Foundation Tier GCSE Mathematics Revision Cards (Grades 1-5)

Order of Operations

Brackets
P**o**wers
Division
Multiplication
*A*ddition
Subtraction

e.g. $10 - 4 \times 2 + (6 - 3)$
$= 10 - 4 \times 2 + 3$
$= 10 - 8 + 3$
$= 5$

Factors

A **factor** of a number can divide into the number exactly
e.g. Factors of 12 are 1, 2, 3, 4, 6 & 12

Highest Common Factor
Is the biggest number that divides into both
e.g. H.C.F of 12 and 30 is 6

Multiples

A **multiple** is a number in that numbers times table
e.g. Multiples of 7 are 7, 14, 21, 28, 35,…

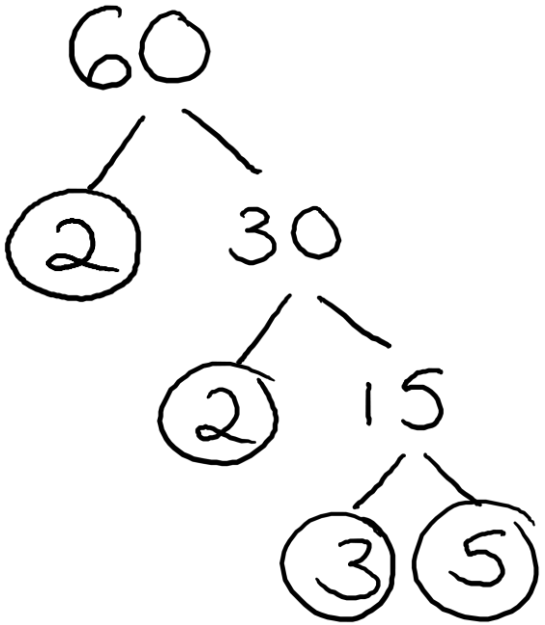
Lowest Common Multiple
Is the smallest number in both times tables
e.g. L.C.F of 12 and 8 is 24

HINT: Write out the times tables

Prime Factorisation

To write a number as a product of its prime factors use a tree

e.g.



$60 = 2 \times 2 \times 3 \times 5$

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

Prime Numbers: 2, 3, 5, 7, 11, 13, 17, 19, 21, …

Estimate

Round all numbers to one significant figure and then calculate

e.g.

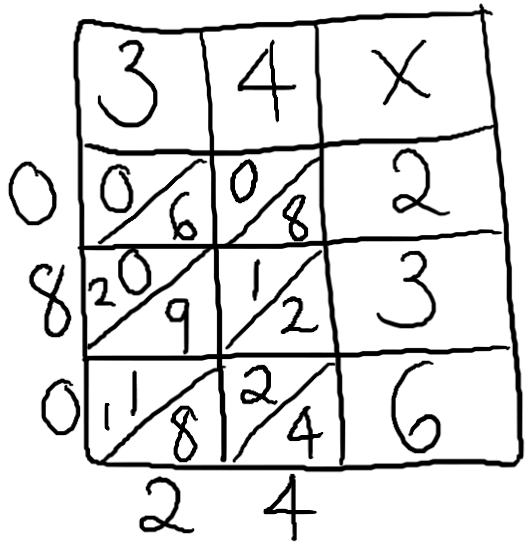
$$\frac{362 \times 11.59}{4.975} = \frac{400 \times 10}{5} = \frac{4000}{5}$$

$$= 800$$

Multiplying Decimals

Multiply the numbers, ignoring the decimal point and then put the point in at the end

e.g. 3.4 x 23.6 = 80.24



Count how many digits after the decimal point in the question, there will be the same amount in the answer

Simplifying Algebra

$$x + x + x + x = 4x$$

$$2a + 3b + 5a - 2b = 7a + b$$

Collect together letters that are the same (like terms)

$$a \times a \times a \times a = a^4$$

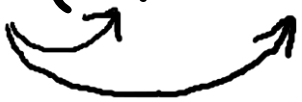
$$2y \times 6z = 12yz$$

Expanding a Single Bracket

Multiply each term inside the bracket by the term outside of the bracket.

e.g.

$3(2f - 4) = 6f - 12$



You can use a grid to help you:

x	2f	-4
3	***6f***	***-12***

$2x(5x + 3) = 10x^2 + 6x$

Factorising

PUT BRACKETS IN

Take outside the bracket anything that goes into both terms (highest common factor)

e.g.

$$6x + 10 = 2(3x + 5)$$

$$5xy - 15y = 5y(x - 3)$$

Data Collection Sheet

Means a tally chart

e.g.

Drink	Tally	Frequency
Tea		
Coffee		
Water		
Squash		
Other		

Stem and Leaf Diagrams

Remember a key

Put your 'leaves' in order from smallest to largest

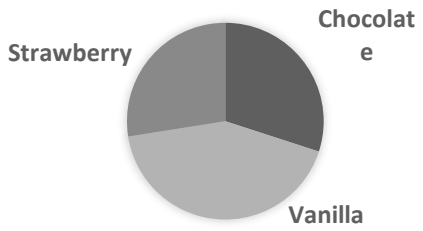
e.g.

4	1 4
5	6 6 7 8
6	2 7
7	0 9
8	1 5 5 7

KEY:

7|9 = 79

Pie Charts



To calculate the angle for each sector:
~ total up the frequencies
~ divide 360 by the total
~ multiply each frequency by your answer to find the angle

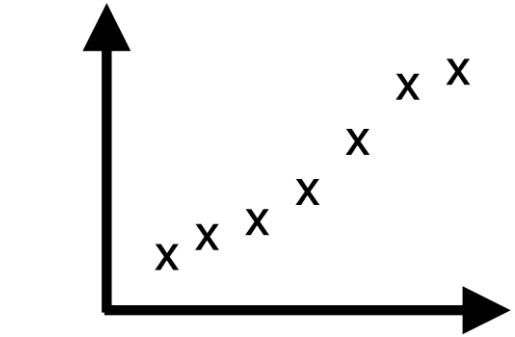
e.g.

Flavour	Frequency	Angle
Chocolate	12	12x**9**= 108°
Vanilla	17	17x**9**=153°
Strawberry	11	11x**9**=99°

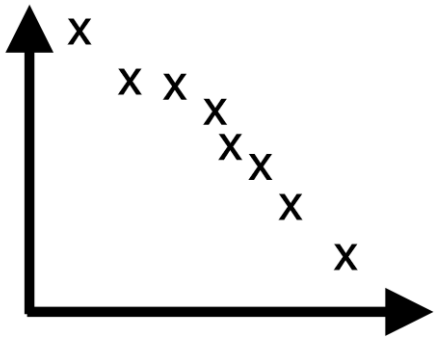
12+17+11 = 40

360 ÷ 40 = **9**

Scatter Diagrams

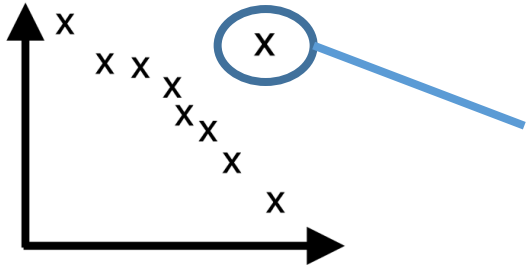


POSITIVE CORRELATION



NEGATIVE CORRELATION

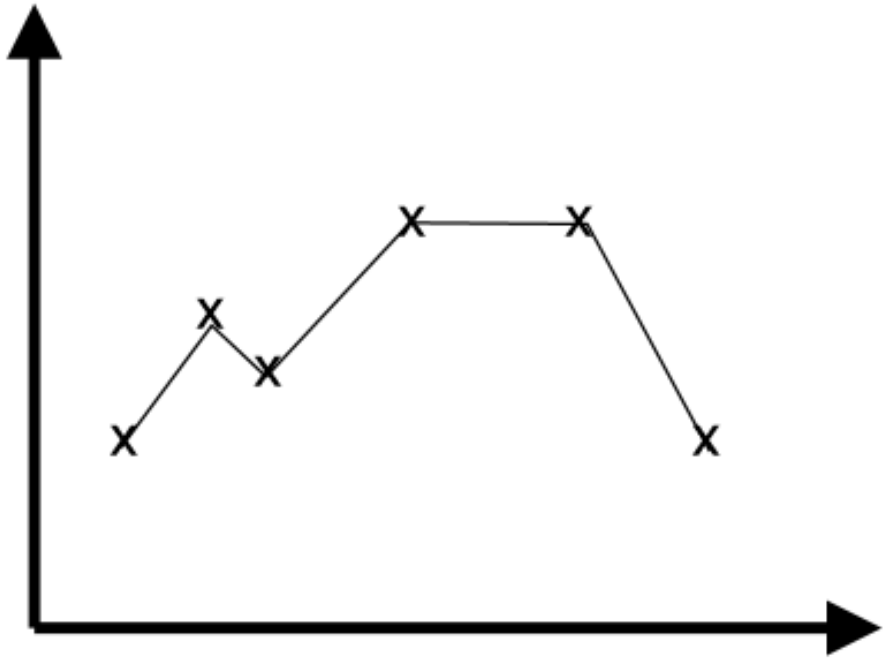
To estimate from a scatter diagram draw on a LINE OF BEST FIT



