YEAR 10 – SUMMER TERM...

@whisto_maths

Probability

What do I need to be able to do?

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

- Add, Subtract and multiply fractions
- Find probabilities using likely outcomes
- Use probability that sums to 1
- Estimate probabilities
- Use Venn diagrams and frequency trees
- Use sample space diagrams
- Calculate probability for independent events
- Use tree diagrams

Keywords

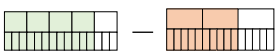
Event: one or more outcomes from an experiment
Outcome: the result of an experiment.
Intersection: elements (parts) that are common to both sets
Union: the combination of elements in two sets.
Expected Value: the value/ outcome that a prediction would suggest you will get
Universal Set: the set that has all the elements
Systematic: ordering values or outcomes with a strategy and sequence
Product: the answer when two or more values are multiplied together.

Add, Subtract and multiply fractions

R

Addition and Subtraction

$$\frac{4}{5} - \frac{2}{3}$$



$$\frac{12}{15} - \frac{10}{15} = \frac{2}{15}$$

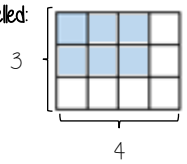
Use equivalent fractions to find a common multiple for both denominators

Multiplication

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

$$\frac{3}{4} \times \frac{2}{3} = \frac{6}{12}$$ ← Parts shaded

Modelled:



Total number of parts in the diagram

Likeliness of a probability

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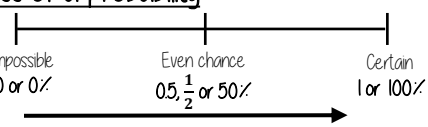


The more likely an event the further up the probability it will be in comparison to another event (It will have a probability closer to 1)

Sum to 1

R

Probability is always a value between 0 and 1

The probability of getting a blue ball is $\frac{1}{5}$

∴The probability of **NOT** getting a blue ball is $\frac{4}{5}$

The sum of the probabilities is 1

Experimental data

Theoretical probability	What we expect to happen
Experimental probability	What actually happens when we try it out

The more trials that are completed the closer experimental probability and theoretical probability become

The probability becomes more accurate with more trials.
Theoretical probability is proportional

Sample space

The possible outcomes from rolling a dice

R

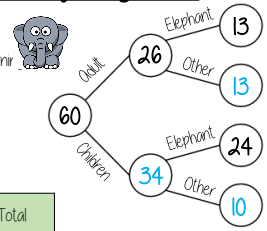
The possible outcomes from tossing a coin	1	2	3	4	5	6
H	1,H	2,H	3,H	4,H	5,H	6,H
T	1,T	2,T	3,T	4,T	5,T	6,T

P (Even number and tales) = $\frac{3}{12}$

Tables, Venn diagrams, Frequency trees

Frequency trees

60 people visited the zoo one Saturday morning. 26 of them were adults. 13 of the adult's favourite animal was an elephant. 24 of the children's favourite animal was an elephant.



Two-way table

	Adult	Child	Total
Elephant	13	24	37
Other	13	10	23
Total	26	34	60

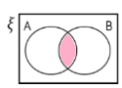
Frequency trees and two-way tables can show the same information

The total columns on two-way tables show the possible denominators

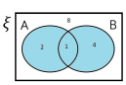
P(adult) = $\frac{26}{60}$

P(Child with favourite animal as elephant) = $\frac{13}{37}$

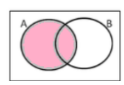
Venn diagram



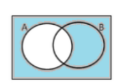
in set A AND set B
$P(A \cap B)$



in set A OR set B
$P(A \cup B)$



in set A
$P(A)$



NOT in set A
$P(A')$

Independent events

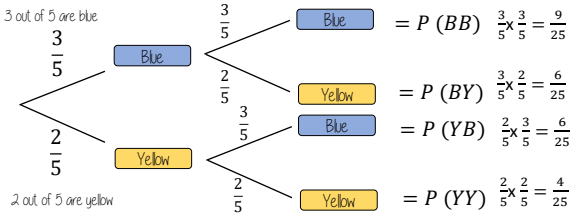
The outcome of two events happening. The outcome of the first event has no bearing on the outcome of the other

$$P(A \text{ and } B) = P(A) \times P(B)$$

Tree diagram for independent event

Isobel has a bag with 3 blue counters and 2 yellow. She picks a counter and replaces it before the second pick.

Because they are replaced the second pick has the same probability

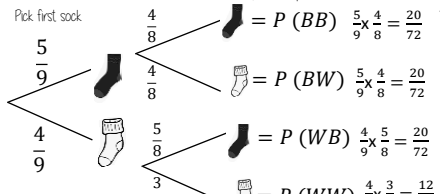


Dependent events

The outcome of the first event has an impact on the second event

Tree diagram for dependent event

A sock drawer has 5 black and 4 white socks, Jamie picks 2 socks from the drawer.



