MMMR and tables

Key vocabulary

Mode - the number which appears most often in a set of data

Median - the middle number when the numbers are placed in numerical order. If there are 2 numbers in the middle you add and halve to find the middle of these numbers.

Mean - a calculated central value which represents a set of data. To calculate the mean; add up all the value and divide by how many numbers there are.

Range - the difference between the largest and smallest value. This shows the spread of the data. The smaller the range the more consistent the data.

Average - the group name given to refer to mode, median and range. Outside of Maths, when a number is stated as the average it generally is referring to the mean.

Picture perfect

Mode — The most common number

Median — Middle number when in order

Mean, Median, Mode, & Range

$$Mean = \frac{Sum}{n} \qquad Mode = 7$$

$$Range = 14 - 5 = 9 \qquad Median = 9$$

Mean — $\dfrac{Sum\ of\ values}{Total\ frequency}$

Range — Largest value - smallest value

Mode, median and mean are averages, range is the spread of the data

Assessment style question

In one month, the number of hours of exercise taken by 10 people are

4   7   2   8   6   5   1   82   3   9

Which is the appropriate average to use in this situation?

Tick a box.

Mean ☐   Median ☐   Mode ☐

Give one reason for each of the other two averages as to why they are **not** appropriate.

Reason 1 _____

_____

Reason 2 _____

_____

The tables show two sets of data.

Set A	
Result	Frequency
2	3
3	7
4	8
5	7
6	9
7	1

Set B	
Result	Frequency
3	3
4	12
5	9
6	8

(a)   Liam says,

"Set A has the higher mode."

Is he correct?
You **must** show your working.

(Total 2 marks)

Always remember

mean — The mean is the average or norm.
- Add up all of the values to find a total.
- Divide the total by the number of values you added together.

$2+2+3+5+5+7+8 = 32$ $32 \div 7 = 4.57$

The mean is 4.57

median — The median is the middle value.
- Put all of the values into order.
- The median is the middle value.
- If there are two values in the middle, find the mean of these two.

2, 2, 3, 5, 5, 7, 8

The median is 5

mode — The mode is the most frequent value.
- Count how many of each value appears.
- The mode is the value that appears the most.
- You can have more than one mode.

2, 2, 3, 5, 5, 7, 8

The modes are 2 and 5

range — The range is the difference between the lowest and highest value.
- Find the highest and lowest values.
- Subtract the lowest value from the highest.

2, 2, 3, 5, 5, 7, 8 $8 - 2 = 6$

The range is 6

Calculating the mean from a frequency table

The frequency table shows pupil ages. Find the mean.

STEP 1: Find fx

Age	Frequency
8	12
9	25
10	37
11	14

Age (x)	Frequency (f)	fx
8	12	8 x 12 = 96
9	25	9 x 25 = 225
10	37	10 x 37 = 370
11	14	11 x 14 = 154

STEP 2: Find the total of fx

Age (x)	Frequency (f)	fx
8	12	8 x 12 = 96
9	25	9 x 25 = 225
10	37	10 x 37 = 370
11	14	11 x 14 = 154
		= 845

STEP 3: Find the total frequency (f)

Age (x)	Frequency (f)	fx
8	12	8 x 12 = 96
9	25	9 x 25 = 225
10	37	10 x 37 = 370
11	14	11 x 14 = 154
	= 88	= 845

STEP 4: Divide the total fx by the total frequency (f)

$845 \div 88 = 9.6$

The mean is 9.6 years

Estimating the mean from a table of grouped data

The frequency table shows pupil ages. Find the mean.

STEP 1: Find the midpoints

Age	Frequency
8 - 10	12
11 - 13	25
14 - 16	37
17 - 19	14

Age	Frequency (f)	Midpoint (x)
8 - 10	12	9
11 - 13	25	12
14 - 16	37	15
17 - 19	14	18

STEP 2: Work out fx

Age	Frequency (f)	Midpoint (x)	fx
8 - 10	12	9	12 x 9 = 108
11 - 13	25	12	25 x 12 = 300
14 - 16	37	15	37 x 15 = 555
17 - 19	14	18	14 x 18 = 252

STEP 3: Work out the total of fx

fx
12 x 9 = 108
25 x 12 = 300
37 x 15 = 555
14 x 18 = 252
= 1215

STEP 4: Work out the total frequency

Frequency (f)
12
25
37
14
= 88

STEP 5: Divide the total fx by the total frequency (f)