This is called an OUTLIER

Frequency Polygon

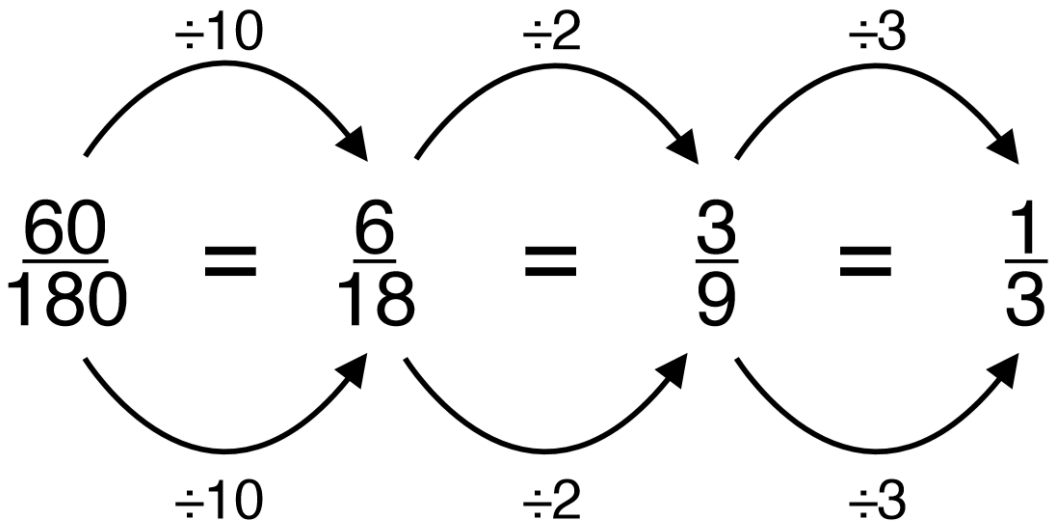
Plot in the middle of each group
Join points with a ruler



Simplify/Cancel Fractions

Divide the top and bottom by the same number

e.g.



Top is *numerator*, bottom is *denominator*

Mixed Numbers ⇔ Improper Fractions

Mixed to Improper

BIG x BOTTOM + TOP

e.g.

$$2\frac{3}{5} = \frac{2 \times 5 + 3}{5} = \frac{13}{5}$$

Improper to Mixed

e.g. See how many of the bottom number fit fits into the top (this is your large number) and the remainder goes on the top of the fraction

$$\frac{13}{4} = 3\frac{1}{4}$$

Calculating with Fraction

Adding & Subtracting Fractions

Make the bottoms the same before you add/subtract

Multiplying Fractions

Times the tops, times the bottoms

Dividing Fractions

Turn the second fraction upside down and multiply (*Keep/Change/Flip*)

Always check to see if you can cancel your answer

Fraction of an Amount

Amount ÷ bottom × top

e.g. $\frac{2}{5}\ of\ 70 = 70 \div 5 \times 2$

$= 14 \times 2 = \mathbf{28}$

Percentage of an Amount

To find 50%: Half it

To find 10%: Divide by 10

To find 5%: Half 10%

To find 1%: Divide by 100

e.g. Find 26% of 180.

10% = 180 ÷ 10 = 18

5% = 18 ÷ 2 = 9

1% = 180 ÷ 100 = 1.8

26% = 18 + 18 + 9 + 1.8

= 46.8

Reciprocal

What you multiply a number by to get 1.

e.g. The reciprocal of 3 is $\frac{1}{3}$

The reciprocal of 7 is $\frac{1}{7}$

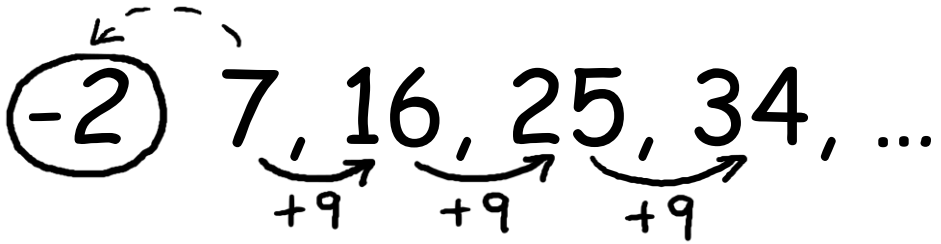
The reciprocal of $\frac{2}{5}$ is $\frac{5}{2}$

The reciprocal of $\frac{1}{6}$ is $\frac{6}{1}$

n^{th} Term of a Sequence

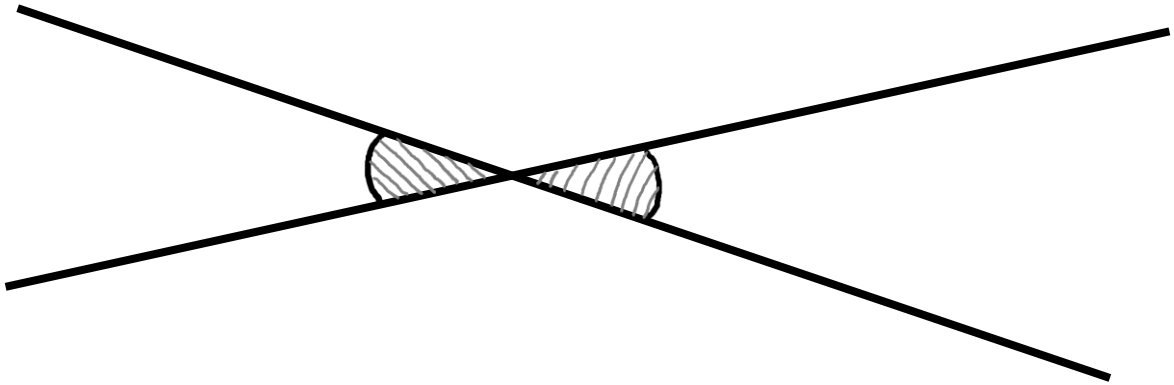
e.g.

Find the n^{th} term of the sequence
7, 16, 25, 34, …

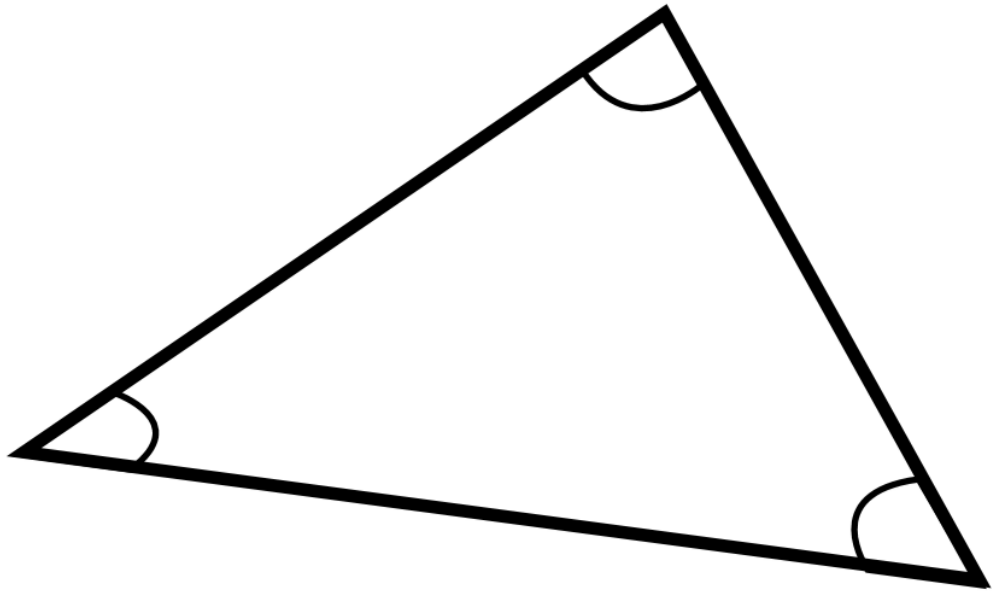


As it is "+9" each time the rule starts with 9n.
Then look at what would be before the first term to find the other bit of the rule.
Answer: 9n – 2

