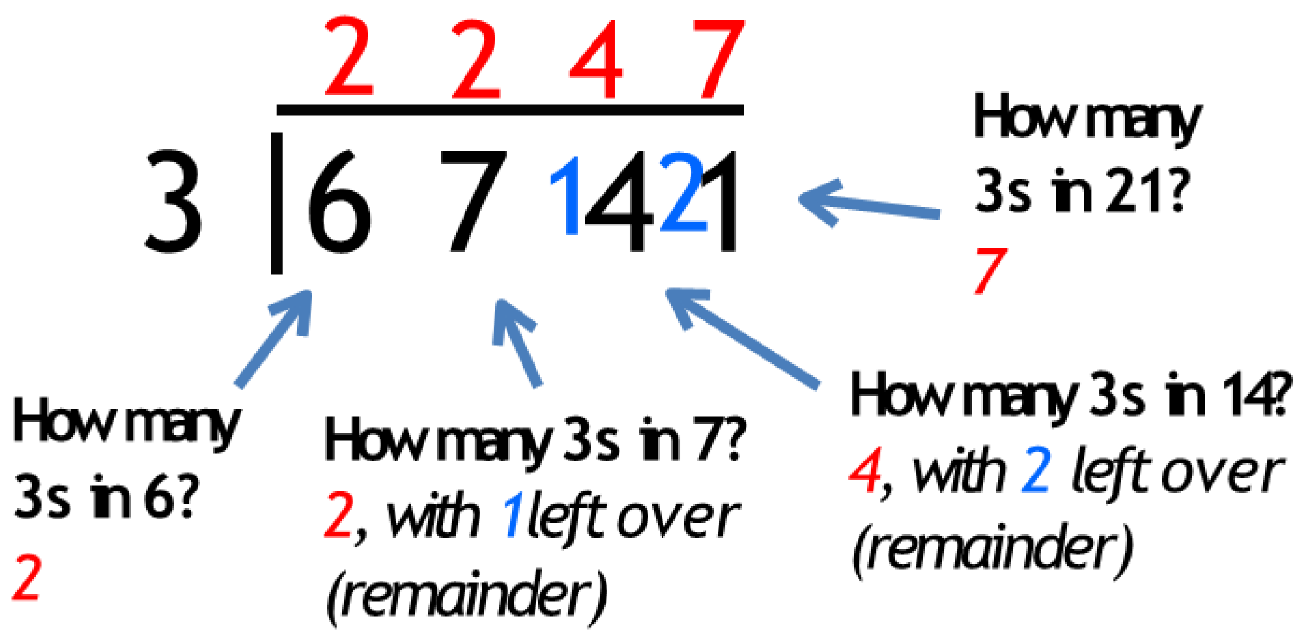
Work out 5.3 × 14.3



7 5.7 9

1. Set up grid
2. multiply to fill in grid
3. Add up along diagonals
4. Find where the decimal points meet, trace the diagonal to the answer

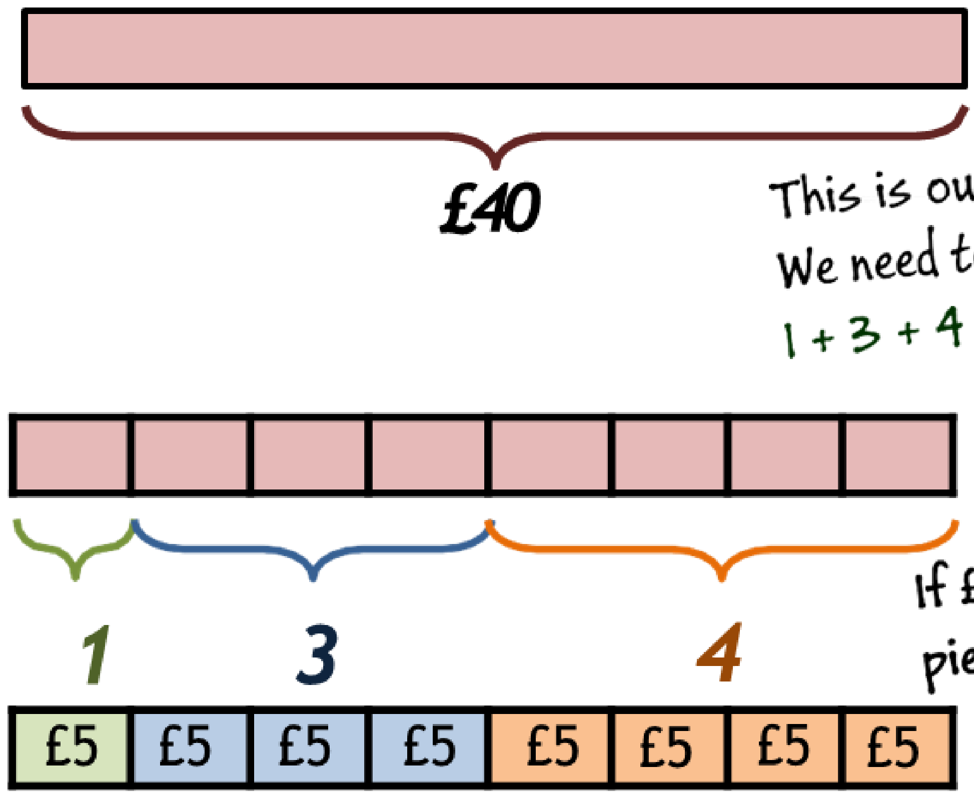
Work out 6741 ÷ 3



These are good ways of doing division and multiplication, but there are others!

SHARING IN A RATIO

£40 is shared in the ratio 1:3:4



This is our whole £40. We need to split it into $1 + 3 + 4 = \underline{8}$ pieces

If £40 has been split into 8 pieces, what's each piece worth?

$£40 \div 8 = £5$

Now you could answer anything!

What's the smallest share?

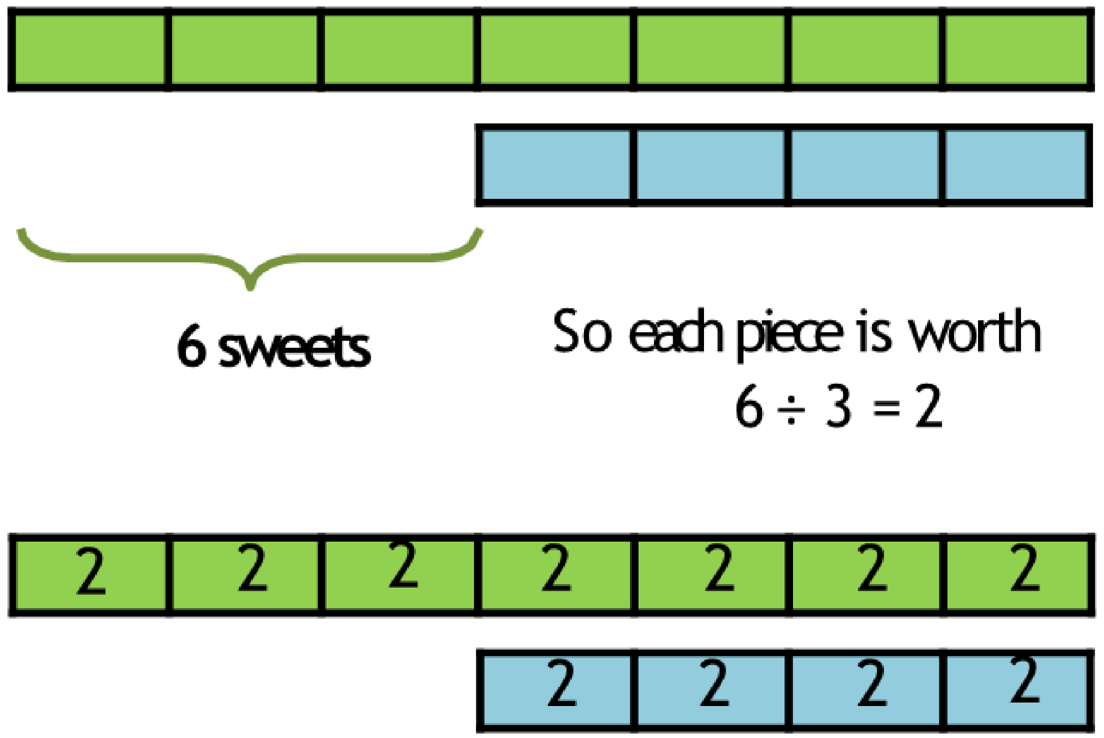
$1 \times £5 = \underline{\textbf{£5}}$

How much larger is the biggest share than the smallest?

The big one has 3 extra pieces

$3 \times £5 = \underline{\textbf{£15}}$

Some sweets are shared in the ratio 4:7. One person gets 6 more than the other.



Now you could answer anything!

How many sweets were shared in total?

$2 \times 11 = 22$ sweets

How many sweets were in the smaller share?

$2 \times 4 = 8$ sweets

FRACTIONS

FRACTION OF AMOUNT

$\frac{3}{7}$ of 42?

Find ONE seventh first, by dividing by 7

$$42 \div 7 = 6$$

You need THREE sevenths, so multiply by 7

$$6 \times 3 = 18$$

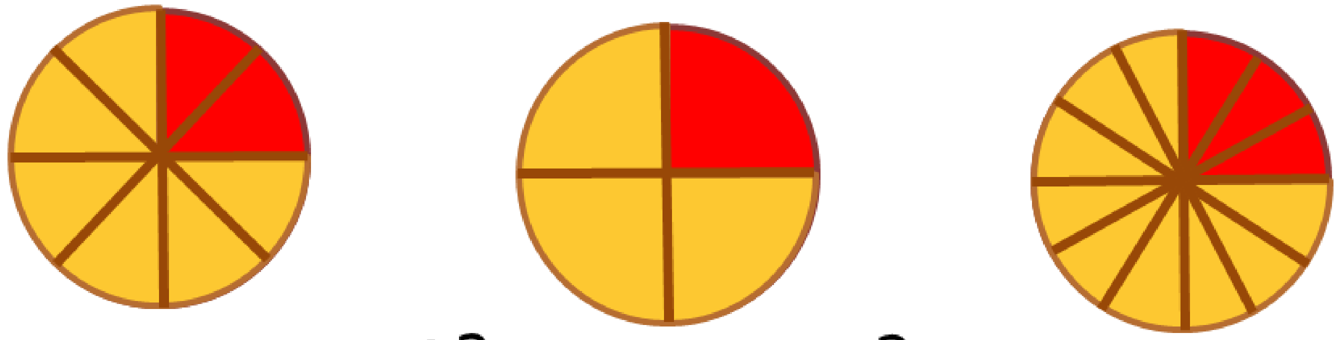
✓

Divide by the **denominator**, multiply by the **numerator.**

EQUIVALENT FRACTIONS

If you × or ÷ the top of a fraction, and do the same to the bottom, the fraction is worth the same.

What fraction is shaded red?



$$\frac{2}{8} \xrightarrow[\div 2]{\div 2} \frac{1}{4} \xrightarrow[\times 3]{\times 3} \frac{3}{12}$$

There is the same amount of red in each circle!

You'd usually be asked to **simplify** a fraction...

Just look for numbers which go into the top and bottom.

$$\frac{24}{36} \xrightarrow[\div 2]{\div 2} \frac{12}{18} \xrightarrow[\div 2]{\div 2} \frac{6}{9} \xrightarrow[\div 3]{\div 3} \frac{2}{3}$$

✓

Nothing else goes into 2 and 3.

FRACTIONS

ADDING/SUBTRACTING

Fractions need to have the same **denominator** before you can add or subtract them**.** You'll need to convert them.

$$\frac{2}{3} + \frac{1}{5} = ?$$

1. Find a number both **denominators** go into. This will be the **denominator** of the new fractions.

$$\frac{\square}{15} + \frac{\square}{15} = ?$$

2. What did we do to each fraction to get from the old denominators to the new? Whatever you've done to the bottom, do to the top too.

$$\frac{2}{3} + \frac{1}{5}$$

x 5 x 5 x 3 x 3

$$\frac{10}{15} + \frac{3}{15} = \frac{13}{15}$$

Now add/subtract the tops!

MULTIPLYING

multiply the numerators

$$\frac{5}{6} \times \frac{2}{5} \rightarrow \frac{5 \times 2}{6 \times 5} \rightarrow \frac{10}{30} \xrightarrow{\div 10} \frac{1}{3}$$

multiply the denominators

Simplify!

DIVIDING

Remember KFC!

Keep the first fraction the same

Flip the second fraction over

Change the sign to ÷

$$\frac{2}{7} \div \frac{3}{4} \rightarrow \frac{2}{7} \times \frac{4}{3} \rightarrow \frac{2 \times 4}{7 \times 3} \rightarrow \frac{8}{21}$$

Flip

Keep

Change

multiply like before

CONVERTING IMPROPER & MIXED FRACTIONS

IMPROPER TO MIXED

Write $\frac{11}{4}$ as a mixed number

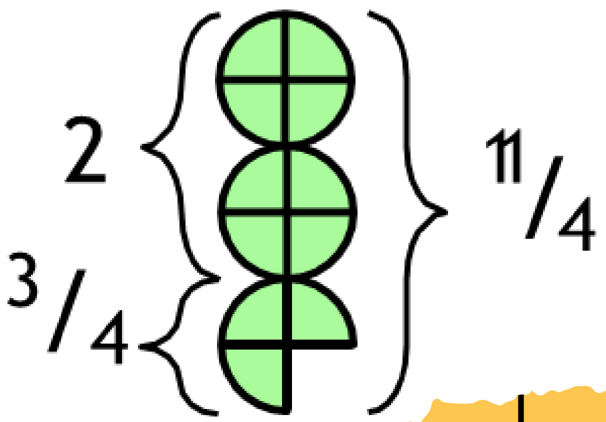
$11 \div 4 = 2$ remainder 3

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

How many "wholes" we can make out of eleven quarters

How many quarters left over

The bottom number stays the same ✓



They're the same!

MIXED TO IMPROPER

Write $3\frac{2}{5}$ as an improper fraction.

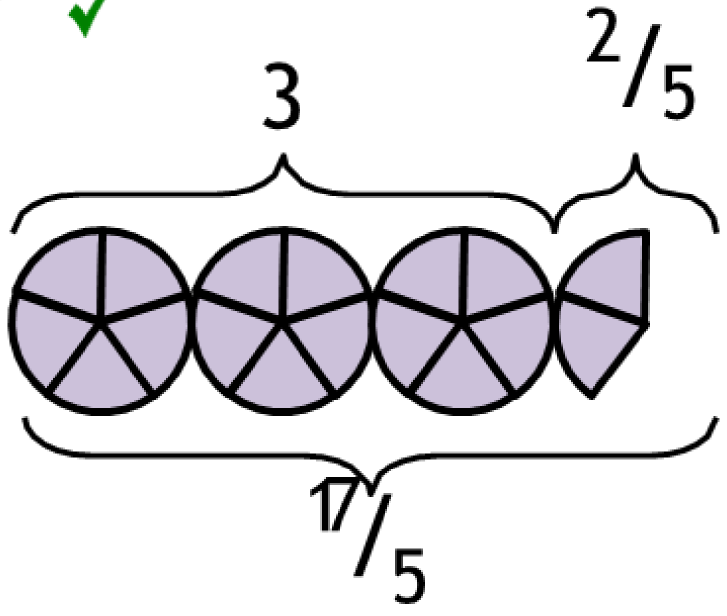
$3 \times 5 = 15$ ← This is the number of fifths in 3.

