

YEAR 11 — CONSTRUCTING IN 2D/3D...

Constructions & congruency

What do I need to be able to do?

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

- Draw and measure angles
- Construct scale drawings
- Find locus of distance from points, lines, two lines
- Construct perpendiculars from points, lines, angles
- Identify congruence
- Identify congruent triangles

Keywords

Protractor: piece of equipment used to measure and draw angles

Locus: set of points with a common property

Equidistant: the same distance

Discorectangle: (a stadium) — a rectangle with semi circles at either end

Perpendicular: lines that meet at 90°

Arc: part of a curve

Bisector: a line that divides something into two equal parts

Congruent: the same shape and size

Draw and measure angles

R

Draw a 35° angle

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

The angle

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

Scale drawings

R

A picture of a car is drawn with a scale of 1:30

For every 1cm on my image is 30cm in real life

The car image is 10cm

Image	Real life
1cm	30cm
10cm	300cm

Locus of a distance from a point

All points are equidistant (the same distance) from the fixed point in the middle

Equipment needed
The radius is the distance from the fixed point

If the point is in the corner it can only make a quarter circle

Locus of a distance from a straight line

All points are equidistant (the same distance) from line

The ends of the line are fixed points

Equipment needed
The line is straight so a ruler is used for the straight lines parallel to your original line

Locus equidistant from two points

Also a perpendicular bisector

Because if the points are joined, this new line intersects it at a 90°

Join the intersections with a ruler
All points on this line are equidistant from both points

Keep the compass the same size and draw two arcs from each point

Construct a perpendicular from a point

Point

Line

Use a compass and draw an arc that cuts the line. Use the point to place the compass

Keep the compass the same distance and now use your new points to make new intersecting arcs

Connecting the arcs makes the bisector

If P is a point on the line, the steps are the same

Locus of a distance from two lines

Also an angle bisector
This cuts the angle in half

From the angle vertex draw two arcs that cut the lines forming the angle

Keep the compass the same size and use the new arcs as centres to draw intersecting arcs in the middle

Join the vertex to the intersection

Congruent figures

Congruent figures are identical in size and shape — they can be reflections or rotations of each other

Congruent shapes are identical — all corresponding sides and angles are the same size

$ACB = KML$

Because all the angles are the same and $AC = KM$, $BC = LM$ triangles ABC and KLM are congruent

Congruent triangles

Side-side-side
All three sides on the triangle are the same size

Angle-side-angle
Two angles and the side connecting them are equal in two triangles

Side-angle-side
Two sides and the angle in-between them are equal in two triangles (it will also mean the third side is the same size on both shapes)

Right angle-hypotenuse-side
The triangles both have a right angle, the hypotenuse and one side are the same

Constructing Triangles

Link to steps R

Side, Angle, Angle

Side, Angle, Side

Side, Side, Side

YEAR 11 — REPRESENTATIONS...

Probability

What do I need to be able to do?

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

- Find single event probability
- Find relative frequency
- Find expected outcomes
- Find independent events
- Use diagrams to work out probabilities

Keywords

Probability: the chance that something will happen

Relative Frequency: how often something happens divided by the outcomes

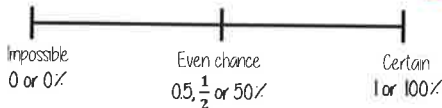
Independent: an event that is not effected by any other events

Chance: the likelihood of a particular outcome

Event: the outcome of a probability — a set of possible outcomes

Biased: a built in error that makes all values wrong by a certain amount

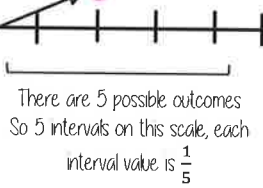
The probability scale



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)



There are 2 pink and 2 yellow balls, so they have the same probability



R

Single event probability

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

The table shows the probability of selecting a type of chocolate

Dark	Milk	White
0.15	0.35	

$$P(\text{white chocolate}) = 1 - 0.15 - 0.35 = 0.5$$



R

Relative Frequency

Frequency of event
Total number of outcomes

Remember to calculate or identify the overall number of outcomes!