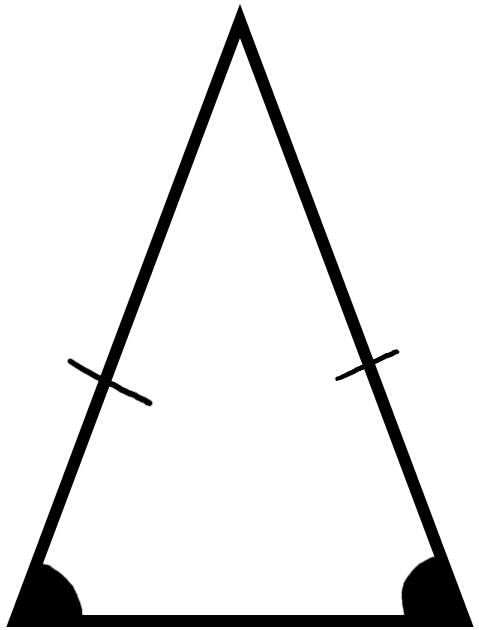
Vertically Opposite Angles are Equal



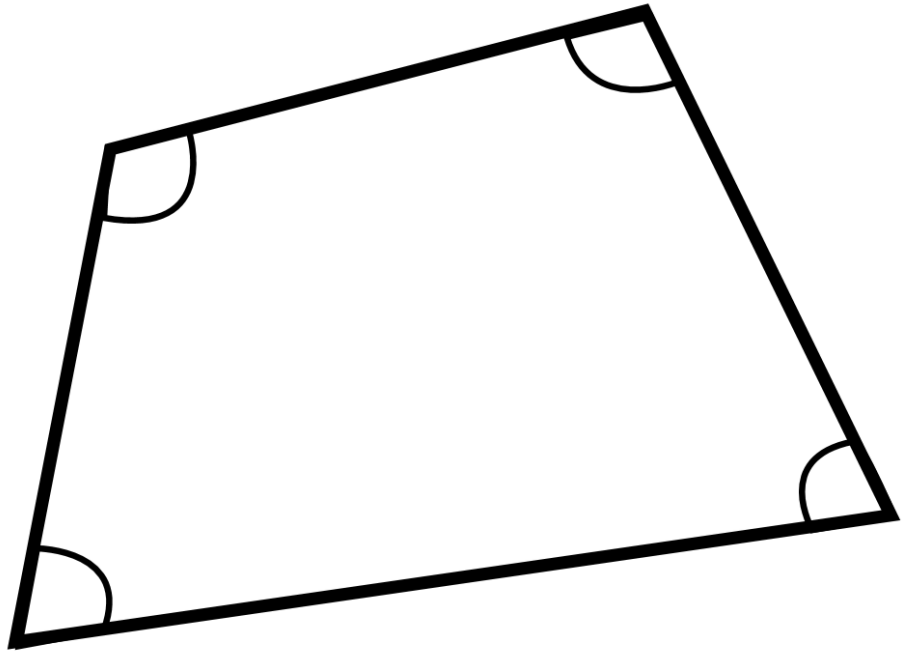
Angles in a Triangle Add Up To 180°



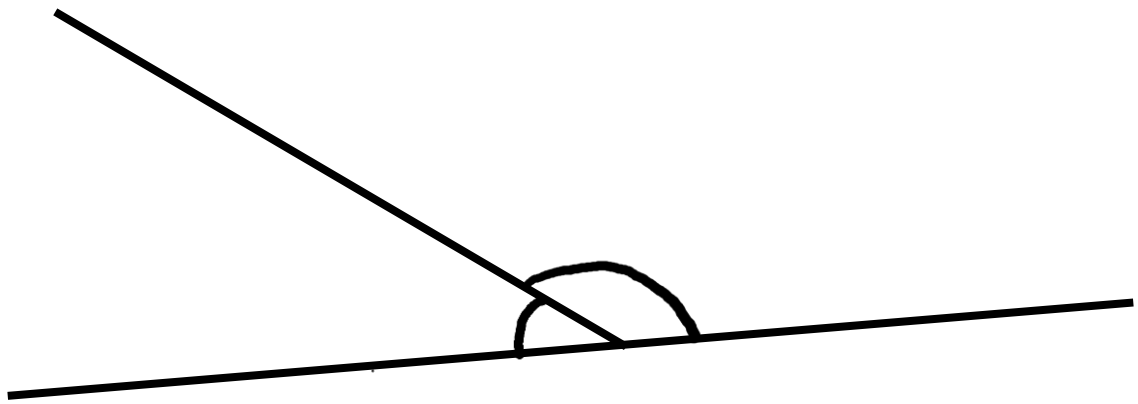
Base Angles in an Isosceles Triangle are Equal



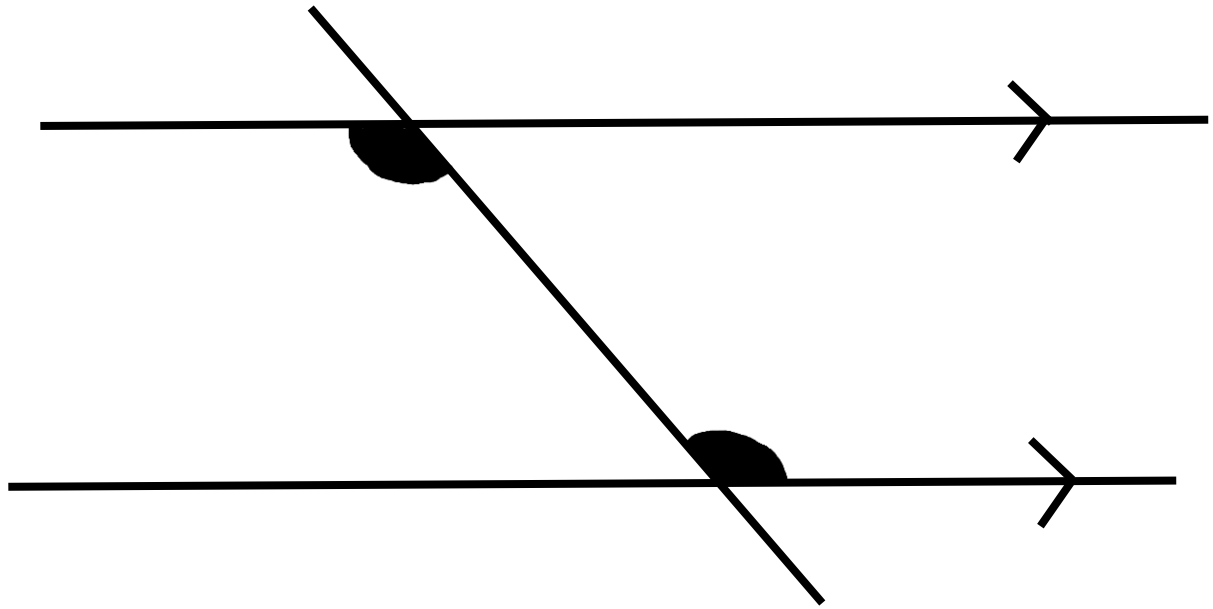
Angles in a Quadrilateral Add Up To 360°