$15 + 2 = 17$ ← Add on the other fifths (from the $^2/_5$)

$$\frac{17}{5}$$ ✓

The bottom number stays the same

They're the same!



Mixed Number

Numbers with a fraction after

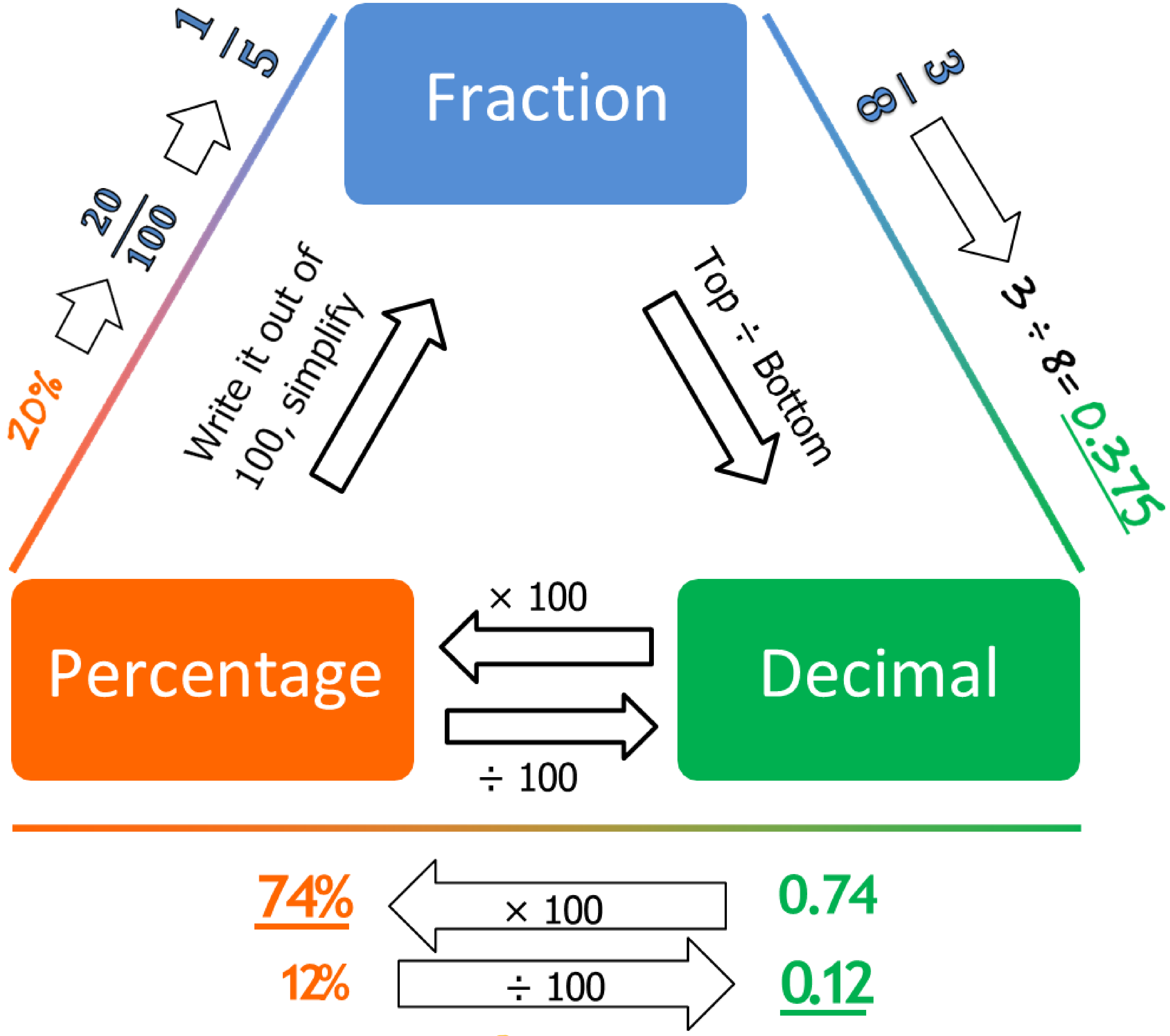
$5\frac{2}{3}$

Improper Fraction

Fractions with a bigger number on the top

$\frac{11}{4}$

FRACTIONS, DECIMALS PERCENTAGES



There are also some common ones you need to remember:

Fraction	Decimal	Percentage
$\frac{1}{2}$	0.5	50%
$\frac{1}{3}$	$0.\dot{3}$	$33.\dot{3}$%
$\frac{1}{4}$	0.25	25%
$\frac{1}{5}$	0.2	20%
$\frac{1}{11}$	0.1	10%

PRIME FACTOR DECOMPOSITION

Write the number 540 as a product of prime factors. Give your answer in index form.

"Product" is what you get when you multiply

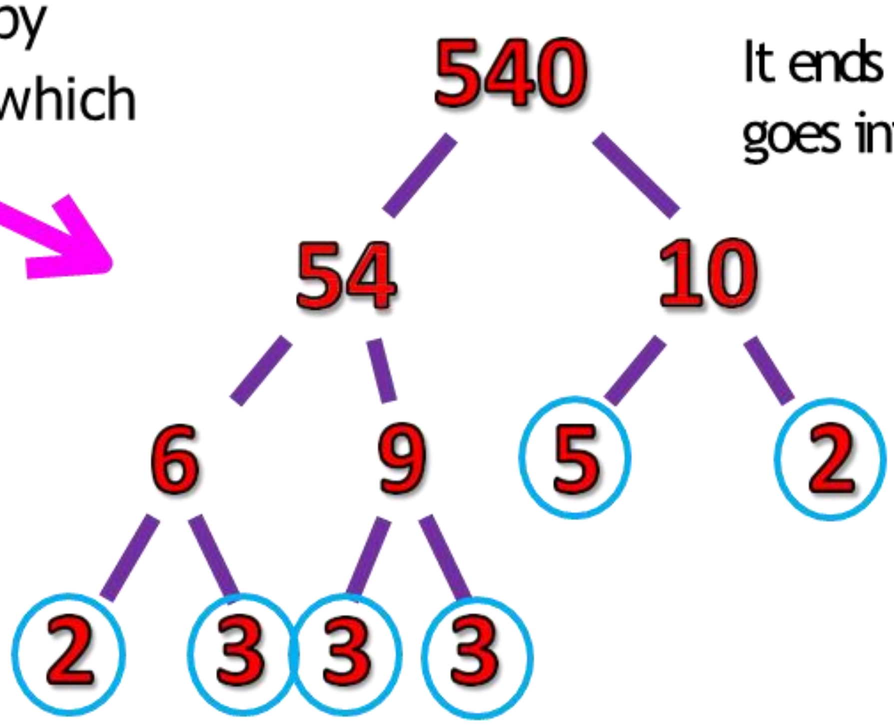
"Prime" numbers only have 2 factors – 1 and themselves

"Factors" are numbers which "go into" other numbers

"Index" is another word for powers, like 3^2

Break down 540 by finding numbers which go into it.

Remember - Each pair of branches should **multiply** the make the number above



It ends in a 0, so 10 goes into it.

10 breaks into 2 and 5

5 and 2 are **prime**, so stop there and circle them

These are all prime, so circle them

540 is equal to each of those circled numbers, multiplied together.

540 = 2 x 3 x 3 x 3 x 5 x 2

This is correct, but we need the answer in **index form**

540 = 2 x 3 x 3 x 3 x 5 x 2

$540 = 2^2 \times 3^3 \times 5$

ALGEBRA VOCAB

Word	Definition	Example
Variable	A letter which represents a number we don't know yet	x, y etc
Coefficient	Written before a letter, it's a number which multiplies a variable	$\mathbf{2}x$ $\mathbf{11}y^2$
Terms	Numbers or variables or both multiplied together	$2t^2$ $5xy$
Expression	A collection of terms	$4x^2 + 1$
Equation	An expression which is equal to something	$4x^2 + 1 = 2$

Word	Definition	Example
Inequality	Like an equation, but with an inequality sign instead of an equal sign	$2x + 1 \geq 2$ $3 \leq 4 - x$
Formula	An equation where each letter stands for something specific	$A = \pi r^2$ $a^2 + b^2 = c^2$
Factor	Terms which 'go into' other terms	$2x + 4$, 2 is a factor.
Factorise	Taking the factors of an expression outside the brackets	$2x + 4$ ↓ $2(x + 2)$

INDICES

"Indices" is another word for powers.
It refers to things like 3^2, x^4, or 6^{10}!

6^3

These can be called different things, like
Powers
Indices
Exponents

The 4 Rules of Indices

Rule	Explanation	Example
$a^0 = 1$	Any number to the power of zero equals 1.	$23^0 = 1$ $1^0 = 1$
$a^n \times a^m = a^{m+n}$	When multiplying, add the powers together.	$2^3 \times 2^4 = 2^{3+4}$ $= \mathbf{2^7}$
$a^n \div a^m = a^{m-n}$	When dividing, subtract the powers.	$6^3 \div 6^4 = 6^{-1}$ $= \mathbf{6^{-1}}$
$(a^n)^m = a^{m \times n}$	When doing a power to another power, multiply the powers.	$(2^4)^3 = 2^{4\times3}$ $= \mathbf{2^{12}}$
$a^{-n} = \frac{1}{a^n}$	With negative powers, get rid of the minus sign, and do 1 divided by what's left.	$2^{-3} = \frac{1}{2^3} = \mathbf{\frac{1}{8}}$

For these rules, the two big numbers have to be the same!

See that the two big numbers being multiplied are the same?

ALGEBRA

EXPANDING

Multiply everything inside the bracket by whatever's outside the bracket.

$$2x(3x+4)$$
$$2x \times 3x \; + \; 2x \times 4$$
$$6x^2 \; + \; 8x$$

It's the same with double brackets, but make sure you multiply everything!

$$(2x+3)(4x-5)$$
$$2x \times 4x + 2x \times -5 + 3 \times 4x + 3 \times -5$$
$$8x^2 + -10x + 12x + -15$$
$$8x^2 + 2x - 15$$

Simplify at the end

FACTORISING

It's the opposite of expanding.

Find the **biggest** thing that goes into both terms.
This goes outside the brackets.

$$12x+4$$
$$4(\square + \square)$$

What do you need to multiply by **4** to get to 12x?

$12x \div 4 = 3x$

What do you need to multiply by **4** to get to 4?

$4 \div 4 = 1$

$$4(3x+1)$$

SOLVING EQUATIONS

Remember: Whatever you do to the Left, you've got to do to the Right.

$$2x + 8 = 4x + 4$$
-2x -2x Get the x's together first
$$8 = 2x + 4$$
-4 -4 Now get the numbers on the other side
$$4 = 2x$$
÷2 ÷2 Find out what one x is
$$2 = x$$

RE-ARRANGING EQUATIONS

The "subject" of an equation is the bit by itself.

Subject ↓ $y = 2x + 3$

$\frac{2d + 3c}{2} = e$ ← Subject (e)

Subject ↓ $p = 4r^2/\sqrt{q}$

You can rearrange equations the same way you solve them – by doing the same thing to both sides.

Make x the subject of the equation

We want to get x by itself

$y = 2x + 3$

-3   -3

$y - 3 = 2x$

÷2   ÷2

$\frac{y - 3}{2} = x$

Remember you have to × or ÷ everything

Make p the subject of the equation

$\frac{3p}{2} - 5 = r$

+5   +5

$\frac{3p}{2} = r + 5$

×2   ×2

$3p = 2r + 11$

÷3   ÷3

$p = \frac{2r + 11}{3}$

Make b the subject of the equation

$3b + 2 = a - 2b$

+2b   +2b

First, get the 'b's in the same place

$5b + 2 = a$

-2   -2

$5b = a - 2$

÷5   ÷5

$b = \frac{a - 2}{5}$

NTH TERM

Using the n^{th} term lets you find any number in a sequence, like the second number, tenth number, or hundredth number…

Find the n^{th} term of the following sequence.

11, 8, 5, 2, -1

14 11, 8, 5, 2, -1

+3 -3 -3 -3 -3

Whatever the numbers are changing by, that's what goes before the 'n'.

The number which would come **before** the first term is what you add or subtract.

-3 n +14

$-3n+14$ ✓

The n^{th} term of a sequence is 2n+5.
Find the second, fifth and tenth terms in the sequence.

2^{nd} term	2×2+5 9	Second term is **9** ✓
5^{th} term	2×5+5 15	Fifth term is **15** ✓
10^{th} term	2×10+5 25	Tenth term is **25** ✓

Just substitute this number into the 'nth term' equation
2n+5

STRAIGHT LINE GRAPHS

Draw the graph of $y = 2x - 3$.

make a table of some easy 'x' values, so you can work out some 'y' values.

x	-1	0	1	2
y				

Substitute these 'x' values into the equation

$y = 2x - 3$

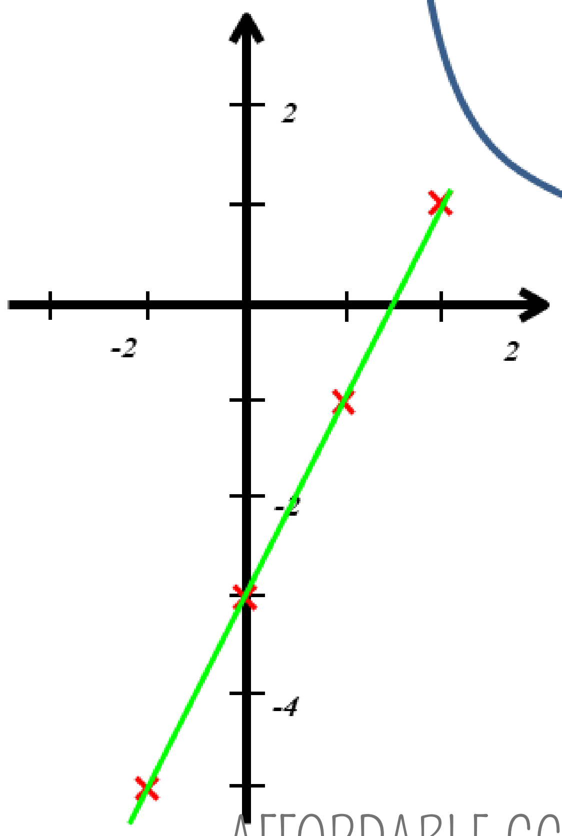
x	-1	0	1	2
y	-5	-3	-1	1

For example,
2 x 1 - 3 = -1

Each pair of x and y values is a coordinate.

