YEAR 8 - REPRESENTATIONS...
Tables and Probability

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What do I need to be able to do?

By the end of this unit you should be able to:
- Construct a sample space diagram.
- Systematically list outcomes.
- Find the probability from two-way tables.
- Find the probability from Venn diagrams.

Keywords

Outcomes: the result of an event that depends on probability.
Probability: the chance that something will happen.
Set: a collection of objects.
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.
Union: Notation 'U' meaning the set made by comparing the elements of two sets.

Construct sample space diagrams

Sample space diagrams provide a systematic way to display outcomes from events

The possible outcomes from rolling a dice

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

This is the set notation to list the outcomes S =

In between the { } are a; the possible outcomes

S = { 1H, 2H, 3H, 4H, 5H, 6H, 1T, 2T, 3T, 4T, 5T, 6T}

Probability from sample space

The possible outcomes from rolling a dice

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

This is the set notation that represents the question P

What is the probability that an outcome has an even number and a tails?

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

In between the ( ) is the event asked for

There are three even numbers with tails

There are twelve possible outcomes

Numerator: the event

Denominator: the total number of outcomes

Probability from two-way tables

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

$$P \text{ (Girl walk to school)} = \frac{21}{100}$$

The event

The total in the set

The total number of items

## Product Rule

The number of items in event a X The number of items in event b

Probability from Venn diagrams

100 students were questioned if they played badminton or went to swimming club.
40 went swimming, 25 went to badminton and 11 went to both.

This whole curve includes everyone that went swimming
Because 11 did both we calculate **just** swimming by 40- 11

Swimming   Badminton

29   11   14

46
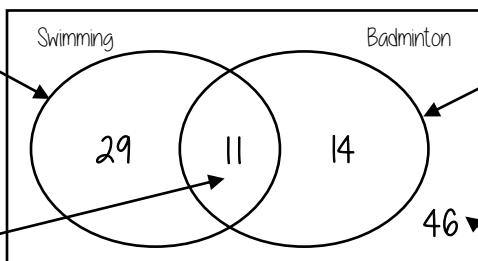
This whole curve includes everyone that went to badminton.
Because 11 did both we calculate **just** badminton by 25 - 11

The intersection represents both
Swimming **AND** badminton

The number outside represents those that did **neither** badminton or swimming   100 – 29 – 11 – 14

$$P \text{ (Just swimming)} = \frac{29}{100}$$

Representing Data

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What do I need to be able to do?

By the end of this unit you should be able to:
- Draw and interpret scatter graphs
- Describe correlation and relationships.
- Identify different types of non-linear relationships.
- Design and complete an ungrouped frequency table.
- Read and interpret grouped tables (discrete and continuous data)
- Represent data in two way tables.

Keywords

Variable: a quantity that may change within the context of the problem.
Relationship: the link between two variables (items). E.g. Between sunny days and ice cream sales
Correlation: the mathematical definition for the type of relationship..
Origin: where two axes meet on a graph.
Line of best fit: a straight line on a graph that represents the data on a scatter graph.
Outlier: a point that lies outside the trend of graph.
Quantitative: numerical data
Qualitative: descriptive information, colours, genders, names, emotions etc.
Continuous: quantitative data that has an infinite number of possible values within its range.
Discrete: quantitative or qualitative data that only takes certain values.
Frequency: the number of times a particular data value occurs.

Draw and interpret a scatter graph.

| Age of Car (Years)	2	4	6	8	10
Value of Car (£s)	7500	6250	4000	3500	2500
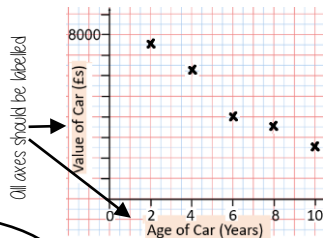
- This data may not be given in size order
- The data forms information pairs for the scatter graph
- Not all data has a relationship

All axes should be labelled

The axis should fit all the values on and be equally spread out

"This scatter graph show as the age of a car increases the value decreases"

The link between the data can be explained verbally

Linear Correlation
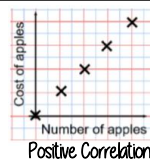
Positive Correlation
As one variable increases so does the other variable
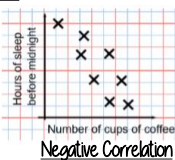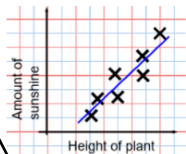
Negative Correlation
As one variable increases the other variable decreases
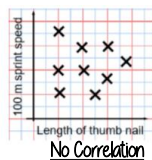
No Correlation
There is no relationship between the two variables

The line of best fit

The Line of best fit is used to make estimates about the information in your scatter graph

Things to know:
- The line of best fit **DOES NOT** need to go through the origin (The point the axes cross)
- There should be approximately the same number of points above and below the line (It may not go through any points)
- The line extends across the whole graph

It is only an estimate because the line is designed to be an average representation of the data

It is always a **straight line**.