Angles on a Straight Line Add Up To 180°

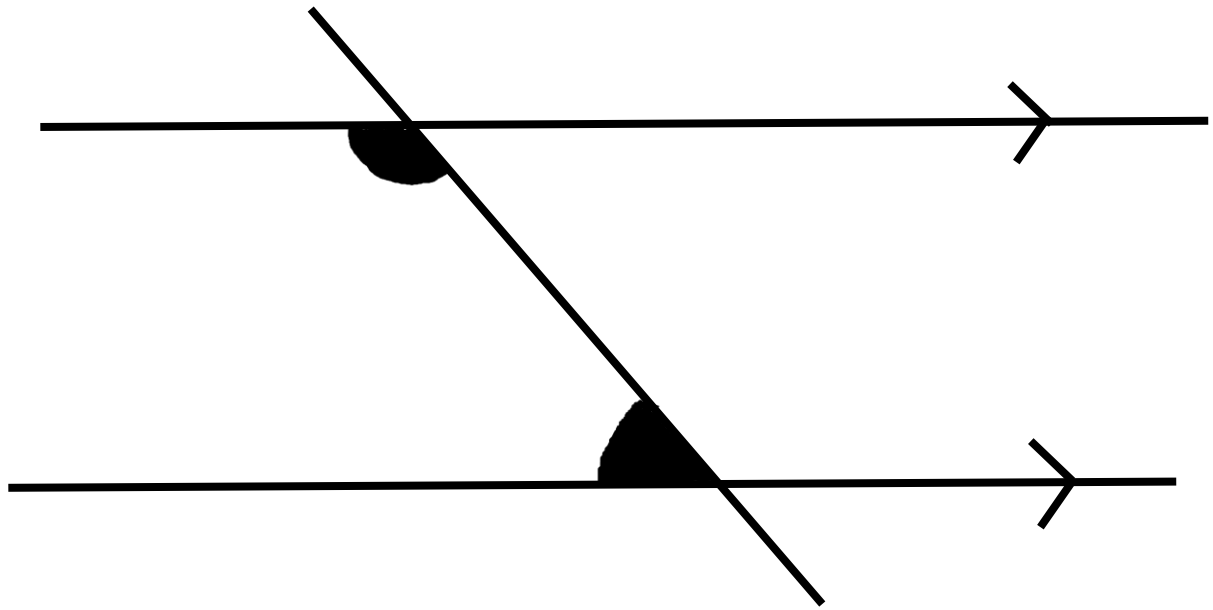


Alternate Angles are Equal



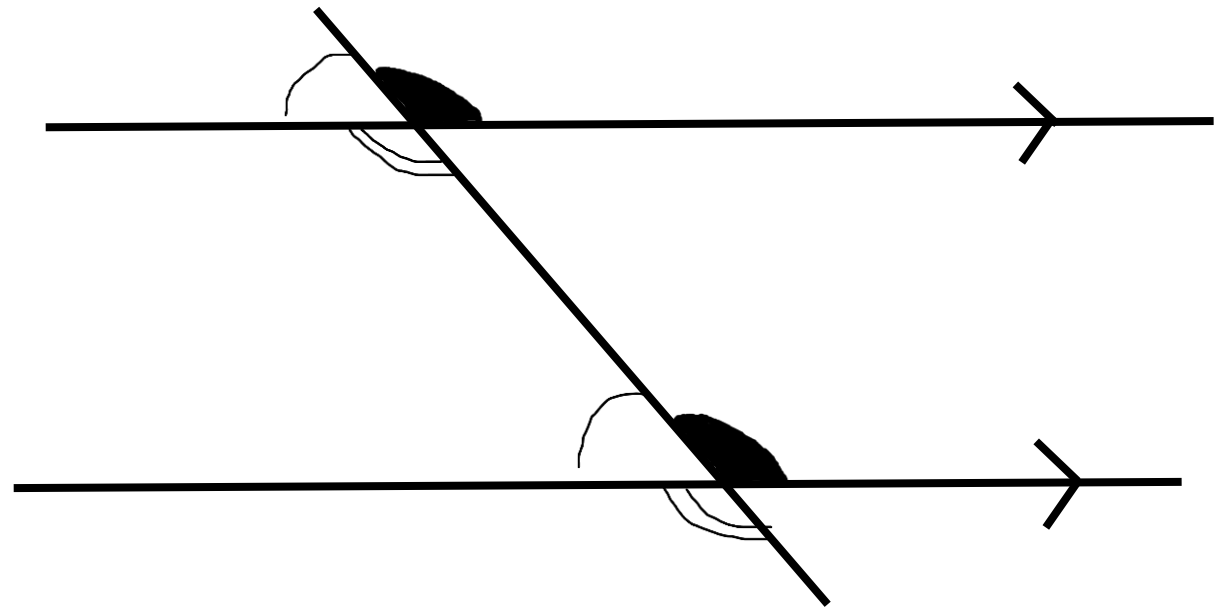
Angles are inside the parallel lines on opposite sides of the line that cuts through

Allied or Co-interior Angles add up to 180°



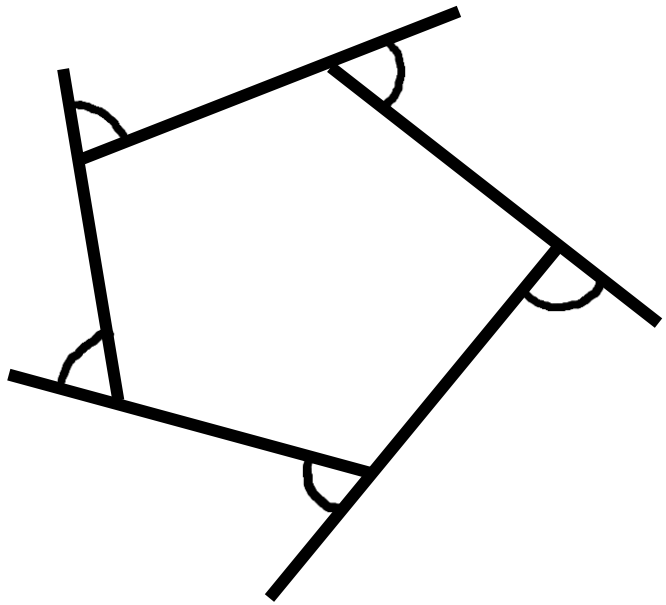
Angles are inside the parallel lines on SAME sides of the line that cuts through

Corresponding Angles are Equal



Consider the four angles created on each parallel line. The top right from each set of four angles is the same, the bottom left of each set of four angles is the same etc.

Exterior Angles



The exterior angles of any shape add up to 360°

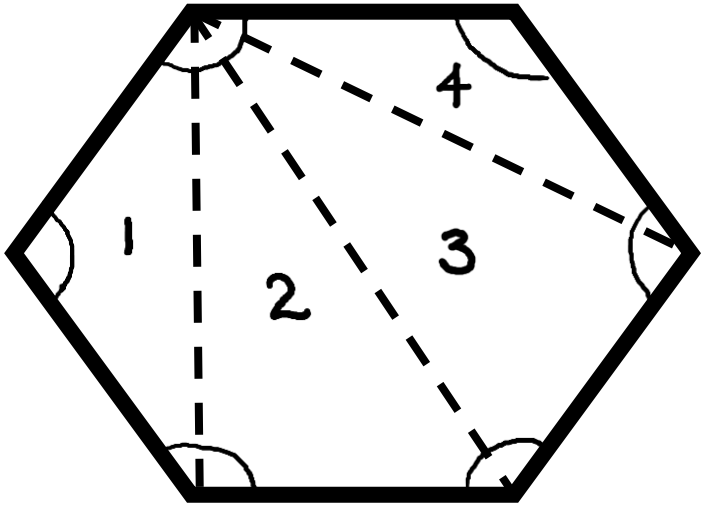
Congruent

When two shapes are exactly the same

Similar

When they are the same shape but different sizes, one is an enlargement of the other

Interior Angles



HINT:
To find the total of interior angles pick a corner and split the shape into triangles from there. Each triangle is 180°

e.g. $4 \times 180 = 720°$

Angles in a hexagon add to 720°

The sum of the interior angles of any shape is:
(sides – 2) x 180

Averages

Mean

Add up all the values and divide by how many there are

Median

Middle number when the data is in order

Mode

Most common value

Range

Difference between the smallest and the largest values in your data

Range = Biggest – Smallest

Mean from a Frequency Table

Add an extra column and MULTIPLY

VALUES	FREQUENCY	MULTIPLY
	Total →	

Mean = Total ÷ Total of Frequency

Mean from a Grouped Frequency Table

Add two extra columns MIDDLE and MULTIPLY

WEIGHT	FREQUENCY	MIDDLE	MULTIPLY
$0 < W \leq 10$	11	5	11 X 5 = 55
$10 < W \leq 20$	14	15	14 X 15 = 210
$20 < W \leq 30$	7	25	7 X 25 = 175
$30 < W \leq 40$	8	35	8 X 35 = 280
How many →	40	Total →	720