(-1, -5) (0, -3) (1, -1) (2, 1)

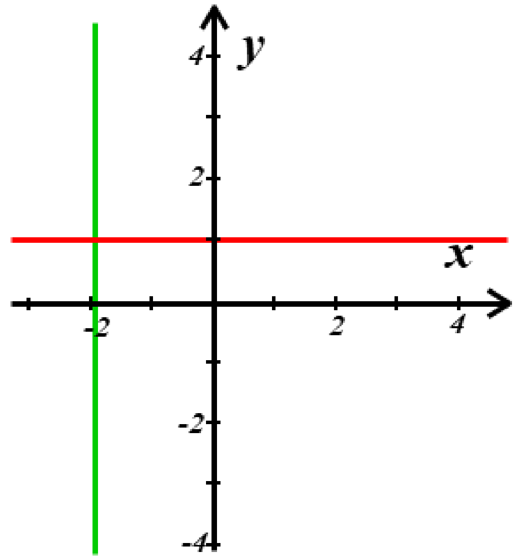
Now plot them and join them up!



x axis

The line $y = 1$ crosses the y axis at 1.

The line $x = -2$ crosses the x axis at -2.



AFFORDABLE GCSE MATHS TUTORING AVAILABLE

SHAPE VOCABULARY

Types of Quadrilateral ← Four sided shape

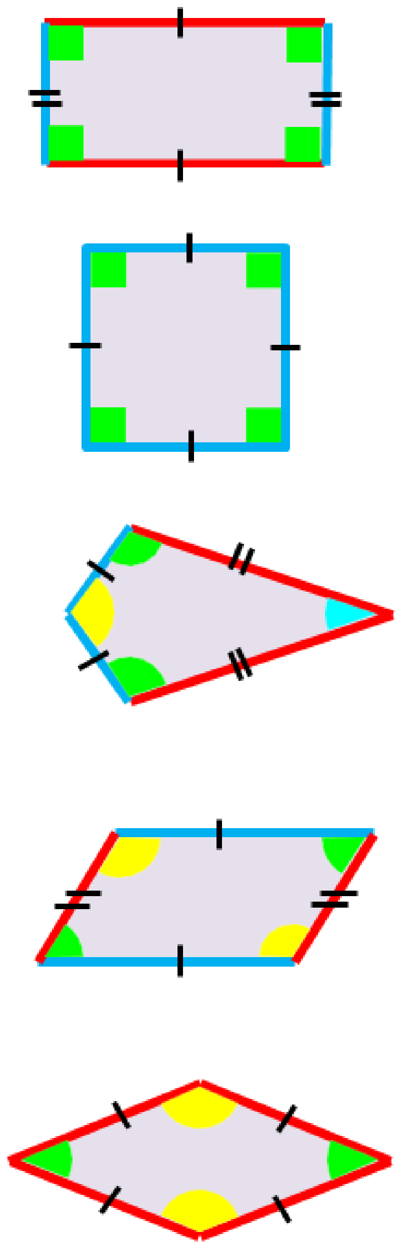
Rectangle

Square

Kite

Parallelogram

Rhombus

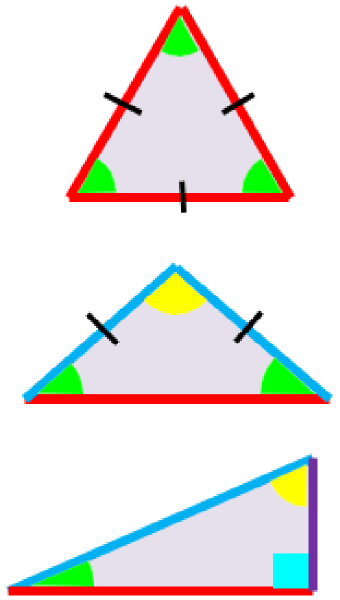


Types of Triangle

Equilateral

Isosceles

Scalene

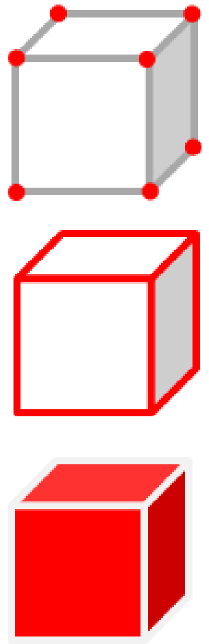


Features of 3D shapes

Vertices

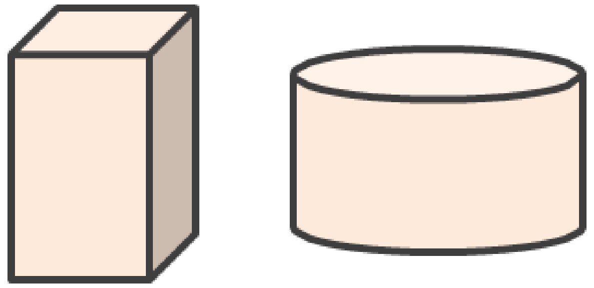
Edges

Faces



Prism

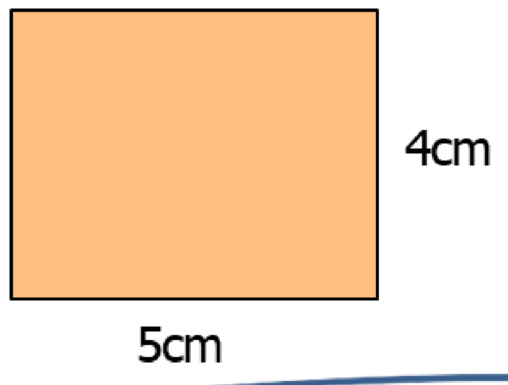
A 3D shape you can cut into slices, where every slice looks the same.



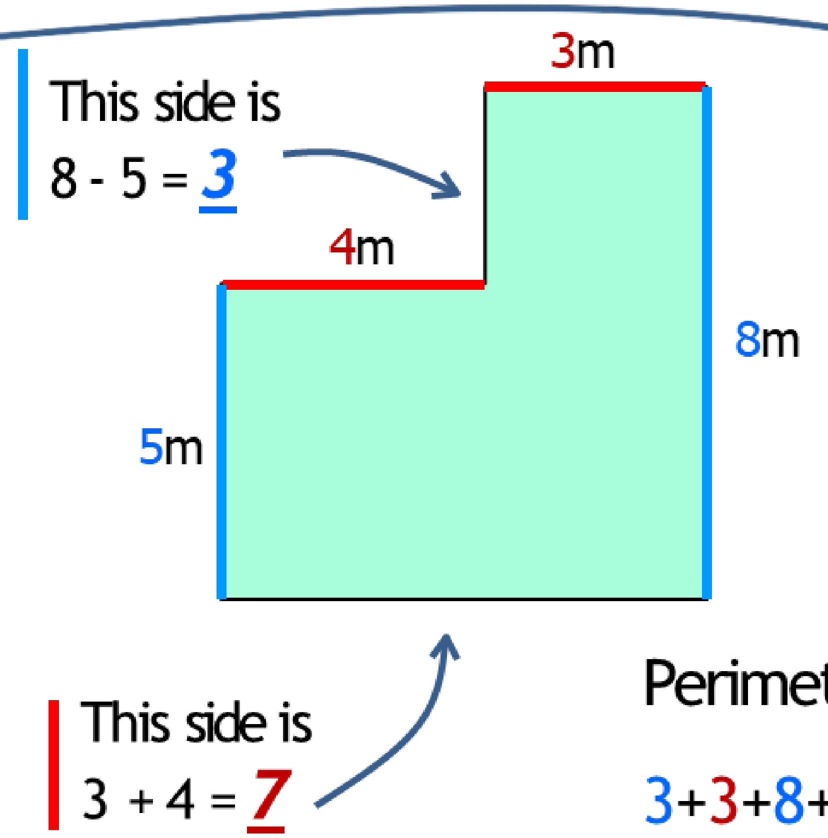
PERIMETER & AREA

The units for area are things like cm^2, m^2, km^2...

Perimeter is the distance round the outside of a shape.



Perimeter = 5+4+5+4 =18



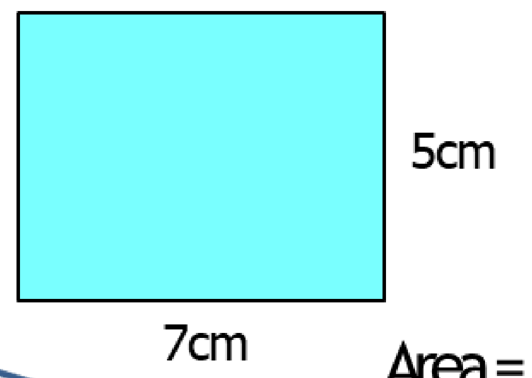
Perimeter

3+3+8+7+5+4

= 30m

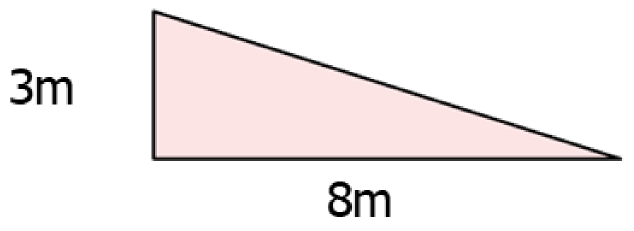
Area is the space inside a shape.

Area of a rectangle	=	base x height



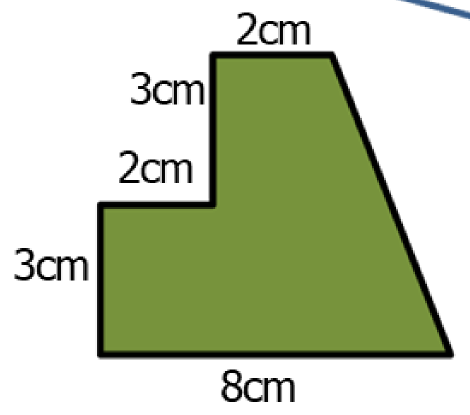
Area = 5 x 7 $=35cm^2$

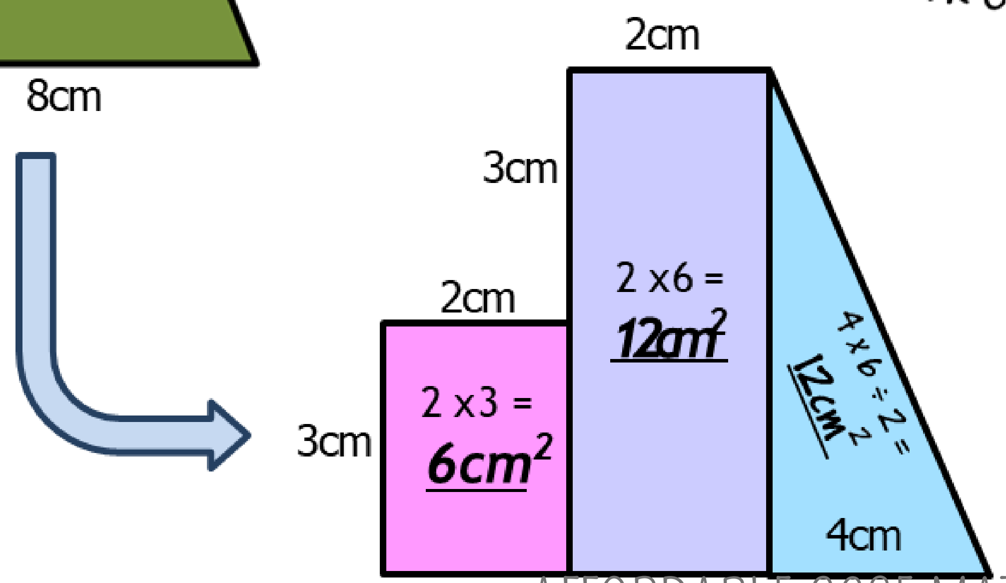
Area of a triangle	=	(base x height)÷2



Area = (3 x 8) ÷ 2 $=12cm^2$

With complicated shapes, break them into shapes you *can* work out





Area = 6 + 12 + 12 $=30cm^2$

AREA & CIRCUMFERENCE OF CIRCLE

Special word for perimeter of a circle

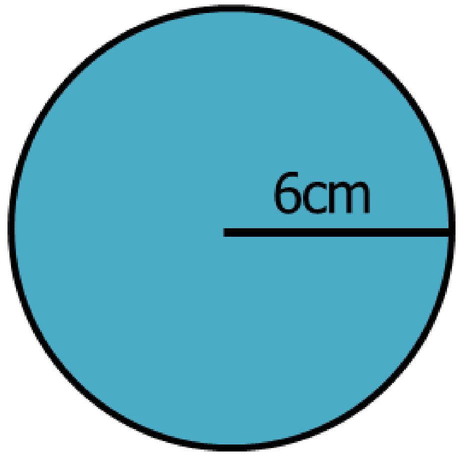
$\pi = 3.14159265...$

Pi is a number roughly the same as 3.14 which goes on forever. Rather than keep writing 3.14..., we usually just use the symbol π.

Area = πr^2	Circumference = $\pi d = 2\pi r$

YOU HAVE TO REMEMBER THESE

Find the area and circumference of this circle.
Give your answers to 1 decimal place.



Area $= \pi r^2$

$= \pi \times r^2$

$= 3.14 \times 6^2$

$= 113.04$

$= 113.0$ cm (1dp)

Circumference $= \pi d$

$= \pi \times d$

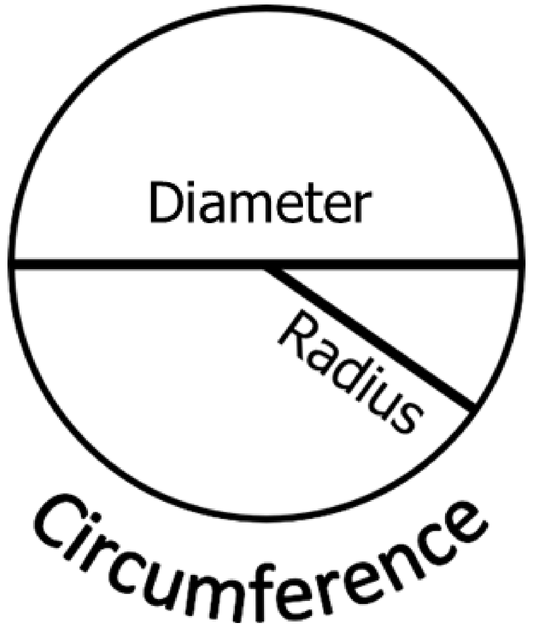
$= 3.14 \times 2 \times 6$

$= 3.14 \times 12$

$= 37.68$

$= 37.7$ cm (1dp)

Diameter is double the radius...



r stands for radius

d stands for diameter

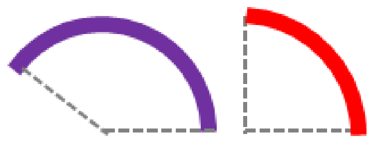
Diameter is double the radius.