NOTE: as "socks" are removed from the drawer the number of items in that drawer is also reduced ∴ the denominator is also reduced for the second pick

YEAR 10 – SUMMER TERM

Changing the subject

By the end of this unit you should be able to:	MathsWatch clip	Video tutorial
• Solve linear equations	135a	
• Solve linear inequakities	139	Corbett
• Form & solve equations & inequalities in context of shape	137	
• Change the subject of a simple formula	136	Corbett
• Change the subject of a complex formula		
• Change the subject when the subject appears more than once (H)	190	Corbett
• Solve equations by iteration (H)	180	Corbett

Make x the subject of the following formula:

$$y = \frac{x}{ab} + c$$

Keywords

Expand: multiply out terms to remove brackets
Coefficient: the number in front of a letter in an algebraic term, such as $5x^3$
Rearrange: change the subject of an equation by writing it in a different way
Iterate: keep repeating a process
Converge: tend towards a particular value

YEAR 10 – SUMMER TERM

Angles & bearings

What do I need to be able to do?

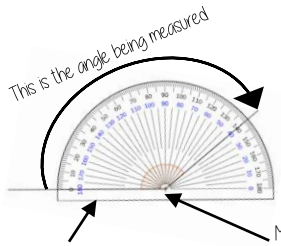
By the end of this unit you should be able to:

- Understand and represent bearings
- Measure and read bearings
- Make scale drawings using bearings
- Calculate bearings using angle rules
- Solve bearings problems using Pythagoras and trigonometry

Keywords

Cardinal directions: the directions of North, South, East, West
Angle: the amount of turn between two lines around their common point
Bearing: the angle in degrees measured clockwise from North
Perpendicular: where two lines meet at 90°
Parallel: straight lines always the same distance apart and never touch. They have the same gradient.
Clockwise: moving in the direction of the hands on a clock.
Construct: to draw accurately using a compass, protractor and or ruler or straight edge.
Scale: the ratio of the length of a drawing to the length of the real thing
Protractor: an instrument used in measuring or drawing angles.

Measure angles to 180° R



Read from 0° on the base line. Remember to use estimation. This is an obtuse angle so between 90 ° and 180 °

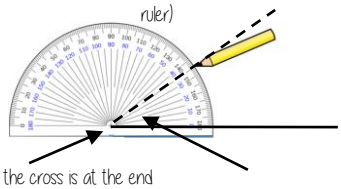
The base line follows the line segment

Make sure the cross is at the point the two lines meet

Draw angles up to 180° R

Draw a 35° angle

Make a mark at 35° with a pencil. And join to the angle point (use a ruler)

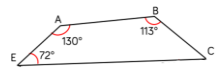


Make sure the cross is at the end of the line (where you want the angle)

The angle

Angle notation R

The letter in the middle is the angle
The arc represents the part of the angle



Angle Notation: three letters $A\hat{B}C$ This is the angle at B = 113 °
$\angle ABC$ is also used to represent the angle at B.

Scale drawings R

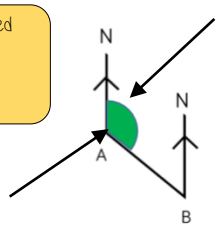
1 : 20

For every 1cm on the model there are 20cm in real life

Remember: Scale drawings ONLY change lengths and distances. Angles remain the same.

Understand and represent bearings

- A bearing is always measured from **NORTH**
- It is always given as three figures



The angle indicated starts from the North line at A and joins the path connecting A to B

This angle shows the bearing of **B from A**

The bearing of B from A is calculated by measuring the highlighted angle

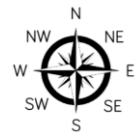
The sentence… "Bearing of ____ from _____" is really important in identifying the bearing being represented

Using **estimation** it is clear this angle is between 090° and 180°

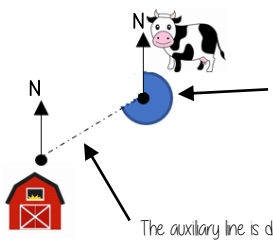
Directions

Clockwise

Anti-Clockwise



Measure and read bearings



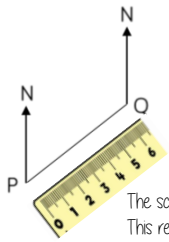
The bearing of the cow to the barn

This angle is measured from **NORTH**
It is measured in a clockwise direction
Estimation indicates this angle is between 180° and 270°
Use a protractor to measure accurately
Remember: bearings are written as three figures