Mean = 720 ÷ 40 = <u>18</u>

Estimated Mean = Total ÷ Total of Frequency

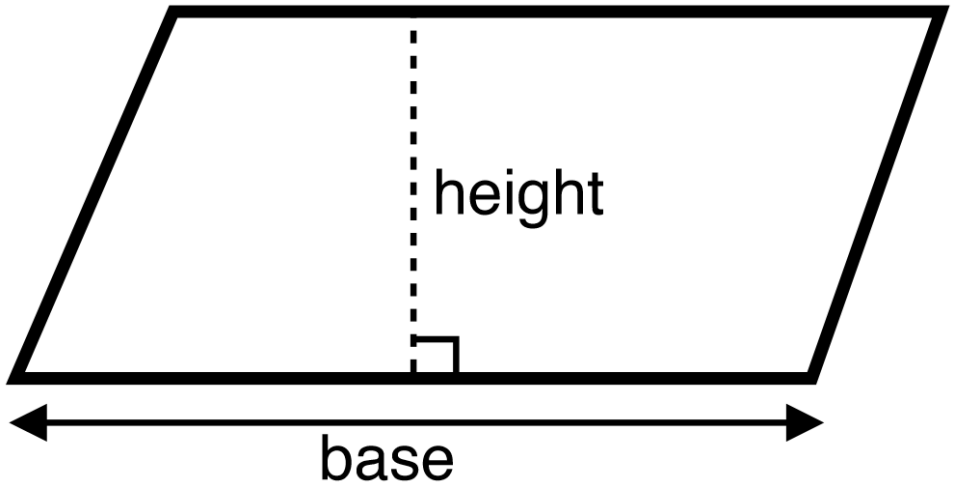
Random Sample

When each piece of data has an equal chance of being included

Perimeter

Add up ALL the sides around the outside of the shape

Area of a Parallelogram

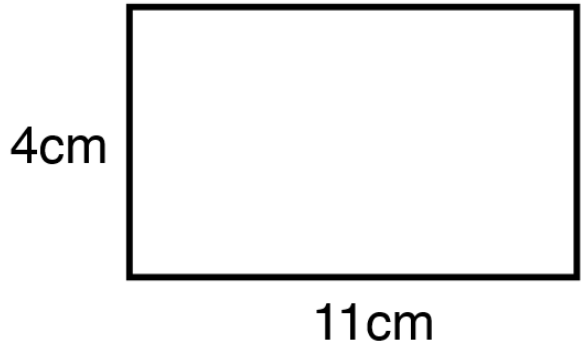


Area = base x height

(the two lengths that meet at a right angle)

Area of a Rectangle

Area = length x width



Area = 11 x 4

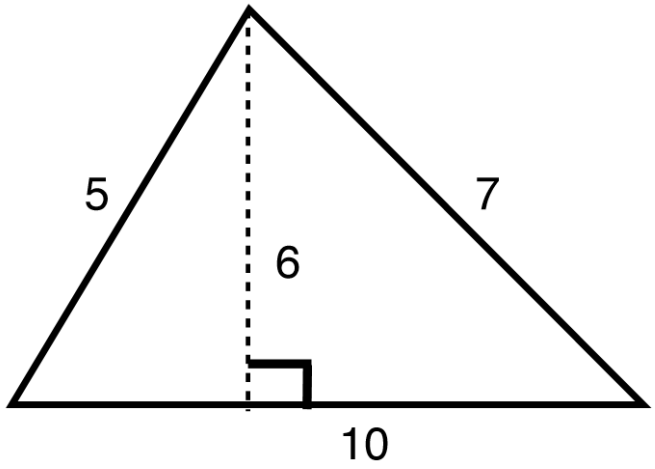
= 44cm^2

Units are squared for area

Area of a Triangle

$$\text{Area} = \frac{\text{multiply lengths that meet at a right angle}}{2}$$

e.g.

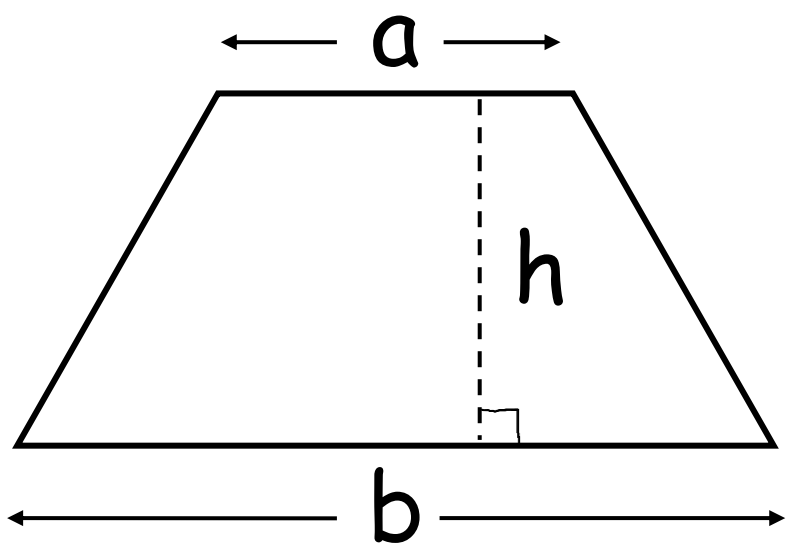


$$\text{Area} = \frac{6 \times 10}{2} = 30$$

Area of a Trapezium

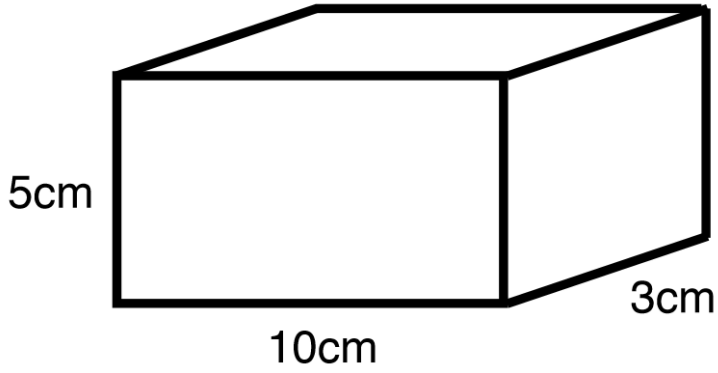
$$\text{Area} = \tfrac{1}{2}(a + b) \times h$$

e.g.



Volume of a Cuboid

Volume = length x width x height



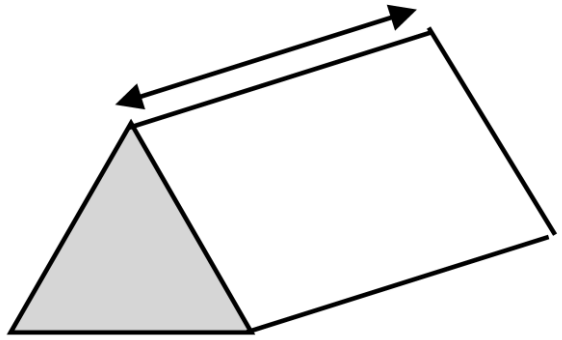
Volume = 5 x 10 x 3

= 150cm^3

Units are cubed for volume

Volume of a Prism

Calculate the area of the shape on the end of the prism and multiply by how far it goes back



Equations of Straight Line Graphs

$$y = mx + c$$

c is the y-intercept
"where the graph cuts through the y-axis"

m is the GRADIENT of the graph
Draw a right angles triangle on from two points on the graph

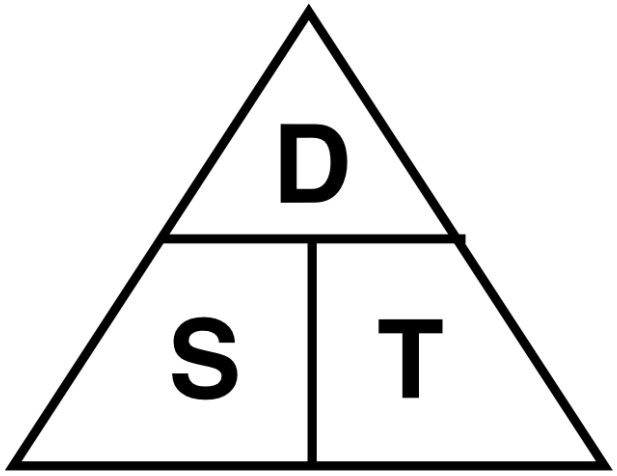
Gradient = $\frac{vertical}{horizontal}$

Positive gradient

Negative gradient

Speed

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$



Cover up the thing you are trying to find

Translations

When a shape is moved left or right and up or down

The TOP number in the vector is left/right
The BOTTOM number in the vector is up or down