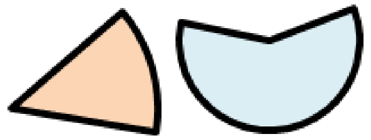
ARCS & SECTORS

Circumference = $\pi d = 2\pi r$

Area = πr^2

You'll need these too!

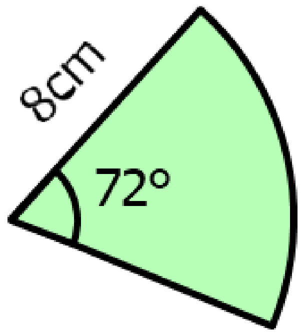
An arc is part of a circumference, like this: 

A sector is a slice of a circle, like this: 

To find the area of a sector, or length of an arc:

1. Find the area / circumference of the full circle,
2. Find what 1°'s worth would be
3. Find the size of your part of the area/circumference

What is the area of this sector?



Area of full circle $= \pi \times r^2$

$= 3.14 \times 8^2$

$= 200.96 \text{ cm}^2$

What would the area of a 1° slice be?

$200.96 \div 360 = 0.558\ldots \text{cm}^2$

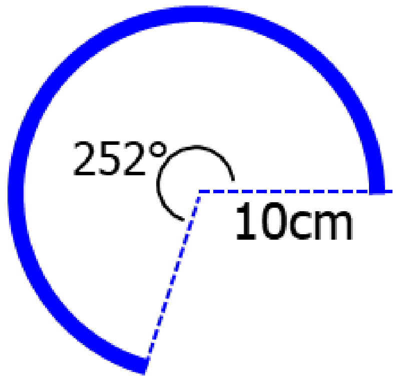
Keep this number on your calculator

So 72° must be...

$0.5588\ldots \times 72 = 40.192$

What is the length of this arc?

Diameter is double the radius



Circumference of full circle $= \pi \times d$

$= 3.14 \times 20$

$= 62.8 \text{ cm}^2$

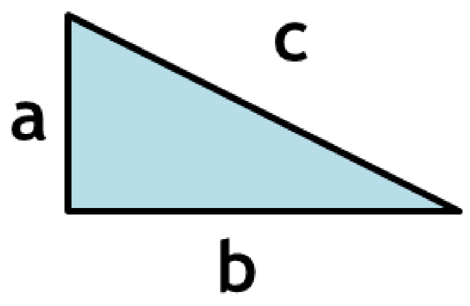
What would a 1° portion of the circumference be?

$62.8 \div 360 = 0.174\ldots$

So 252° must be...

$0.174 \times 252 = 43.96 \text{ cm}$

PYTHAGORAS THEOREM



For a right angled triangle with sides a, b, and c,

$a^2+b^2=c^2$

For finding a long side

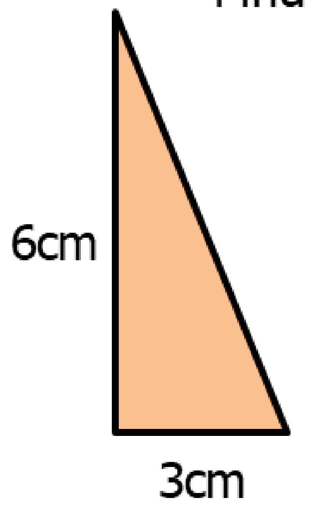
$a^2=c^2-b^2$

For finding a short side

a is the smallest,
b is in the middle,
c is the longest.

Finding the long side

Find the missing side.



$a^2+b^2=c^2$

$3^2+6^2=c^2$

$9+36=c^2$

$45=c^2$

$\sqrt{45}=c$

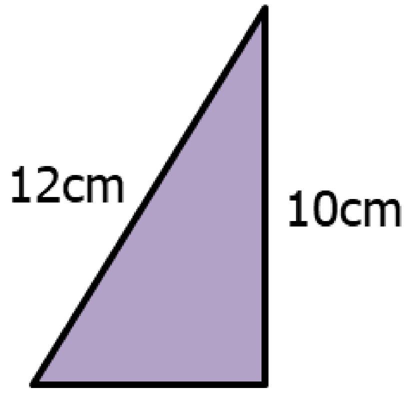
$c = 6.7$cm (1dp)

You can think of this as 3 steps:

1. Square the sides
2. Add them
3. Square root

Finding a short side

Find the missing side.



$a^2=c^2-b^2$

$a^2=12^2-10^2$

$a^2=144-100$

$a^2=44$

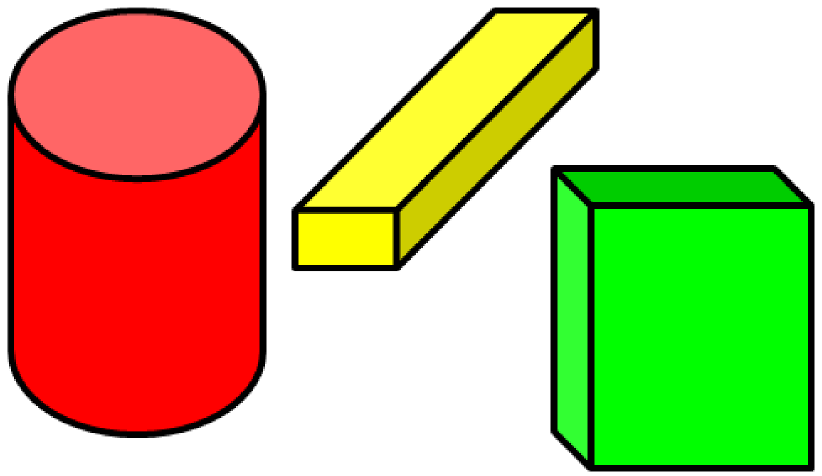
$a=\sqrt{45}$

$a = 6.6$cm (1dp)

You can think of this as 3 steps:

1. Square the sides
2. Subtract them
3. Square root

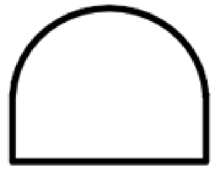
VOLUME OF PRISMS



Prisms are 3D shapes which you could cut into lots of identical slices.

Volume of Prism = Area of Cross Section × Length

↑ Area of each "slice", or the area of the "end" of the shape.



Area = $30m^2$

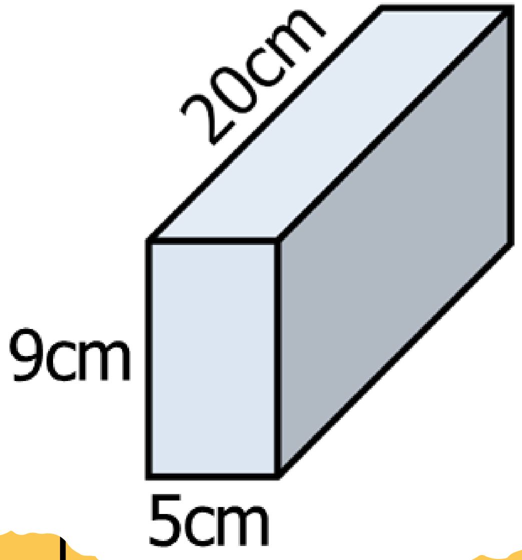
A tunnel cuts through a hillside.
The face of the tunnel is $30m^2$, and the tunnel is 20m long.
What is the volume of the tunnel?

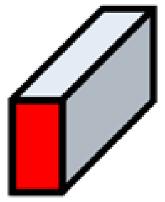
Volume of prism = Area of cross section x Length

= 30 x 20

= $1200m^3$

What is the volume of this cuboid?





Lets call this red side the cross section.

Area of cross section = 9 x 5

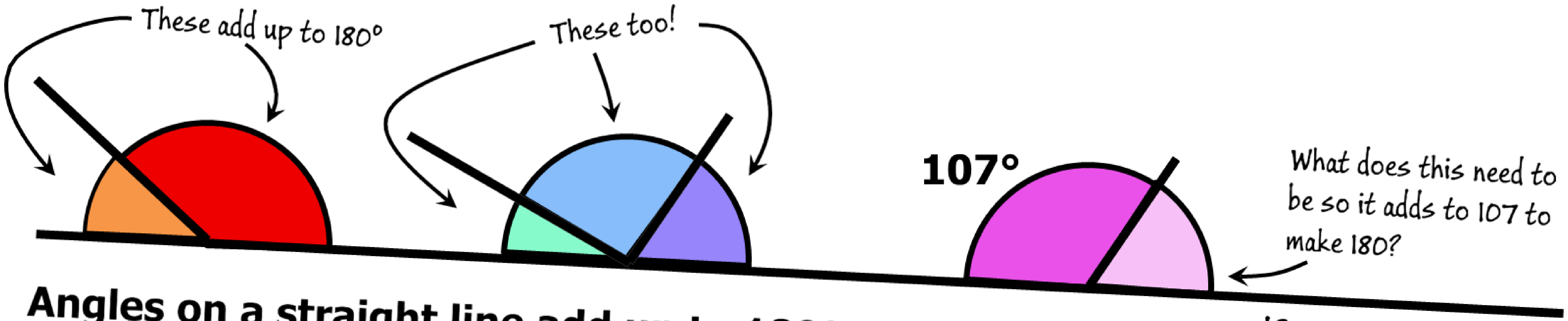
= **45** cm^2

multiply area of cross section by length

Volume = **45** x 20

= **$900cm^3$**

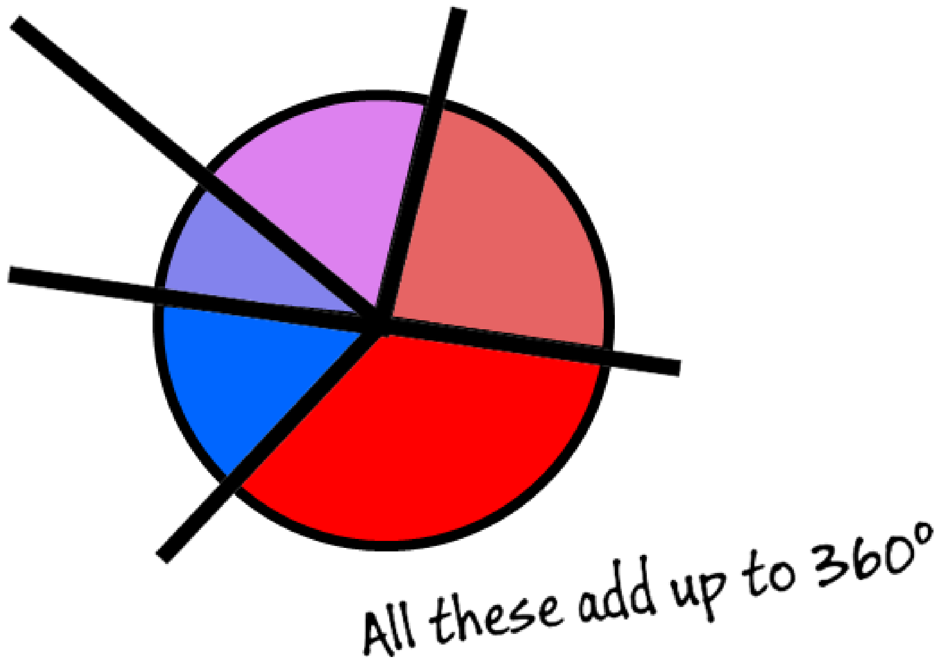
OTHER ANGLE RULES

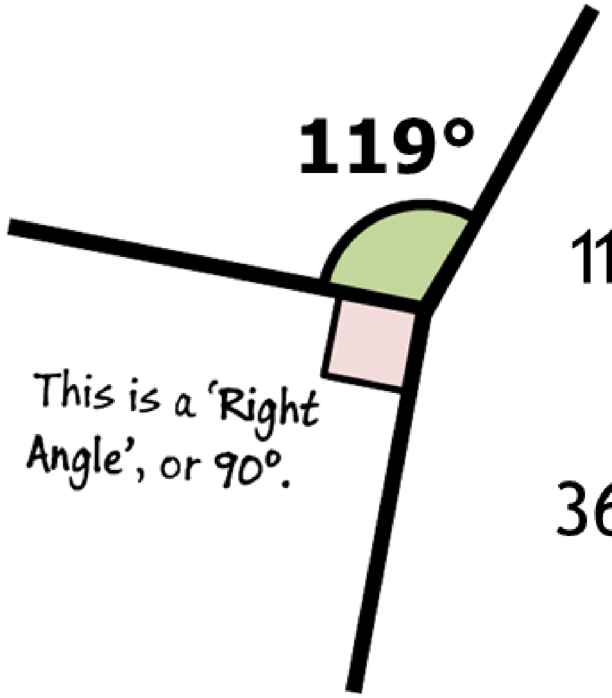


Angles on a straight line add up to 180°

180 − 107 = 73°

Angles around a point add to 360°





What angle is missing?