The auxiliary line is drawn to help you measure and draw the angle that is measured to represent the bearing

Scale drawings using bearings

Remember – angles **DO NOT** change size in scaled drawings



The bearing measurements do not change from "real life" to images

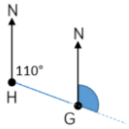
The units in the ratio scale are the same

The scale may need to be calculated from the image. This represents 30km from P to Q

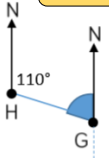
6cm = 30km
6:3,000,000

Bearings with angle rules

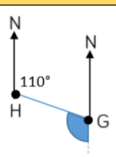
Because two North lines are **PARALLEL**….



They form **corresponding** angles and therefore are the same size



They form **co-interior** angles and add up to 180°

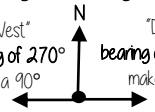


They form **alternate** angles and therefore are the same size

Bearings with right-angled geometry

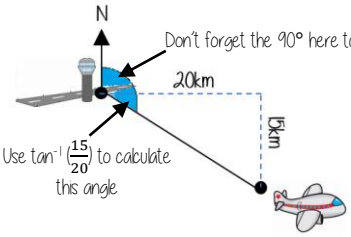
Look for Right-angles: Pythagoras Trigonometry (Sin, Cos, Tan)

"Due West" **bearing of 270°** makes a 90° angle



"Due East" **bearing of 090°** makes a 90° angle

A plane flies East for 20km then turns South for 15km. Find the bearing of the plane from where it took off.

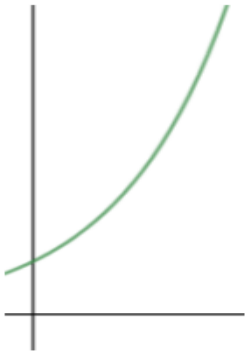


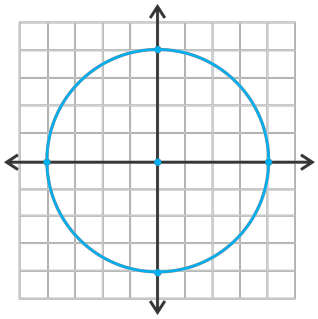
Use $\tan^{-1}\left(\frac{15}{20}\right)$ to calculate this angle

YEAR 10 - SUMMER TERM

Graphs

By the end of this unit you should be able to:	MathsWatch clip	Video tutorial
• Plot & read from quadratic graphs	98	Corbett
• Plot & read from cubic graphs	161	MathsGenie
• Plot & read from reciprocal graphs	161	MathsGenie
• Recognise graph shapes		
• Identify & interpret roots & intercepts of quadratics	160	
• Understand & use exponential graphs (H)	194	Corbett
• Find and use the equation of a circle centre (0,0) (H)	197	Corbett
• Construct & interpret conversion graphs		Corbett Corbett
• Construct & interpret conversion graphs		Corbett Corbett
• Construct & interpret other real-life straight graphs		Corbett
• Interpret distance/time graphs	143	Corbett
• Construct distance/time graphs		Corbett
• Construct & interpret speed/time graphs	216a	MathsGenie
• Recognise & interpret graphs that illustrate direct & inverse proportion		Corbett
• Find approximate solutions to equations using graphs		Corbett
• Estimate the area under a curve (H)	216a	Corbett





Keywords

Quadratic: an expression in which the highest power is 2, such as $x^2 - 5x + 3$

Cubic: an expression in which the highest power is 3, such as $8 + x^3$

Estimate: read approximate values from a graph

Asymptote: a line that a curve approaches, but never quite touches

Gradient: the steepness (or slope) of a line. A negative gradient means the line slopes downhill

Substitute: put numbers in place of letters to find the value of an expression

Reciprocal: a graph with an equation of the form $y = \frac{k}{x}$ where k is a number

Roots: the solutions when an equation equals zero (often the x-intercepts of a graph)

Exponential: a graph with an equation of the form $y = k^x$ where k is a number

Parallel: straight lines that never meet (equal gradients)

Horizontal: a straight line which goes from side to side, parallel to the x-axis

Vertical: a straight line which goes up and down, parallel to the y-axis

Intercept: the point where a line crosses the axis of a graph

Constant: unchanging. It will be a straight line on a graph, for example, a constant speed on a distance-time graph will be a straight diagonal line

Convert: change between two different units of measurement, such as cm and inches

Direct proportion: two quantities which remain in the same ratio at all times

Inverse proportion: a relationship in which one quantity increases as the other decreases