$\begin{bmatrix} -2 \\ 5 \end{bmatrix}$ means you move 2 LEFT and 5 UP

$\begin{bmatrix} 4 \\ -7 \end{bmatrix}$ means you move 4 RIGHT and 7 DOWN

Sharing in a Ratio

~ Add up the numbers in the ratio

~ Divide the amount by the total of the ratio

~ Multiply each number in the ratio by your answer

e.g. Share £450 in a ratio of 2:7

$2+7=9$

$450 \div 9 = 50$

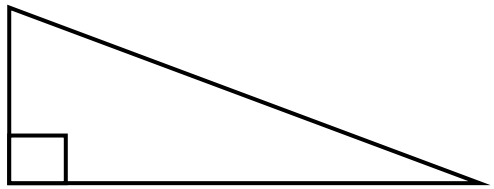
$2 \times 50 = £100$

$7 \times 50 = £350$

Pythagoras

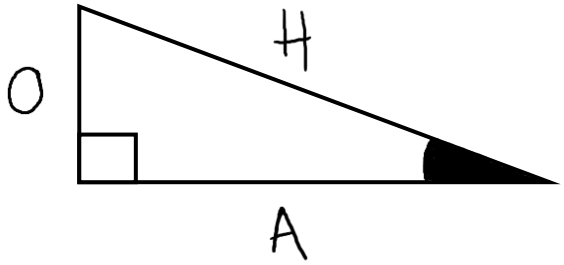
To find the missing side in a right angled triangle you:

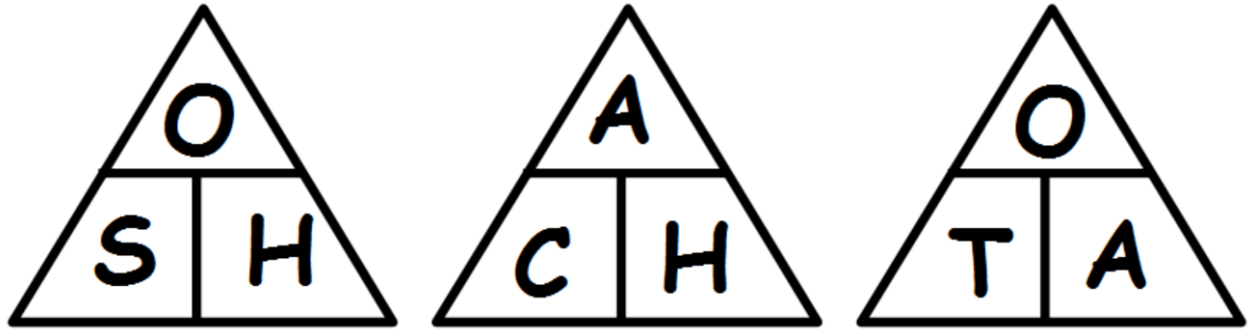
1) Square the sides you know
2) **Add** to find the **longest** side OR *subtract* to find a *shorter* side
3) Square root your answer $\sqrt{}$



Trigonometry

For right angled triangles.
Label: Opposite, Adjacent & Hypotenuse





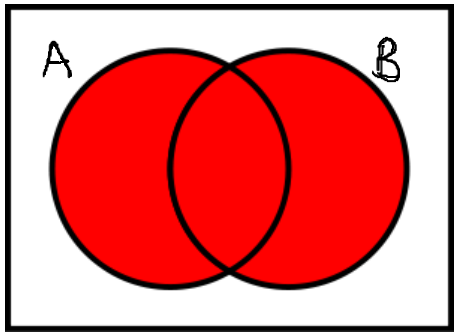
Probability

Estimating how many times something will occur = multiply the probability by the number of trials

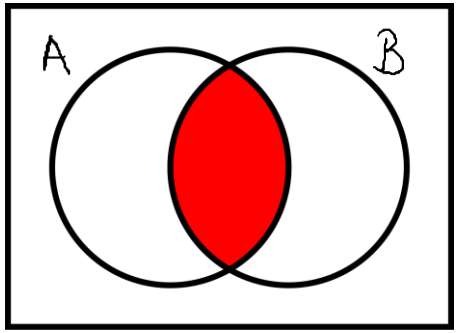
e.g. If the probability of choosing a blue counter is 0.3 and you pick 500 counter how many blue will you pick?

$0.3 \times 500 = 150$

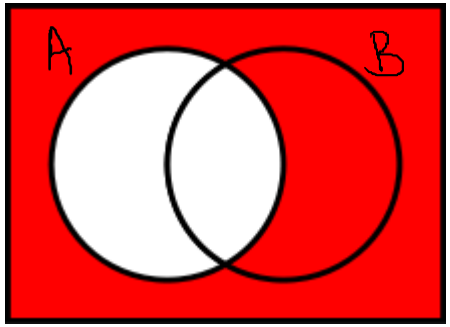
Venn Diagrams



A U B is all of the elements in A or B out of the total for the whole diagram. A or B.



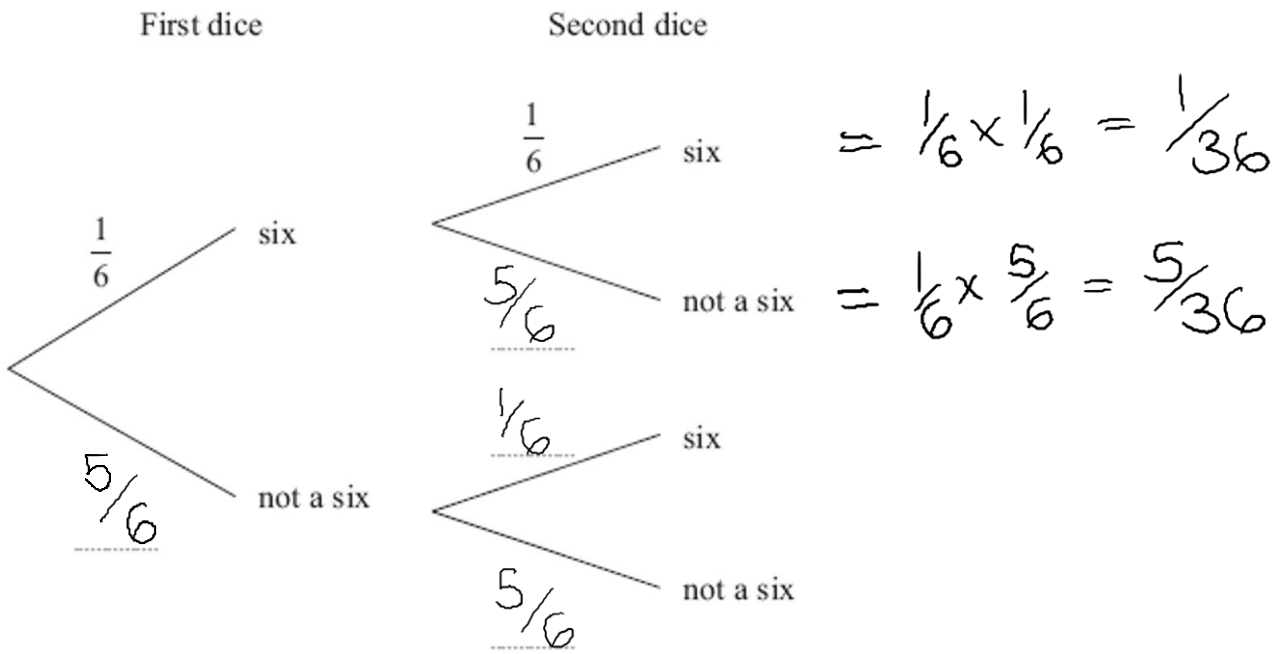
A ∩ B is all the elements in A and B



A' means NOT A

Tree Diagrams

Remember to **multiply** at the end of each branch



Percentage Increase/Decrease

e.g. INCREASE 260 by 14%

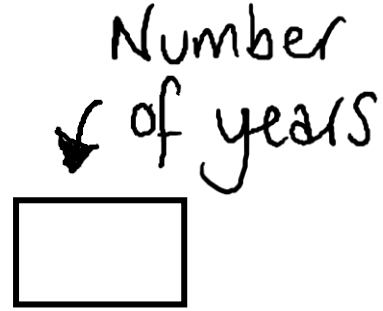
$$260 \times 1.14 = 296.4$$

e.g. DECREASE 320 by 6%

$$320 \times 0.94 = 300.8$$

If you reduce by 6% there is 94% left

Compound Interest



Amount x 1.___

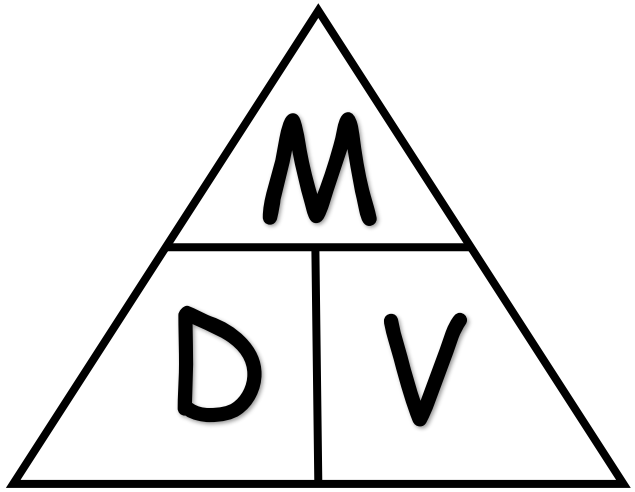
↑ percentage interest

e.g. Charlie invests £600 for 4 years with 3% compound interest.
How much money will he have at the end of 4 years?