119 + 90 = 209°
(angles so far)

360 - 209 = 151°
(what we need to make 360°)

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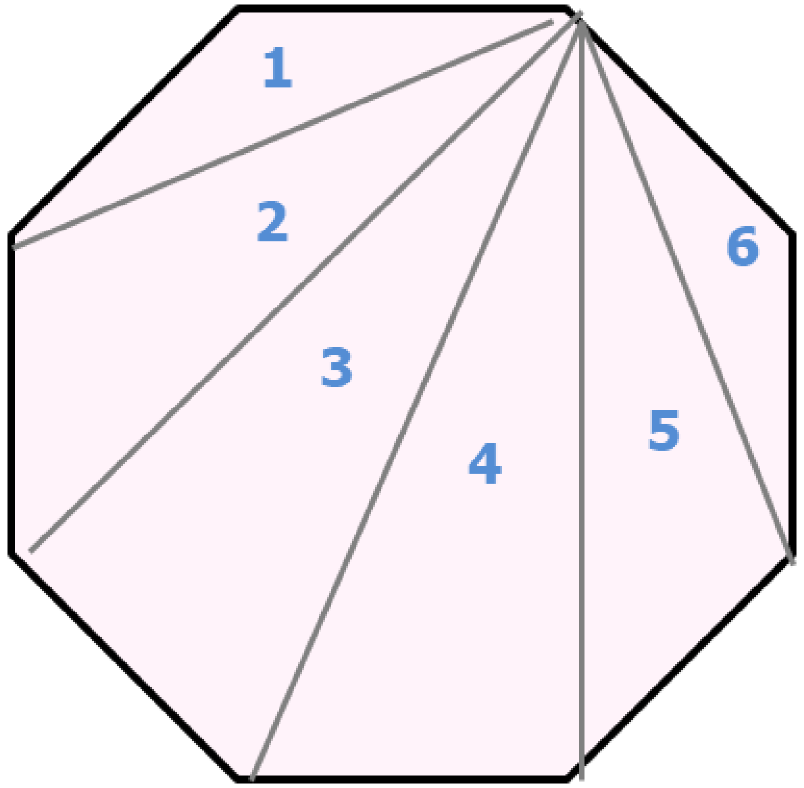
INTERIOR & EXTERIOR ANGLES

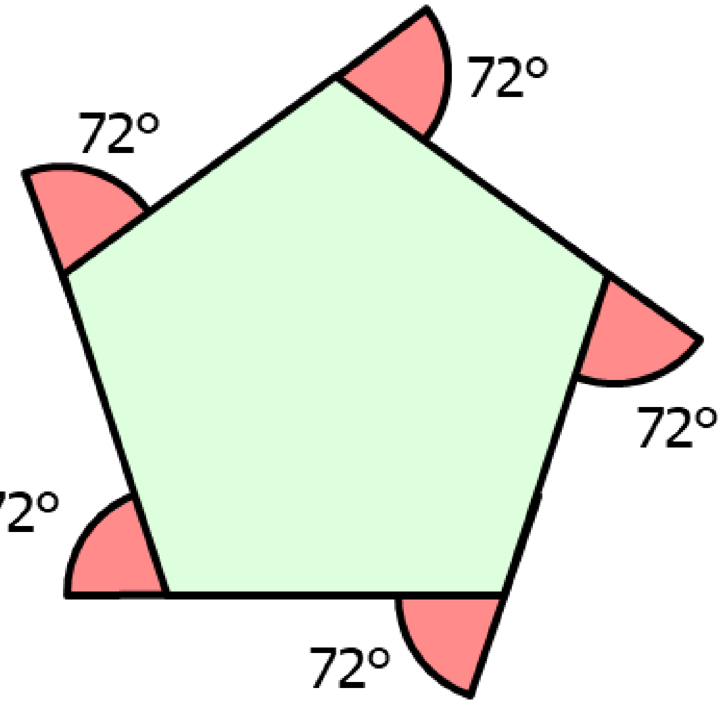


- To find the SUM of interior angles of a polygon, you can split it into triangles.
- This shape has 6 triangles, each triangle has 180° in it, so…

$180 \times 6 = \underline{1080}°$

- If it's a REGULAR shape, you can divide the SUM of interior angles, by the number of angles.
- That tells you what each angle must be…

$1080 \div 8 = \underline{135}°$

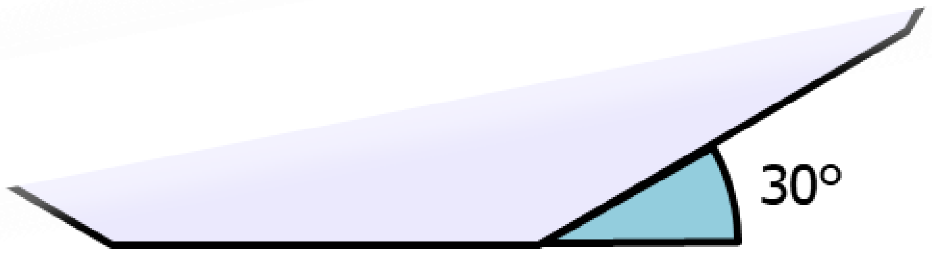


Exterior angles always add to 360°

The exterior angles of a regular pentagon are all 72°…

$72 + 72 + 72 + 72 + 72 = \underline{360}°$

If you know the exterior angle of a REGULAR shape, you can find how many sides it has.

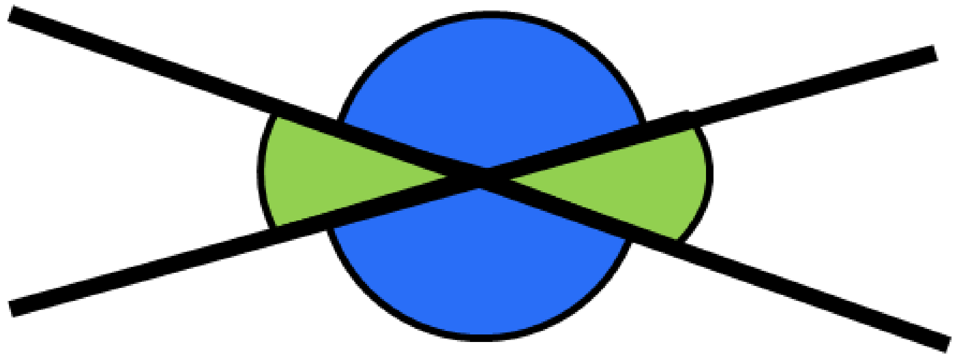


There must be twelve 30° angles, so there must be 12 sides!

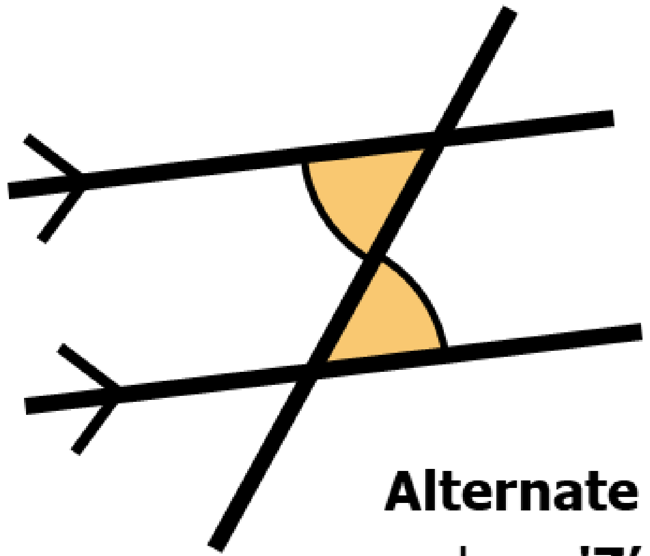
$360 \div 30 = \underline{12}$

REGULAR – All sides/angles the same

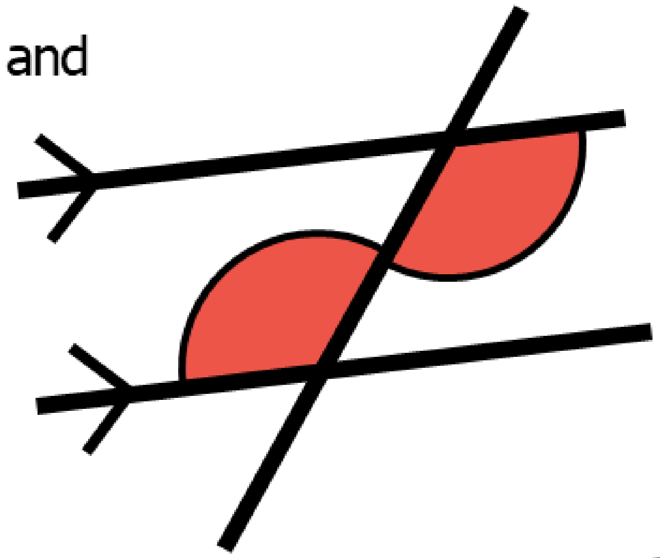
ANGLES IN PARALLEL LINES



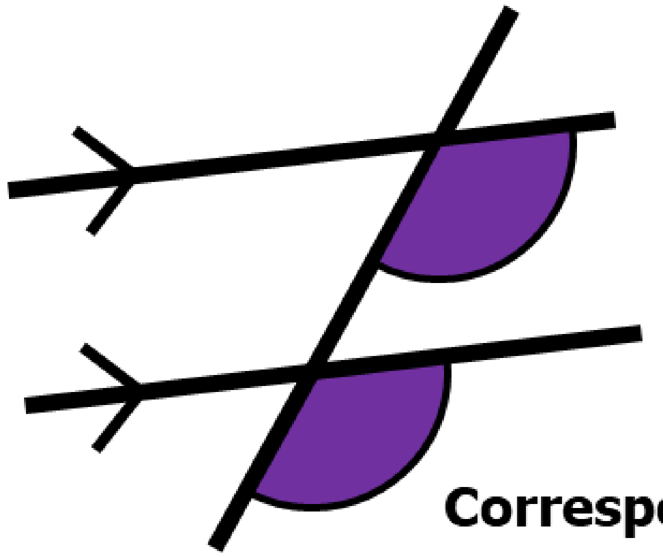
Vertically Opposite angles are the same

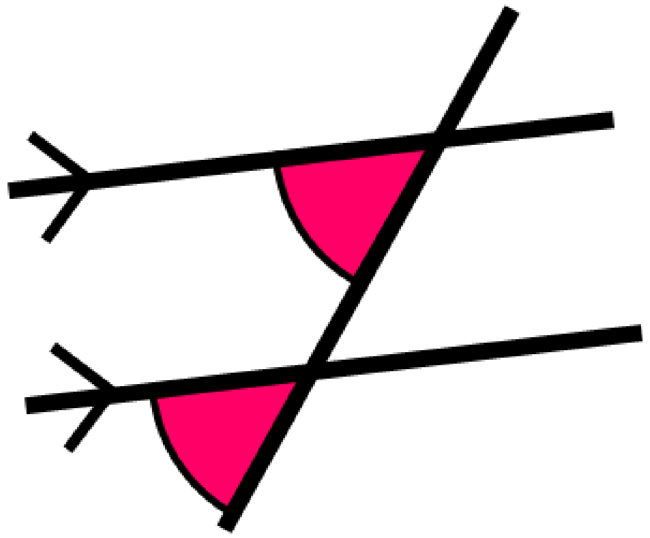


Alternate angles make a **'Z'** shape and are the same



Sometimes the 'Z' is hard to spot...

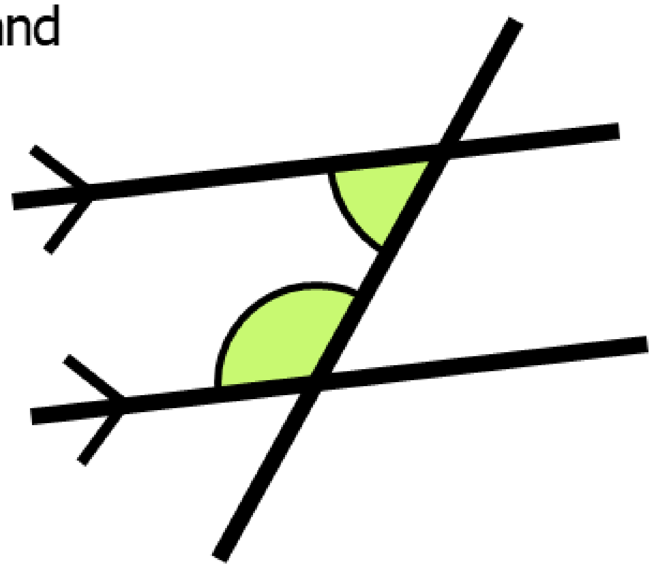




Corresponding angles make an **'F'** and are the same

Sometimes the 'F' is hard to spot...

Co-interior angles make a **'C'** shape, and **add up to 180°**



BEARINGS

Bearings are just a way of expressing a direction.

Sometimes called "Three Figure Bearings", because they should always have 3 digits. 32° ✗ 032° ✓

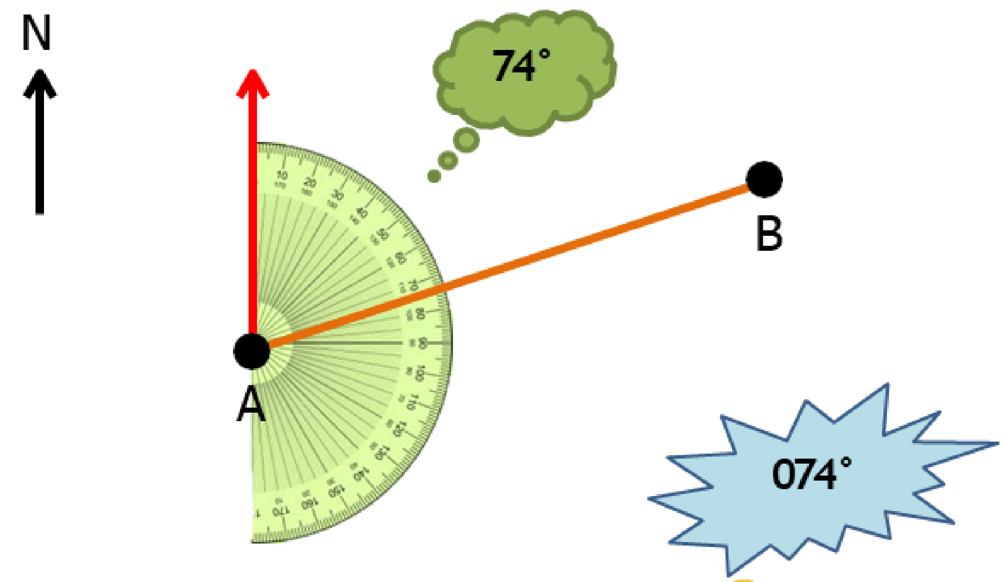
Two important things to remember:

1. measure from North
2. measure clockwise

What is the bearing of B from A?

A to B

1. Check which direction you're going in
2. Draw in the North line at your starting point
3. Connect the points
4. measure the angle clockwise from North
5. Turn it into a Three Figure Bearing



What is the bearing of D from C?

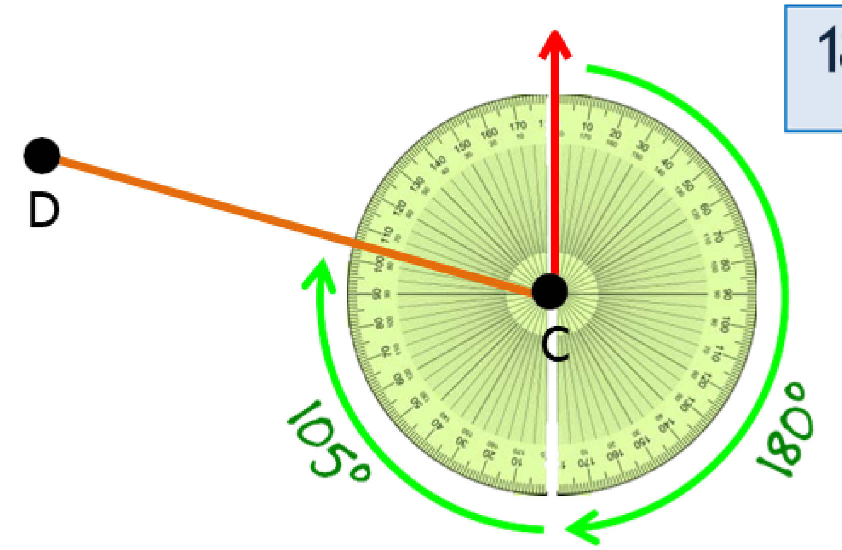
N

D

C

C to D

1. Check which direction you're going in
2. Draw in the North line at your starting point
3. Connect the points
4. measure the angle clockwise from North
5. Turn it into a Three Figure Bearing



$180° + 105° = 285°$

AVERAGES

Mean – Find the **total**, divide by how many

Mode – The **most** common number

Median –The **medium:** put the numbers in order, find the middle number

Range – The difference between the biggest and smallest number

The mean of four numbers is 5.