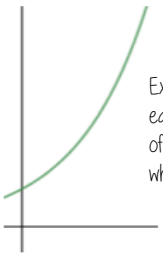
Acceleration: the rate at which velocity changes

YEAR 10 - SUMMER TERM

Graphs

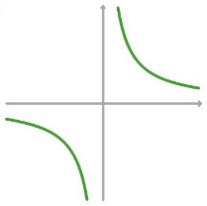
Some (but not all) key points:

Exponential graphs are often this shape

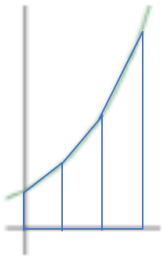


Exponential equations are often of the form $y = k^x$ where k is a number

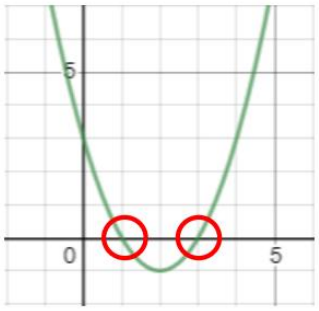
Reciprocal graphs are often this shape



Exponential equations are of the form $y = \frac{k}{x}$ where k is a number

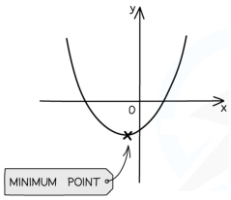


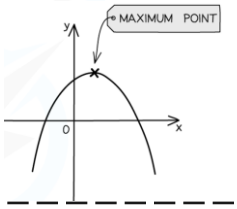
The area under a curve can be found by splitting it up into different trapezia



Roots are where the curve crosses the x-axis

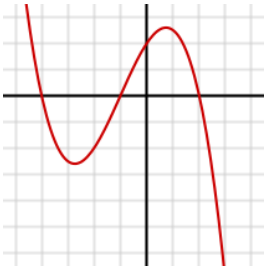
Quadratic graphs:





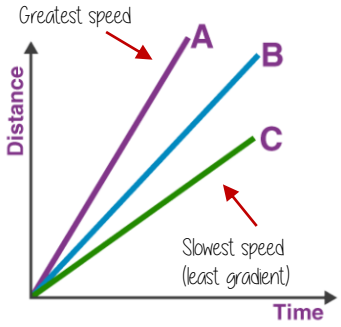
Cubic graphs generally look like these

'Uphill' if the x^3 term is positive, such as $y = 2x^3 - 4x + 8$

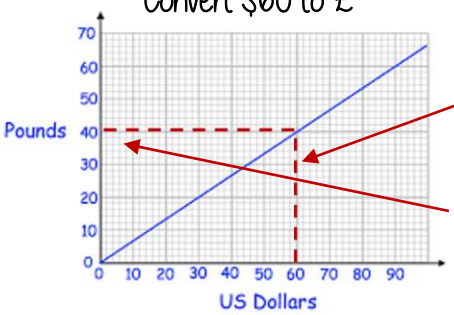


'Downhill' if the x^3 term is negative, such as $y = -3x^3 + x^2 + 7$

Some (but not all) key points:

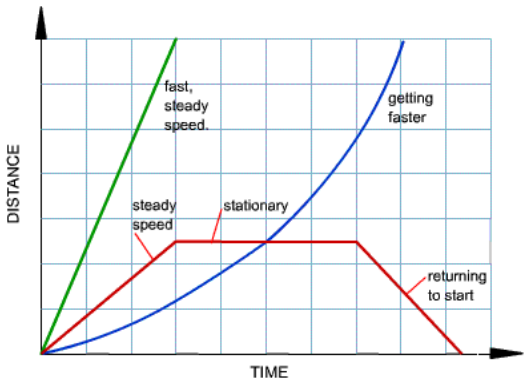


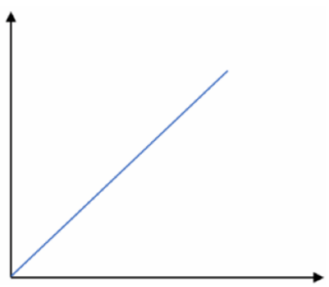
Convert $60 to £



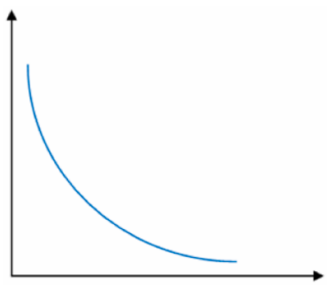
Step 1:
Go up from 60$ until you hit the diagonal conversion line

Step 2:
Go across until you hit the axis and read off the value: £40





Direct proportion



Inverse proportion