Colour	Frequency	Relative Frequency
Green	6	0.3
Yellow	12	0.6
Blue	2	0.1
	20	

Relative frequency can be used to find expected outcomes

e.g Use the relative probability to find the expected outcome for green if there are 100 selections

$$\text{Relative frequency} \times \text{Number of times} \\ 0.3 \times 100 = 30$$

Expected outcomes

Expected outcomes are estimations it is a long term average rather than a prediction

Dark	Milk	White
0.15	0.35	0.5

The sum of the probabilities is 1

An experiment is carried out 400 times

Show that dark chocolate is expected to be selected 60 times

$$0.15 \times 400 = 60$$

Independent events



The rolling of one dice has no impact on the rolling of the other. The individual probabilities should be calculated separately

Probability of event 1 \times Probability of event 2



$$P(5) = \frac{1}{6} \quad P(R) = \frac{1}{4}$$

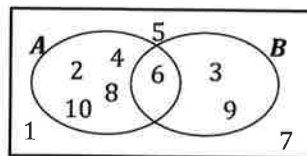
Find the probability of getting a 5 and a red

$$P(5 \text{ and } R) = \frac{1}{6} \times \frac{1}{4} = \frac{1}{24}$$

Using diagrams

Recap Venn diagrams, Sample space diagrams and Two-way tables

R



	Car	Bus	Wak	Total
Boys	15	24	14	53
Girls	6	20	21	47
Total	21	44	35	100

The possible outcomes from tossing a coin

The possible outcomes from rolling a dice

	1	2	3	4	5	6
H	1H	2H	3H	4H	5H	6H
T	1T	2T	3T	4T	5T	6T

YEAR 11 — PROPORTION...

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

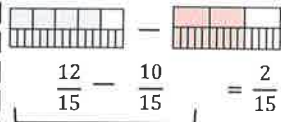
Keywords

- 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

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

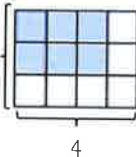
Multiplication

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

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

Parts shaded

Modelled:



Total number of parts in the diagram

R

Likelihood of a probability

Impossible
0 or 0%

Even chance
0.5, 1/2 or 50%

Certain
1 or 100%

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)

R

Sum to 1

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

R

Experimental data

Theoretical probability

What we expect to happen

Experimental probability

What actually happens when we try it out

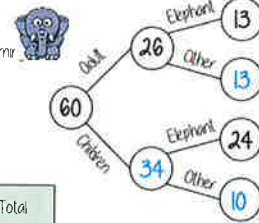
The more trials that are completed the closer experimental probability and theoretical probability become

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

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.



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

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

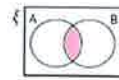
$$P(\text{Adult}) = \frac{26}{60}$$

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

Two-way table

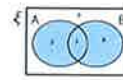
	Adult	Child	Total
Elephant	13	24	37
Other	13	10	23
Total	26	34	60

Venn diagram



in set A AND set B

$$P(A \cap B)$$



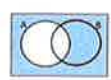
in set A OR set B

$$P(A \cup B)$$



in set A

$$P(A)$$



NOT in set A

$$P(A')$$

Sample space

The possible outcomes from rolling a dice

R

	1	2	3	4	5	6
H	H1	2H	3H	4H	5H	6H
T	1T	2T	3T	4T	5T	6T

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

Independent events

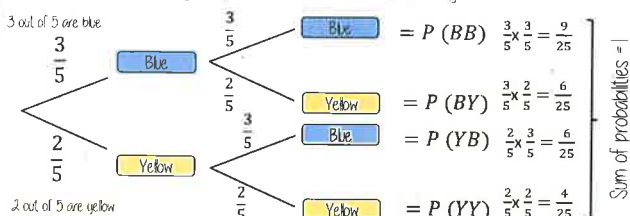
The outcome of two events happening. The outcome of the first event has no bearing on the outcome of the other

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

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

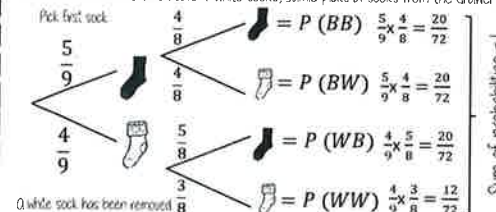


Dependent events

Tree diagram for dependent event

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