$1215 \div 88 = 13.8$

The mean is 13.8 years

Charts

Frequency Tables

These are a useful and clear way of displaying data

E.g. The table below shows the scores out of ten for 20 students

Mark	Tally	Frequency
4	II	2
5	II	2
6	IIII	4
7	HH	5
8	IIII	4
9	II	2
10	I	1

Frequency means how often something occurs

This means 5 students scored 7 marks in their test

Grouped Frequency Tables

These contain sorted data in groups called **classes**
E.g. The table below shows the ages of people taking swimming lessons

Class Interval	Frequency
15 – 25	60
25 – 35	35
35 – 45	22
45 – 55	18
55 – 65	15

Total frequency will tell you the total number of people taking swimming lessons

This means 18 people who took swimming lessons were between the ages of 45 and 55

Classes or class widths

Comparative Bar Charts

The table shows the number of cars sold by Kitty and George in the first four months of 2014.

	January	February	March	April
Kitty	2	5	13	10
George	4	7	9	10

The chart has a key to make it easier to understand.

*A **comparative bar chart** allows you to easily compare the number of cars Kitty and George sold each month.*
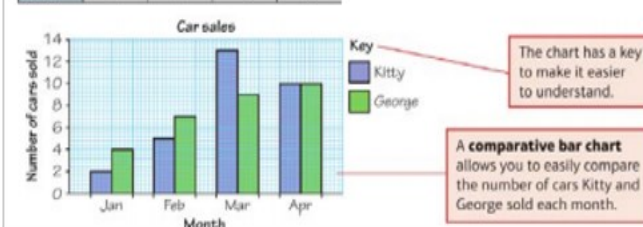
Two-Way Tables

These are used to show how data falls into 2 different categories
For example gender and favourite sport to watch

What is your favorite sport to watch on television?

	Football	Basketball	Baseball
Males	40	22	15
Females	12	16	45
Total	52	38	60

A two-way table divides data into groups in rows going across and columns going down the table

Time-Series Graph

These are used to show how something changes over time. It is a line graph with time plotted along the horizontal axis
For example the height of a balloon at different times
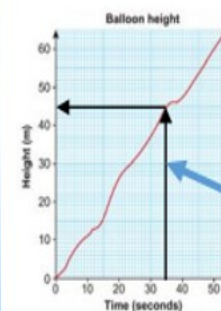
You can estimate the height of the balloon at different times using the graph

E.g. the height of the balloon at 35 seconds is approximately 45m as shown by the arrows on the graph

Stem and Leaf Diagrams

This shows numerical data split into a 'stem' and 'leaves'. The leaf is usually the last digit and the stem is the other digits.

Here are the heights of some students (in cm).
169, 163, 153, 173, 166, 178, 177
Construct a stem and leaf diagram for this data.
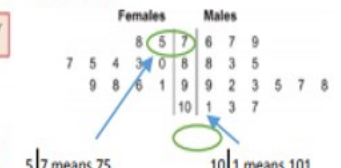
15	3
16	9 3 6
17	3 8 7

Decide on a stem. Write the numbers in your diagram as you work along the data list.

15	3
16	3 6 9
17	3 7 8

Put the leaves in your diagram in order.

Key: 15|3 means 153 cm

Write a key for your diagram.

A back-to-back stem and leaf diagram compares 2 sets of data. E.g. the ages of males and females

	Females		Males	
		8	5 7	6 7 9
7 5 4 3	0	8	3 5
9 8	6 1	9	2 3 5 7 8
		10	1 3 7

5|7 means 75   10|1 means 101

Pie Charts

This is a circle divided into **sectors.** Each sector represents a set of data. Pie charts are excellent for displaying the most/ least popular type of something.

Plotting pie charts example

The table show the match results of a football team.

Result	Won	Drawn	Lost
Frequency	28	12	20

28 + 12 + 20 = 60

The total number of games is the total frequency.

1 game = 360° ÷ 60 games = 6° per game

*Work out the angle for **one** game.*

360° in a circle

28 games won = 28 × 6° = 168°
12 games drawn = 12 × 6° = 72°
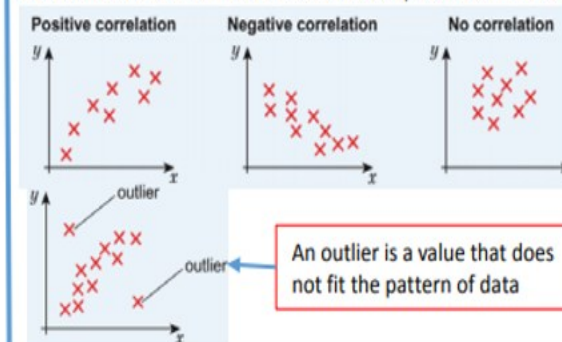20 games lost = 20 × 6° = 120°

Work out the angle for each result.