$600 \times 1.03^4 = £675.31$

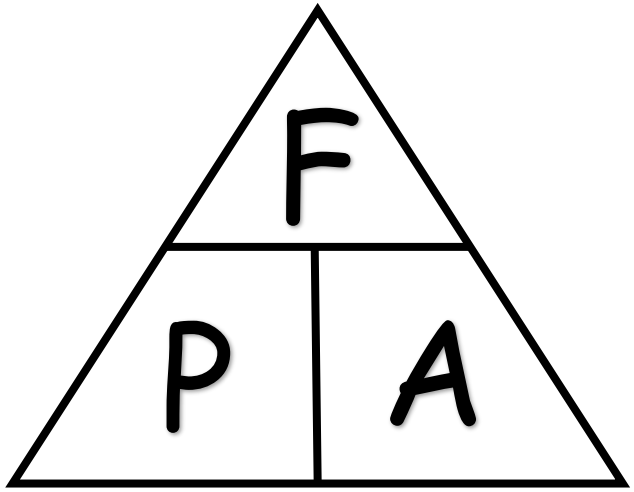
Density

$$\text{Density} = \frac{\text{mass}}{\text{volume}}$$

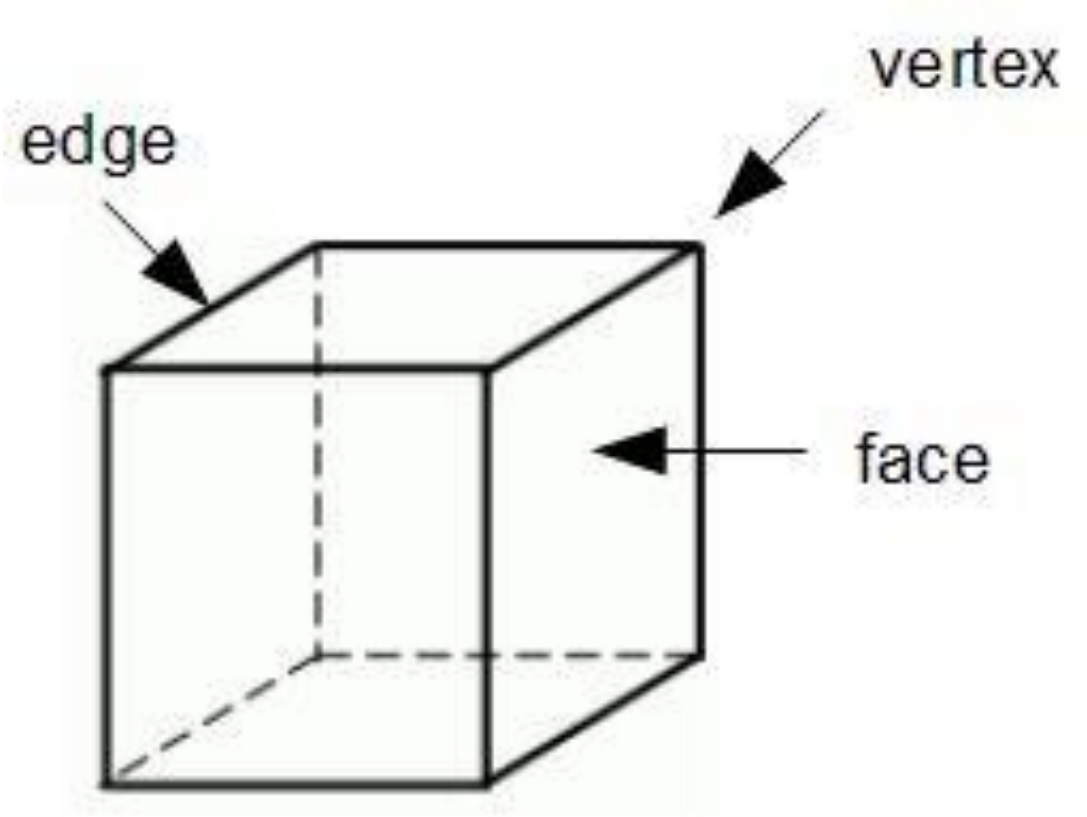


Pressure

$$\text{Pressure} = \frac{\text{force}}{\text{area}}$$



3D Shapes



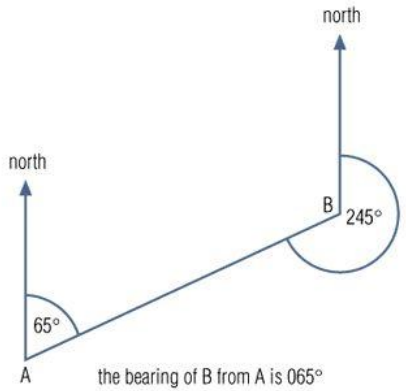
Bearings

Always:

~ measured from North

~ measured clockwise

~ given as 3 digit number



Expanding Double Brackets

Expand and simplify: $(x + 3)(x - 6)$

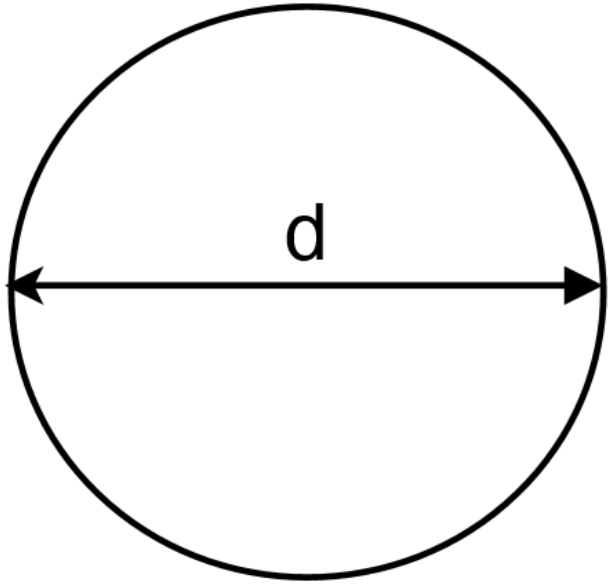
x	x	$+3$
x	x^2	$+3x$
-6	$-6x$	-18

$= x^2 - 3x - 18$

Comes from the total of the peanut.