Using a line of best fit

Interpolation is using the line of best fit to estimate values inside our data point.

e.g. 40 hours revising predicts a percentage of 45.
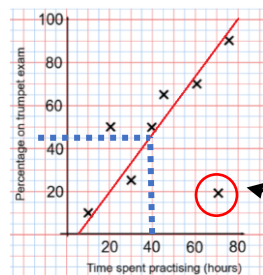
Extrapolation is where we use our line of best fit to predict information outside of our data
This is not always useful – in this example you cannot score more that 100%. So revising for longer can not be estimated

This point is an "outlier"
It is an outlier because it doesn't fit this model and stands apart from the data

Ungrouped Data

The number of times an event happened

The table shows the number of siblings students have. The answers were
3, 1, 2, 2, 0, 3, 4, 1, 1, 2, 0, 2

2 people had 0 siblings. This means there are 0 siblings to be counted here

Number of siblings	Frequency
0	2
1	3
2	4
3	2
4	1

0
3
2 + 2 + 2 + 2 OR 2 x 4 = 8
3 + 3 OR 3 x 2 = 6
4

2 people have 3 siblings so there are 6 siblings in total

Best represented by discrete data (Not always a number)

OVERALL there are
0 + 3 + 8 + 6 + 4
Siblings = 21 siblings

Grouped Data

If we have a large spread of data it is better to group it. This is so it is easier to look for a trend Form groups of equal size to make comparison more valid and spread the groups out from the smallest to the largest value.

Discrete Data The groups do not overlap

Cost of TV (£)	Tally	Frequency
101 – 150	THL II	7
151 – 200	THL THL I	11
201 – 250	THL	5
251 - 300	III	3

We do not know the exact value of each item in a group – so an estimate would be used to calculate the overall total (Midpoint)

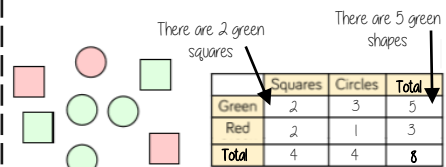**Continuous Data** To make sure all values are included inequalities represent the subgroups

x Weight(g)	Frequency
$40 < x \le 50$	1
$50 < x \le 60$	3
$60 < x \le 70$	5

e.g this group includes every weight bigger that 60Kg up to and including 70Kg

Representing data in two-way tables

Two-way tables represent discrete information in a visual way that allows you to make conclusions, find probability or find totals of sub groups

There are 2 green squares

There are 5 green shapes

	Squares	Circles	Total
Green	2	3	5
Red	2	1	3
Total	4	4	8

There are 8 items in total

Using your two-way table

To find a fraction
e.g. What fraction of the items are red? 3 red items
but 8 items in total = $\frac{3}{8}$

Interleaving: Use your fraction, decimal percentage equivalence knowledge

YEAR 8 - REPRESENTATIONS...
Working in the Cartesian plane

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What do I need to be able to do?

By the end of this unit you should be able to:
- Label and identify lines parallel to the axes
- Recognise and use basic straight lines
- Identify positive and negative gradients
- Link linear graphs to sequences
- Plot y = mx + c graphs