What's the missing one?

mean = Total ÷ how many

5 = Total ÷ 4

What number, divided by 4, equals 5?

20.

The total needs to be **20**.

2 + 5 + 4 = 11

What's missing to make 20?

9 ✓

7, 5, 8, 5, 1, 7

Mean	Mode	Median	Range
7 + 5 + 8 + 5 + 1+ 7 = 33 33 ÷ 6 = 5.5	Two 7s and two 5s So 7 <u>and</u> 5 are the mode	1 5 5 7 7 8 - in order ↑ middle number What's between 5 and 7? <u>6</u>	8 - 1= <u>7</u>

MEAN FROM FREQUENCY TABLE

With large amounts of data, it's often easier to put it all in a table.

This table is easier than writing down 0 0 1 1 2 2 2 2 2 3 3 3, but means the same thing!

Number of Pets	Frequency
0	2
1	2
2	5
3	3

Range

The range is still the difference between the biggest and smallest.

3 – 0 = **3**

But don't look at the frequency column! We want the biggest and smallest number of pets

Median

The number in the middle. There are (2+2+5+3=) **12** responses.

The middle number is the $\frac{11+1}{2} = 6.5^{th}$ number.

The 6^{th} and 7^{th} answers are both 2s…

Median = **2**

Mode

Most common. Which number has the highest frequency?

2

Mean

Number of Pets	Frequency	Number of Pets x Frequency
0	2	0
1	2	2
2	5	10
3	3	9
	12	**21**

If 5 people had 2 pets etc, this column works out how many animals they had altogether

This is the total number of people asked...

..and this is the total number of pets

mean = total ÷ how many

= 21 ÷ 12

= **1.75**

MEAN FROM GROUPED FREQUENCY TABLE

Sometimes you'll see a type of frequency table, with data put into groups.

Minutes late m	Frequency
$0 \le m < 10$	4
$10 \le m < 20$	3
$20 \le m < 30$	7
$30 \le m < 40$	6

4 people were less than 10 minutes late

If you're *exactly* 10 minutes late, you fit here

These 6 people could have been *exactly* 30 minutes late, to 39minutes and 59 seconds late, but not 40 minutes!

Modal Class

Class is another word for group...

Which group has the most people in?

$20 \le m < 30$

Estimating the Mean

We can only estimate the mean, because we don't know exactly how late everyone was.

Everything in purple, you might have to do!

This 'midpoint' is basically a guess of how late these people actually were

Minutes late m	Frequency	**Midpoint**	**Midpoint x Frequency**
$0 \le m < 10$	4	**5**	**20**
$10 \le m < 20$	3	**15**	**45**
$20 \le m < 30$	7	**25**	**175**
$30 \le m < 40$	6	**35**	**210**
	20		**450**

These numbers are estimates for how many minutes late each group of people was *in total*.

This is the total number of people who were late

So this is an estimate of the total number of minutes late

Mean = total ÷ how many

= **450 ÷ 20**

= **22.5** ✓

DISPLAYING DATA

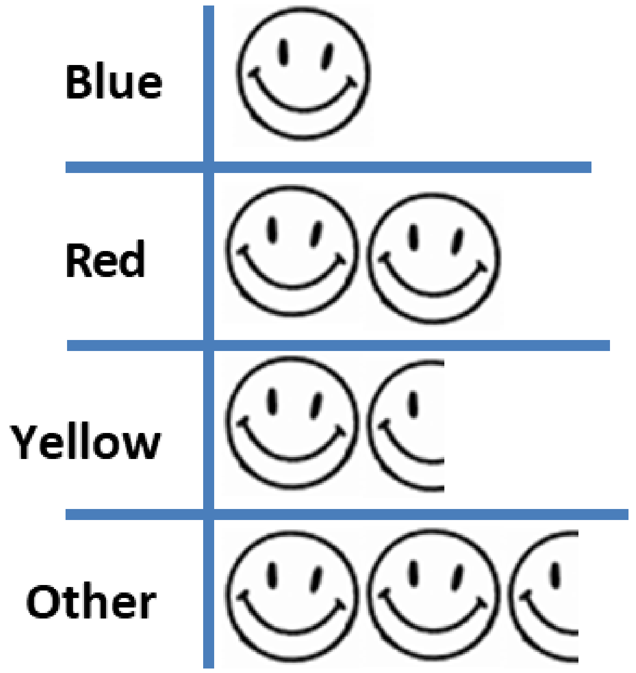
70 people were asked their favourite colour. We can record their answers in a Tally Chart, and represent them in Pictograms and Bar Charts.

Tally Chart

Colour	Tally	Frequency
Blue	𝍸 𝍸	10
Red	𝍸 𝍸 𝍸 𝍸	20
Yellow	𝍸 𝍸 𝍸	15
Other	𝍸 𝍸 𝍸 𝍸 𝍸	25

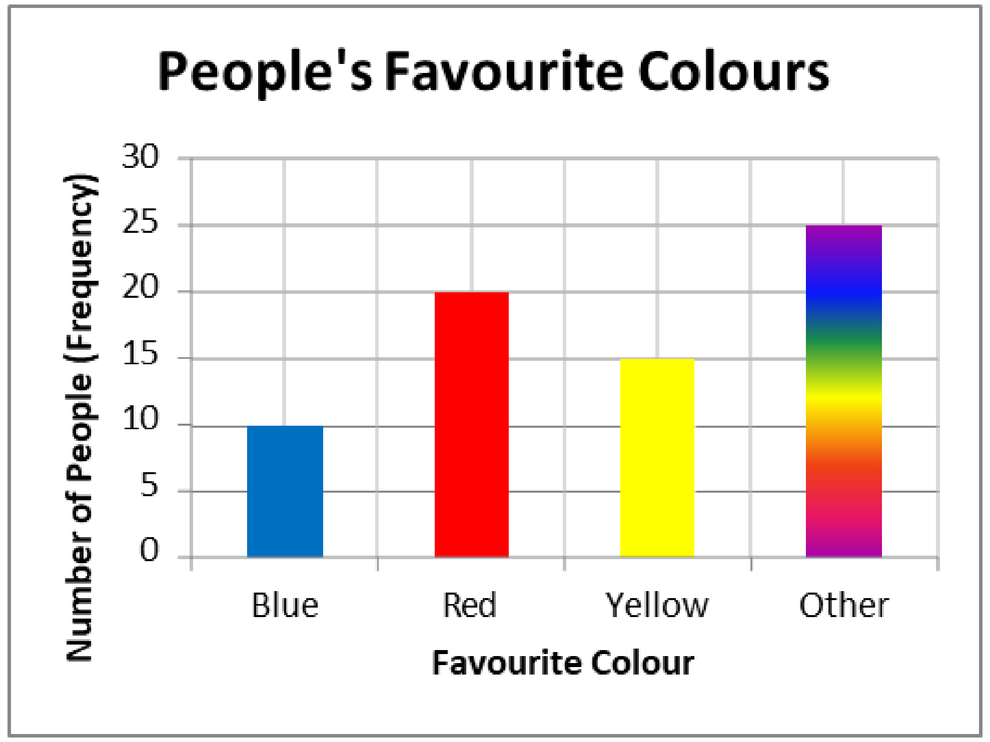
Pictogram

KEY: = 10 people



Bar Chart

- Gaps Between Bars
- Label the Bars
- Label BOTH Axes
- Title
- Consistent Scale



PIE CHARTS

Represent this data in a Pie Chart.

Eye Colour	Frequency
Brown	8
Blue	5
Green	2
Other	3

We need to know how many degrees each section should be.

Eye Colour	Frequency
Brown	8
Blue	5
Green	2
Other	3
Total	18

First, we need to know the total number of people asked.

$360 \div 18 = 20$

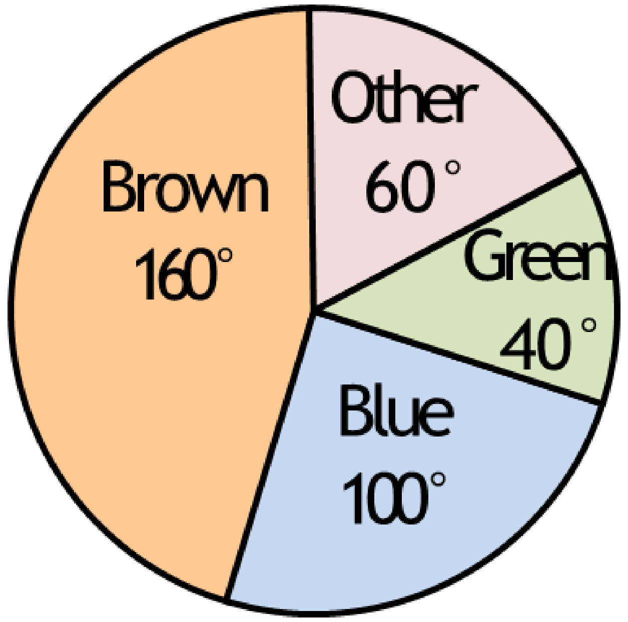
Degrees in a circle

Number of people asked

20 degrees represents one person

Eye Colour	Frequency	Degrees
Brown	8	$8 \times 20 = 160$
Blue	5	$5 \times 20 = 100$
Green	2	$2 \times 20 = 40$
Other	3	$3 \times 20 = 60$
Total	18	360

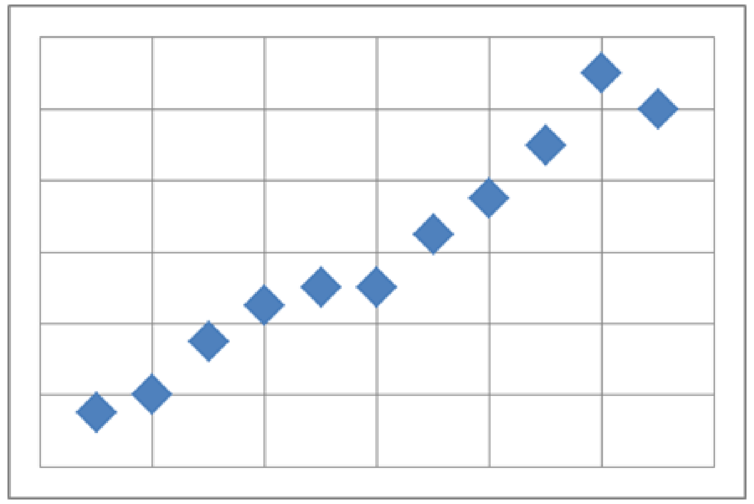
Check they add up to 360



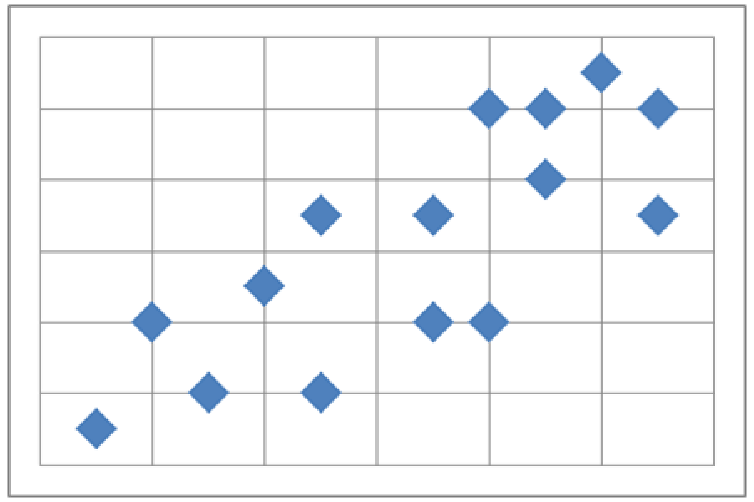
CORRELATION

The **strength** of the correlation is about how close the points are to a straight line, **not** how steep the line is.

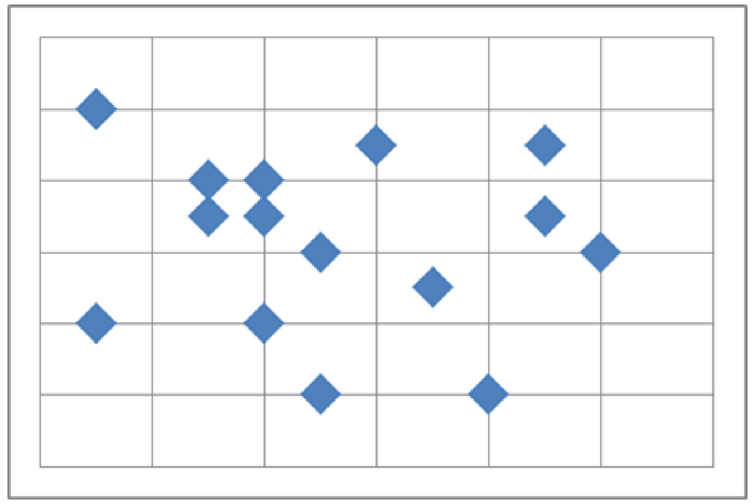
Positive means the line is going uphill, **Negative** means it's going downhill.