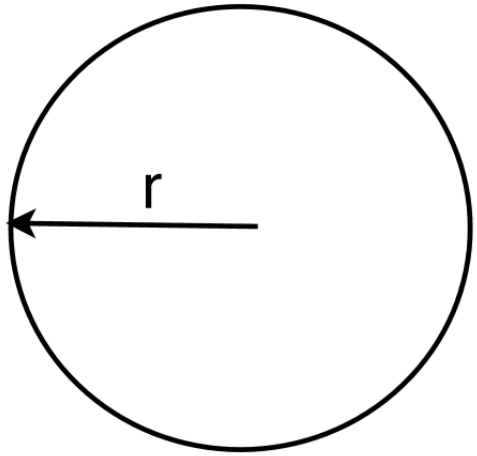
Circumference of a Circle

$$\text{Circumference} = \pi \times d$$

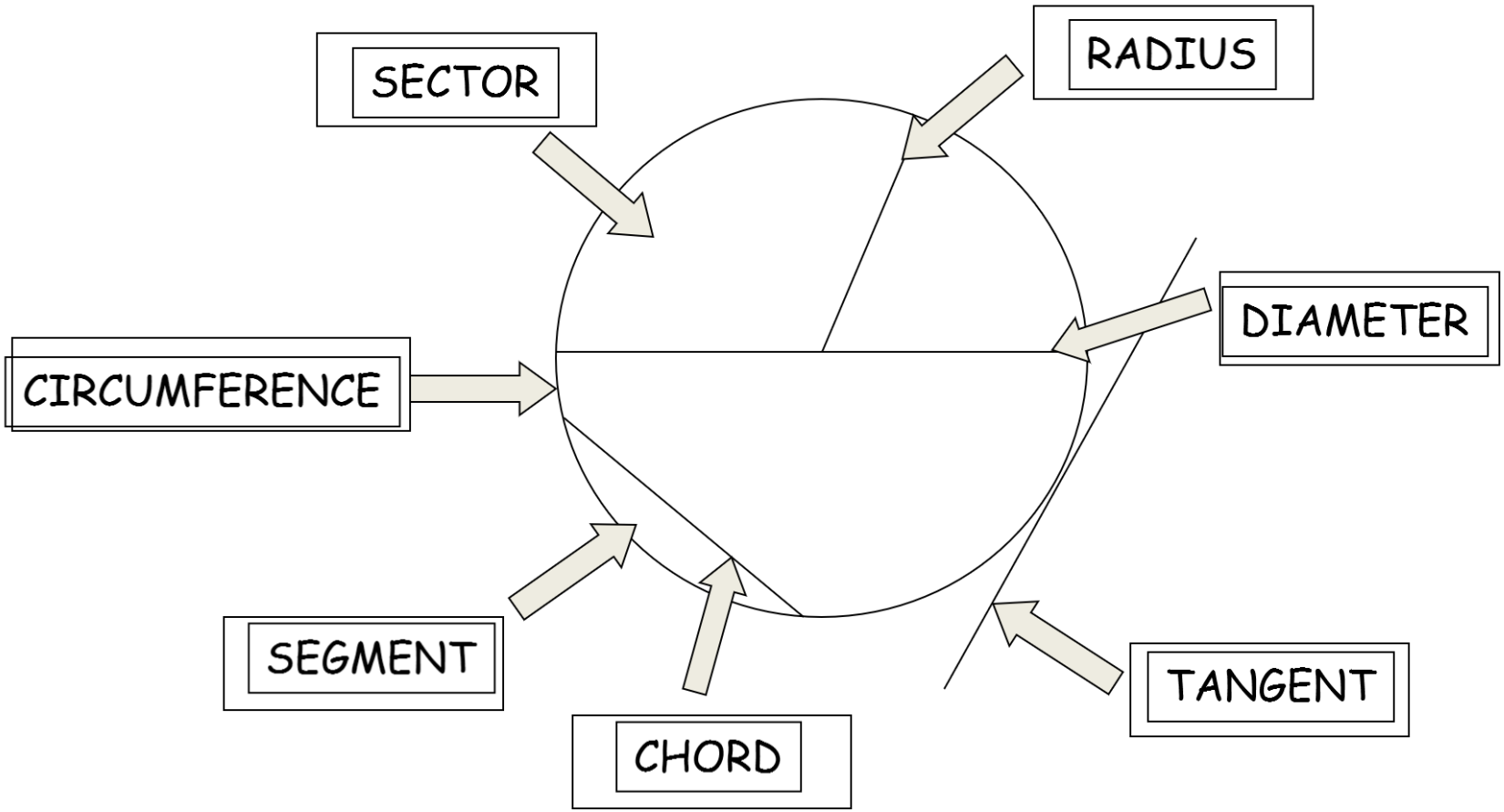


Area of a Circle

$$\text{Area} = \pi \times r^2$$

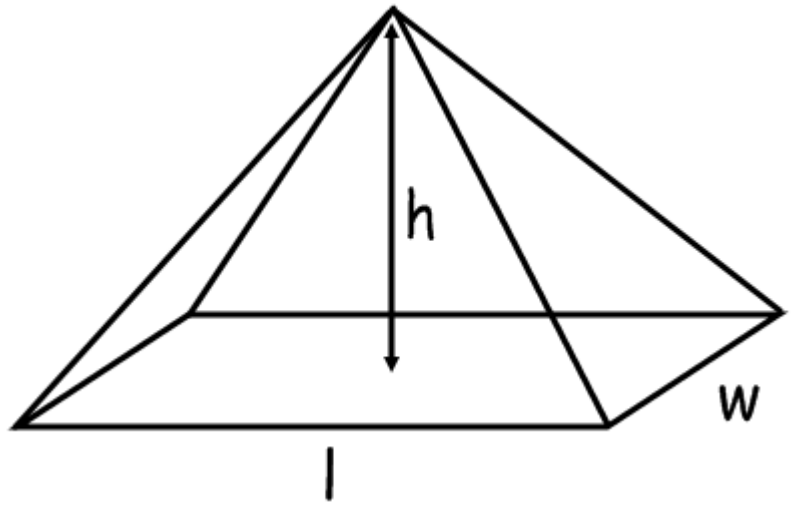


Parts of Circles



Volume of a Pyramid

$$\text{Volume} = \frac{1}{3} \times area\ of\ base \times vertical\ height$$



Power of a Power

$$(x^3)^5 = x^{15}$$

Multiply the powers

Laws of Indices

$$x^4 \times x^6 = x^{10}$$

Add the powers

$$x^9 \div x^2 = x^7$$

Subtract the powers

Anything to the Power Zero

$$x^0 = 1$$

$$5^0 = 1$$

Anything to the power zero is 1

Negative Powers

For whole numbers the negative in the power means "one over"

e.g. $6^{-1} = \frac{1}{6}$

e.g. $8^{-2} = \frac{1}{8^2} = \frac{1}{64}$

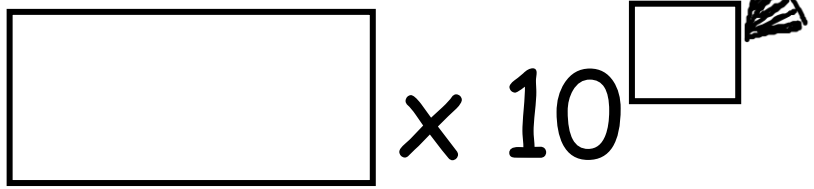
For fractions the negative in the power "flips the fraction over"

e.g. $\left(\frac{2}{3}\right)^{-1} = \frac{3}{2}$

e.g. $\left(\frac{3}{5}\right)^{-2} = \frac{5^2}{3^2} = \frac{25}{9}$

Standard Form

Always written as:



Power is how many places the decimal point has moved

A number from 1 and below 10.

e.g. $2370000 = 2.37 \times 10^{6}$

e.g. $0.00007045 = 7.045 \times 10^{-5}$

Simultaneous Equations

~ Make the amount of x or the amount of y the same by multiplying the equation

~ Add or subtract the equations to get rid of one of the letters

~ Solve the equation to get the letter on its own

~ Substitute your answer into the equation in the question to find the second value

$$2x + 4y = 2 \quad ①$$

$$7x - 8y = -37 \quad ②$$

Make x the Subject

Change both sides of the equation to get the letter on its own

e.g. Make x the subject of the formula

$$z = 4(x+y)$$ ↘ Expand

$$z = 4x + 4y$$ ↘ $-4y$

$$z - 4y = 4x$$ ↘ $\div 4$

$$\frac{z-4y}{4} = x$$

Error Intervals

Find the upper and lower bounds/limits of the number and put in an inequality

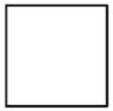
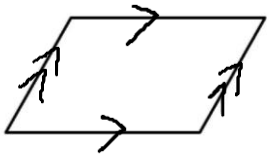
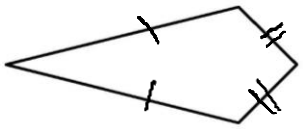
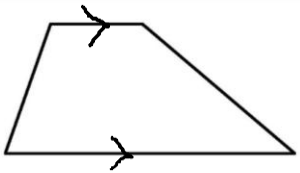
e.g. Write down the error interval for b.
It is 3.7 to 1 decimal place

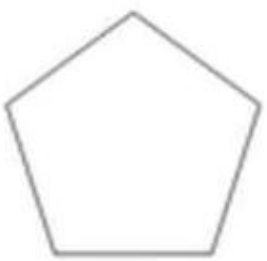
$$3.65 \leqslant b < 3.75$$

e.g. Write down the error interval for h.
It is 45 to the nearest whole number

$$44.5 \leqslant h < 45.5$$

2D Shape Names

Square	
Rectangle	
Rhombus	
Parallelogram	
Kite	
Trapezium	



Pentagon – 5 sides

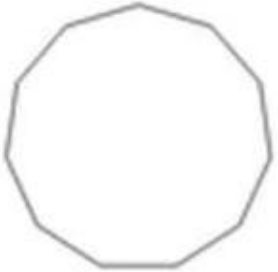
Hexagon – 6 sides

Heptagon – 7 sides

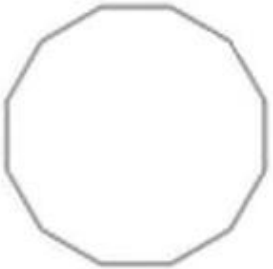
Octagon – 8 sides

Nonagon – 9 sides

Decagon – 10 sides



Hendecagon – 11



Dodecagon – 12

3D Shape Names