Keywords

Quadrant: four quarters of the coordinate plane.
Coordinate: a set of values that show an exact position.
Horizontal: a straight line from left to right (parallel to the x axis)
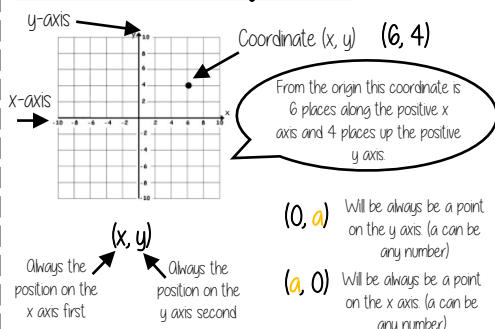**Vertical**: a straight line from top to bottom (parallel to the y axis)
Origin: (0,0) on a graph. The point the two axes cross
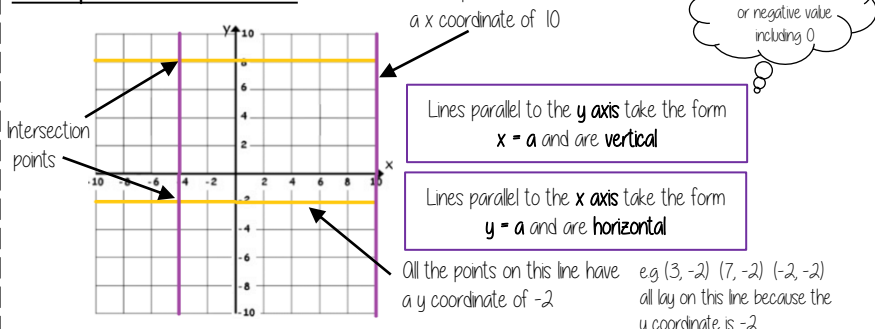**Parallel**: Lines that never meet
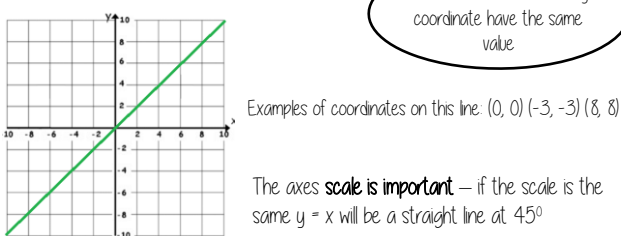**Gradient**: The steepness of a line
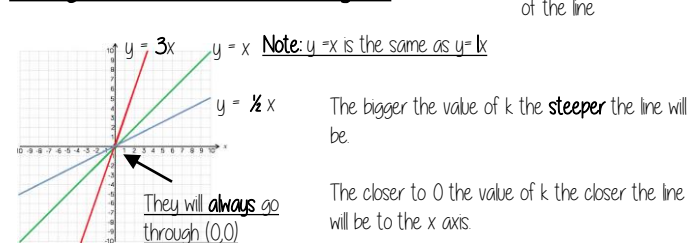**Intercept**: Where lines cross

Coordinates in four quadrants

Coordinate (x, y) (6, 4)

From the origin this coordinate is 6 places along the positive x axis and 4 places up the positive y axis.

(x, y)
Always the position on the x axis first
Always the position on the y axis second

(0, *a*) Will be always be a point on the y axis (a can be any number)

(*a*, 0) Will be always be a point on the x axis (a can be any number)

Lines parallel to the axes

All the points on this line have a x coordinate of 10

Intersection points

All the points on this line have a y coordinate of -2

Lines parallel to the **y axis** take the form **x = a** and are **vertical**

Lines parallel to the **x axis** take the form **y = a** and are **horizontal**

'a' can be ANY positive or negative value including 0

e.g (3, -2) (7, -2) (-2, -2) all lay on this line because the y coordinate is -2

Recognise and use the line y=x

This means the x and the y coordinate have the same value

Examples of coordinates on this line: (0, 0) (-3, -3) (8, 8)

The axes **scale is important** – if the scale is the same y = x will be a straight line at 45°

Recognise and use the lines y=kx

The value of **k** changes the steepness of the line

y = 3x   y = x   Note: y =x is the same as y= 1x

y = ½ x   The bigger the value of k the **steeper** the line will be.

The closer to 0 the value of k the closer the line will be to the x axis.

They will **always** go through (0,0)

Direct Proportion using y=kx

The line must be straight to be directly proportional – variables increase at the same rate **k**

Direct proportion graphs always start at (0,0) as they are describing relationships between two variables

Lines with negative gradients

Any straight-line graph with a negative x value has a negative gradient.

Eg y = -2x
y = -x   y + x = 12

Direction of all negative gradients

Lines in the form y = x + a

y = x + 5
y = x
y = x - 6

All the lines are **parallel** because the gradients are the same
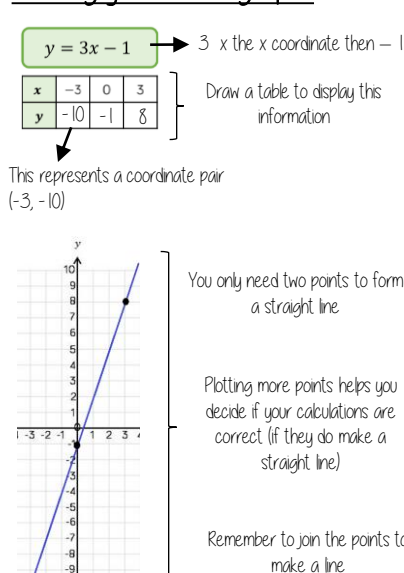
y = x + a

This is the line y=x when the y and x coordinate are the same

This shows the translation of that line.
e.g y = x + 5
Is the line y=x moved 5 places up the graph

5 has been added to each of the x coordinates

Plotting y = mx + c graphs

$y = 3x - 1$ 3 x the x coordinate then – 1

x	-3	0	3
y	-10	-1	8

Draw a table to display this information

This represents a coordinate pair (-3, -10)

You only need two points to form a straight line

Plotting more points helps you decide if your calculations are correct (if they do make a straight line)

Remember to join the points to make a line