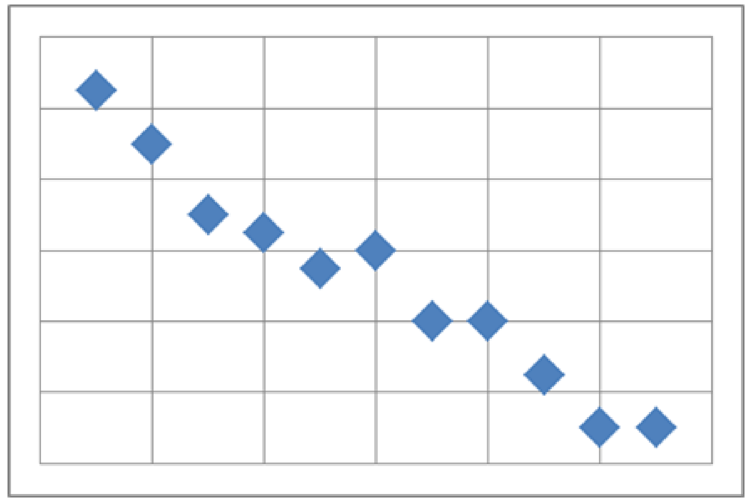
Strong Positive Correlation



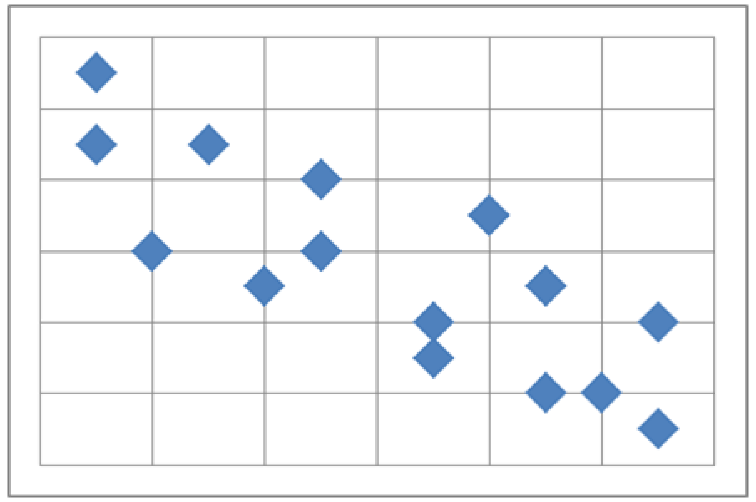
Weak Positive Correlation



No Correlation



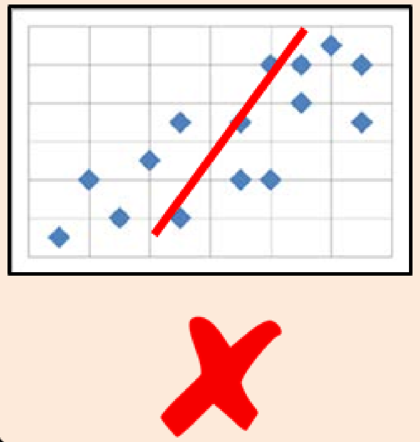
Strong Negative Correlation

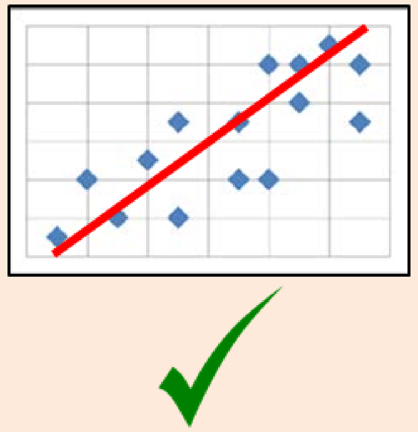


Weak Negative Correlation

Line of Best Fit

A line of best fit is a straight line which represents the data as closely as possible.





CONSTRUCTIONS

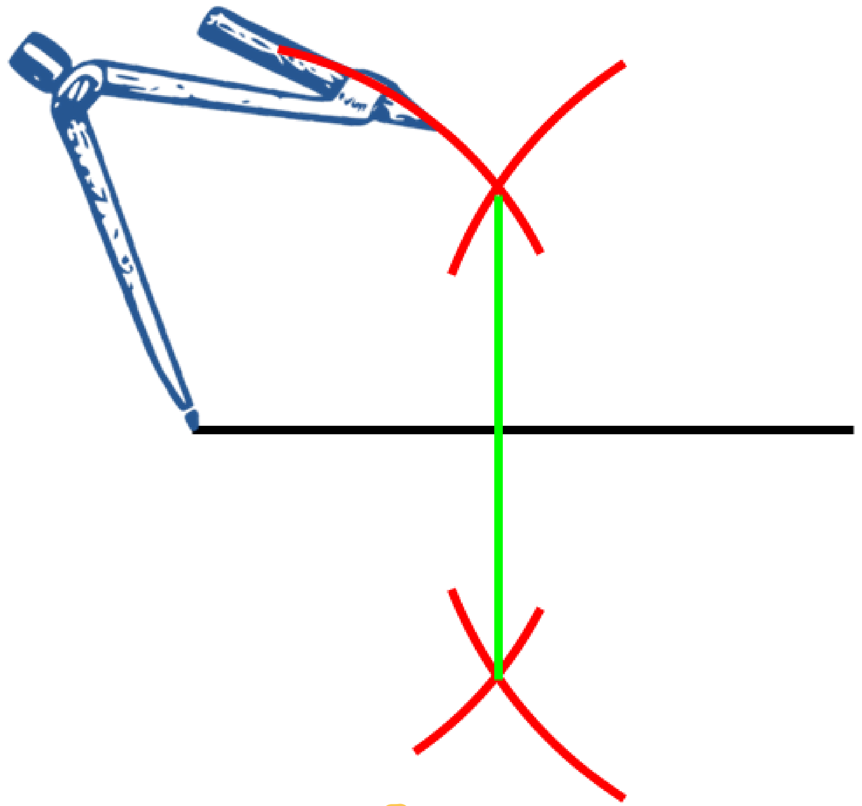
Using a ruler and compasses to draw shapes, lines or angles accurately.

Perpendicular Bisector

Cutting a line in half with a perpendicular line.

Draw curves from either end of the line, which meet in the middle. Do this above *and* below the line.

Connect the places where they cross



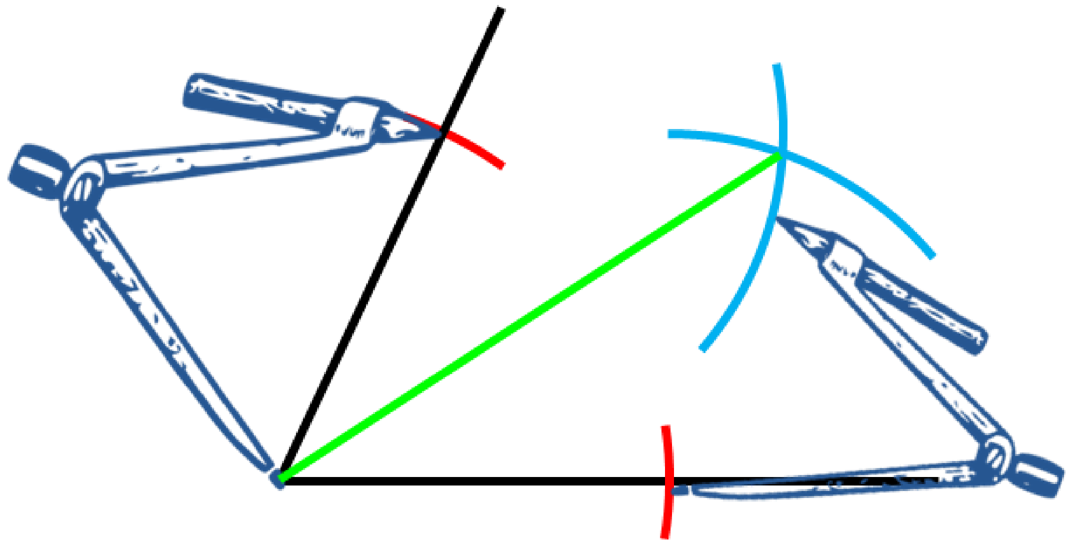
Angle Bisector

Cutting an angle in half.

Use the compasses to draw marks on each line, the same distance from the 'point' of the angle.

Now draw curves from the marks you just made, which cross somewhere.

Join the 'point' of the angle, to where these two curves cross.

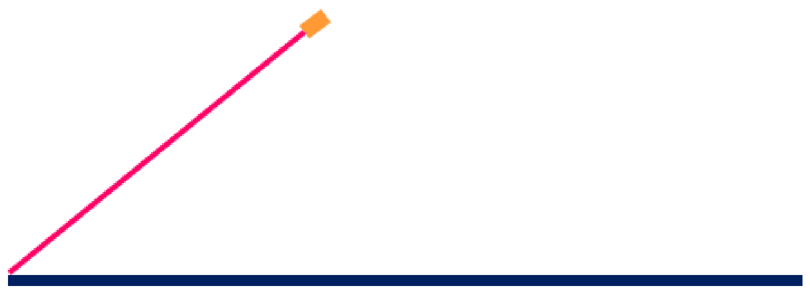


CONSTRUCTIONS

Using a ruler and compasses to draw shapes, lines or angles accurately.

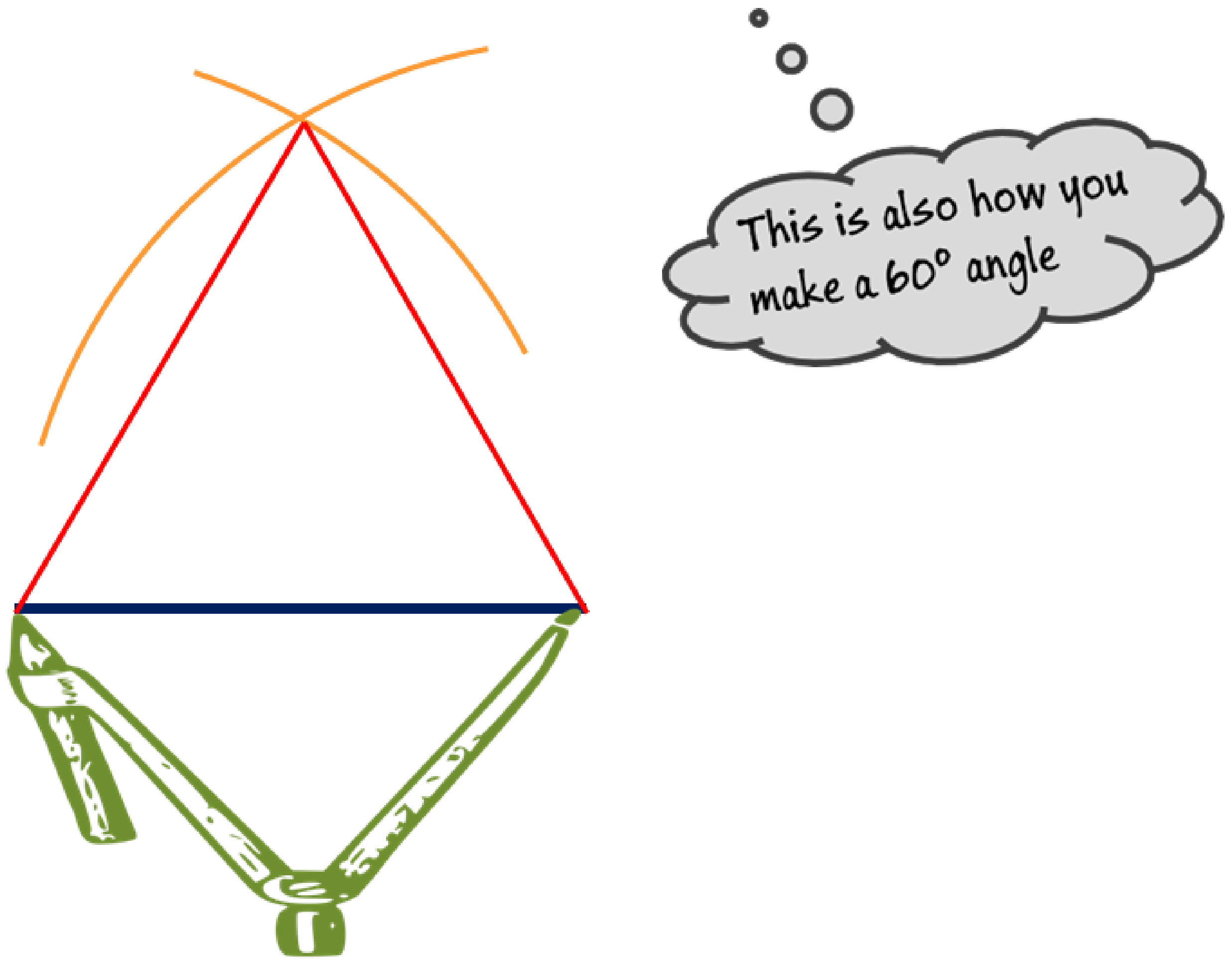
Drawing an angle
(we'll do 40°)

- Start with a straight line
- Line up the protractor so it is straight on the line, and the middle point is at one end
- Read the protractor and make a mark where 40° is
- move the protractor and join your mark to the end of the line.



Equilateral Triangle

- Start with a straight line
- Set your compasses to be as wide as the line.
- Use them to draw curves from either end of the line, which meet above it.
- Connect the place where the curves cross, to each end of the line.



TRANSFORMATIONS

Translation

Sliding a shape around

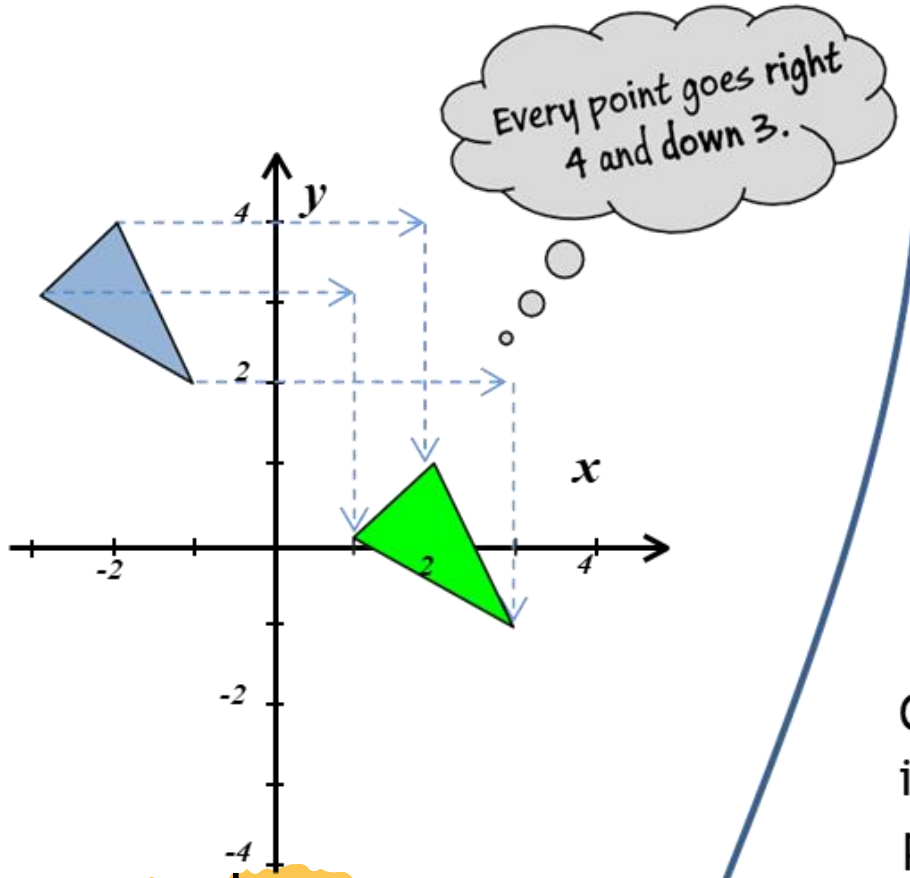
You translate shapes by 'vectors', which look like this:

How far **right** we go. So if it's negative, go **left!**

$\begin{pmatrix} 1 \\ -3 \end{pmatrix}$

How far **up** we go. So if it's negative, go **down!**

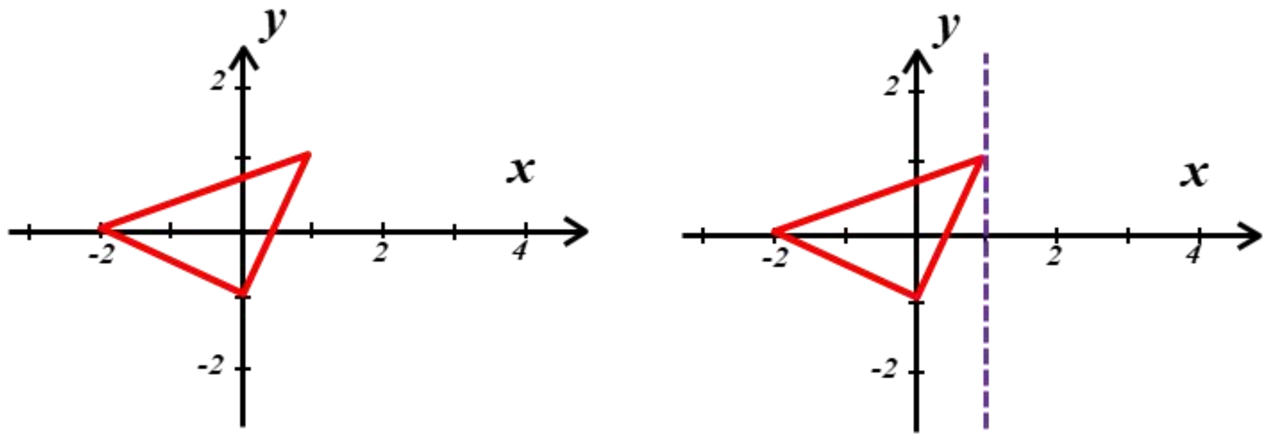
Translate the blue shape by the vector $\begin{pmatrix} 4 \\ -3 \end{pmatrix}$



Reflection

Flipping a shape over a line

Reflect the red triangle in the line $x = 1$.



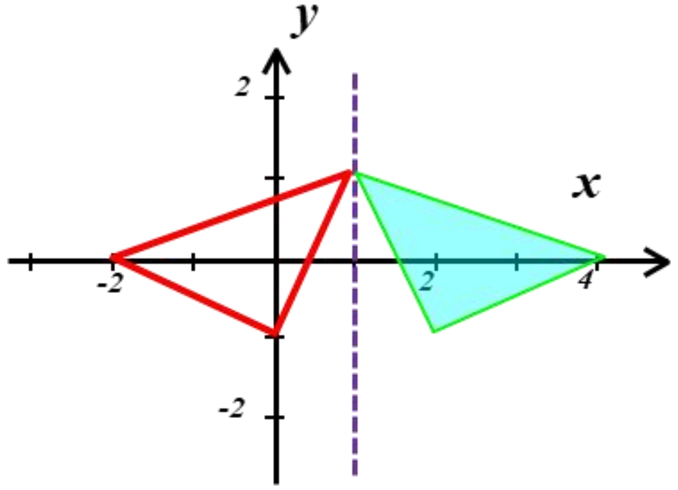
Draw the line x = 1.
Remember, it crosses the x axis at **1**.

Now we need to copy the shape to the other side of the line.

If it helps you can ask for tracing paper to draw the original shape, and flip it over the line.

OR

Count how many squares each point is away from the line, and put each point the same number of squares on the other side.



TRANSFORMATIONS

Rotation

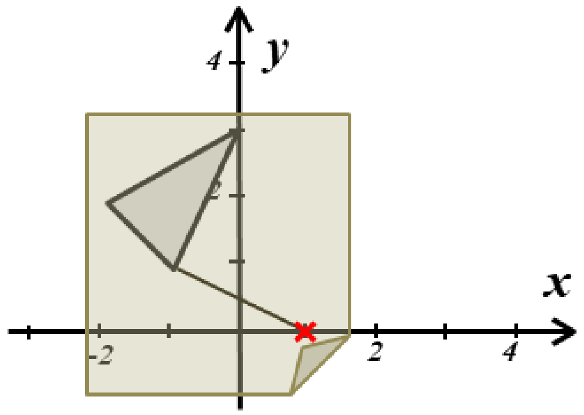
Spinning a shape around

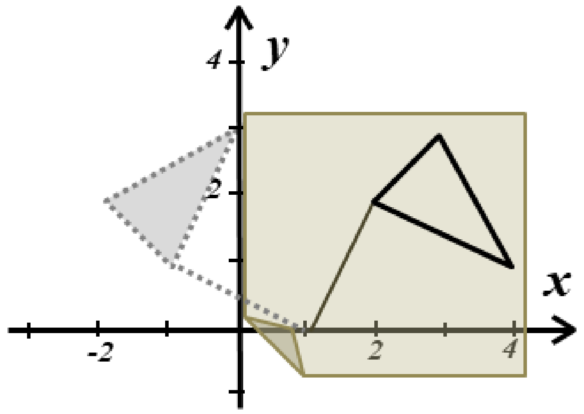
You'll need to know:

1. the centre of rotation,
2. the number of degrees to rotate the shape,
3. the direction of rotation.

Rotate the triangle 90° clockwise about the point (1,0).

- Trace the shape onto tracing paper, and draw a line to the centre of rotation
- Put your pen on the rotation point, and spin the tracing paper until you've made a 90° angle
- Draw the new shape onto the grid





Enlargement

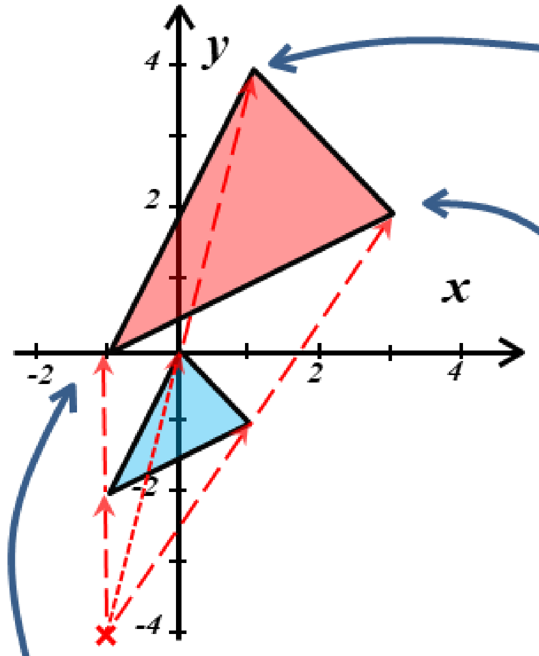
making a shape bigger *or smaller!*

You'll need to know:

- the centre of enlargement,
- the scale factor.

Enlarge the blue triangle by scale factor 2, and centre of enlargement (-1,-4).

There are different ways of doing enlargements. Here's one.



This point was 1 right and 4 up from the centre of enlargement before. Now it needs to be 2 across and 8 up.

This point was 2 right and 3 up from the centre of enlargement. Now it needs to be 4 across and 6 up.

This point was 2 up from the centre of enlargement. Now it needs to be 4 up.

Note: The distance from the centre of enlargement to each new point, is double the distance from the centre of enlargement to the original point.

STANDARD FORM

If a number is really big or really small, we can write it in standard form.

This is when we turn an ordinary number into something that looks like this:

1.85×10^{-2}

Number between 1 and 10 — A 'power' of 10

2.5×10^3

But what does it mean?!

$10^3 = 10 \times 10 \times 10$
$= 1000$

2.5×1000

2500

Standard form

In other words, 2.5×10^3 is the same as 2500.

Ordinary form

But you don't always need to think of it this way...

Write 4.5×10^3 in ordinary form.

Positive power means it's a big number, so 3 spaces right

4 . 5 0 0 → 4 5 0 0 .

Write 8.1×10^{-4} in ordinary form.

Negative power means it's a small number, so 4 spaces left

0.0 0 0 8 . 1 → 0.00081

If the power is positive, it's a big number.

If the power is negative, it's a small number.

Write 2,820,000 in standard form.

The first number (between 1 and 10) has to be 2.82

...but what's the power of 10?

2.8 2 0 0 0 0.

To go from 2.82 to 2,820,000, the decimal has to move **6** places.

2.82×10^6

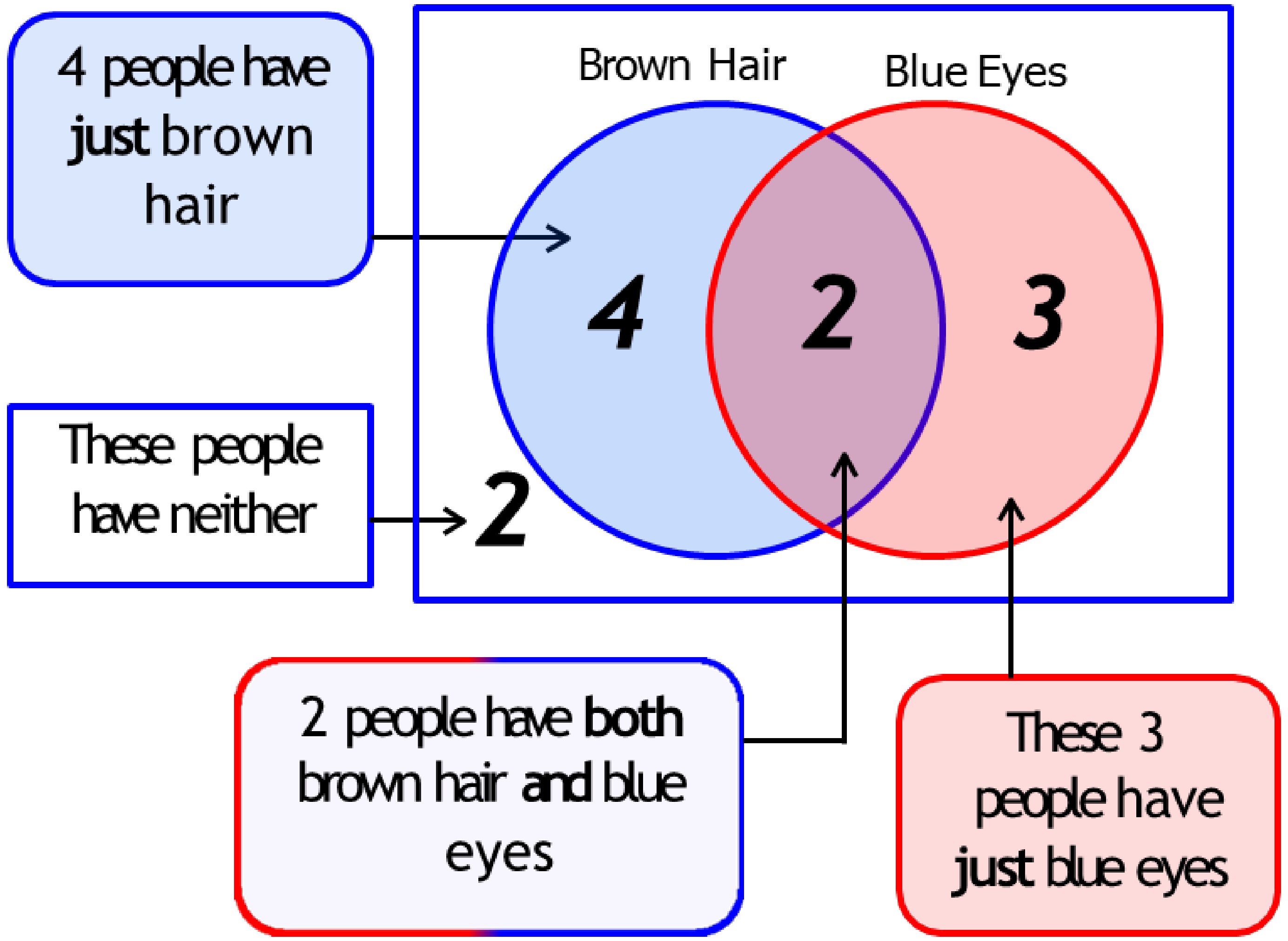
It's a big number, so it must be a positive power of 6!

VENN DIAGRAMS

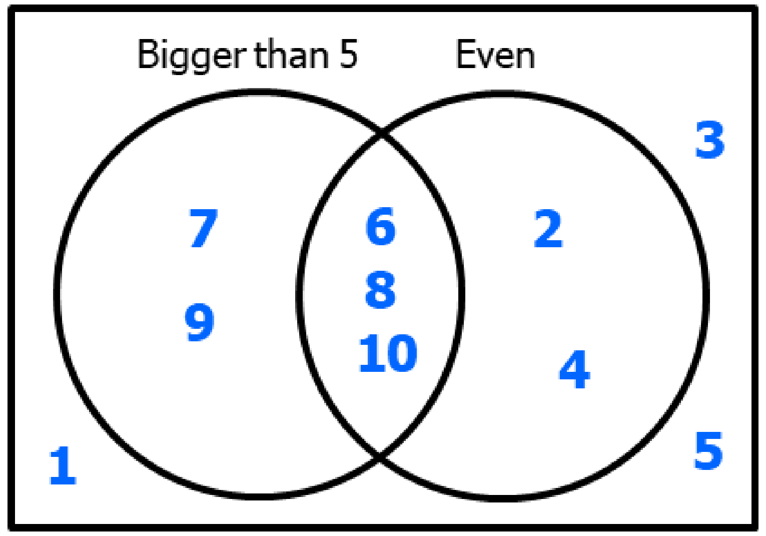
Sometimes called "elements"

Venn diagrams are a way of displaying things which fit into one or more categories.

Sometimes, instead of writing out all the **elements** in a Venn diagram, you'll just see numbers which represent how many elements are in each area.



There are some symbols you need to remember too…

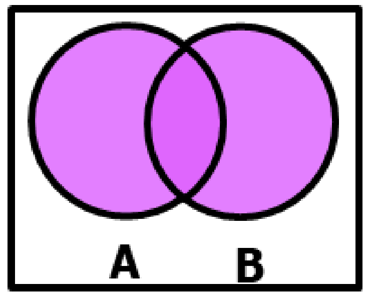


ξ = { 1, 2, …, 10 }

ξ represents everything in the Venn diagram. So here, it means that all the numbers from 1 to 10 are in the diagram.

A∪B "A **u**nion B"

Everything in either A or B



A∩B "A **in**tersect B"

Everything in both A and B