Draw the pie chart. Give it a title and a key. Or label each section

Scatter Graphs

A scatter graph allows you to see the **relationship** between 2 sets of data. E.g. your height and your stride length.

Correlation is used to describe a relationship between 2 **variables**

Positive correlation   Negative correlation   No correlation

An outlier is a value that does not fit the pattern of data

A line of best fit

This is a straight line drawn through the middle of the points on a scatter graph. It should pass as near as many points as possible and represents the **trend** of the points.
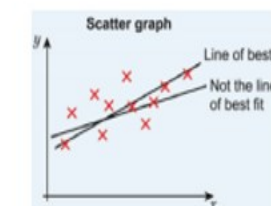
A line of best fit can be used to predict data values within the range of data given.
This is called **interpolation**
It can also be used to predict data values outside the range of data given.
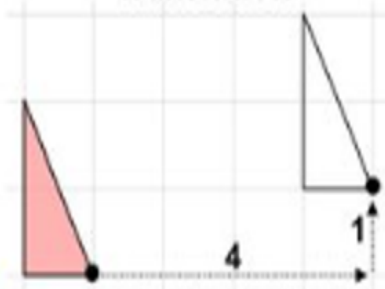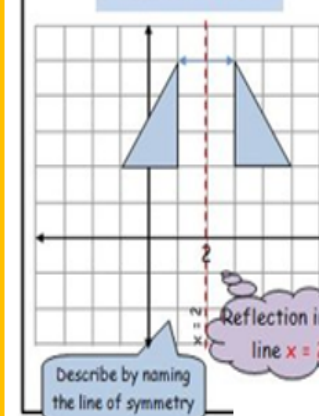This is called **extrapolation.**
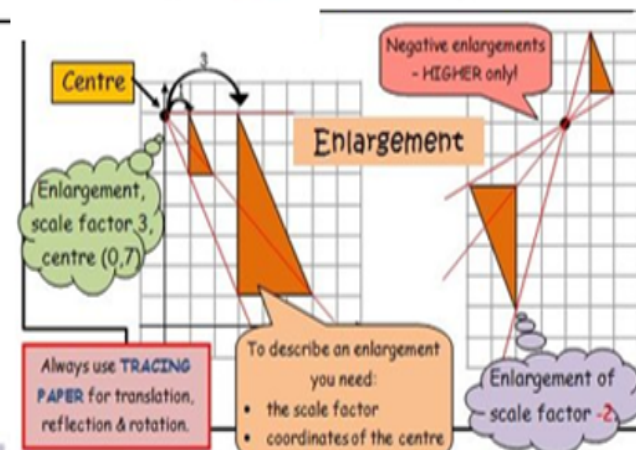
Transformation

Picture perfect

Reflection

Rotation
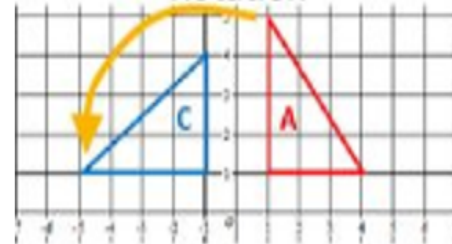
Translation

Always remember

Reflection

Translation

Describe with a vector

$\begin{bmatrix} 3 \\ 4 \end{bmatrix}$

3 ← squares right
4 ← squares up

Reflection in line x = 2.

Describe by naming the line of symmetry

Centre

Negative enlargements – HIGHER only!

Enlargement

Enlargement, scale factor 3, centre (0,7)

Always use **TRACING PAPER** for translation, reflection & rotation.

To describe an enlargement you need:
- the scale factor
- coordinates of the centre

Enlargement of scale factor -2.

Rotation

To describe a rotation you need:
- the angle of rotation
- the direction
- the coordinates of the centre

Rotation of 90°, clockwise, about centre (2,-1)

anti-clockwise   clockwise

Centre of rotation

Assessment style question

Reflection   Rotation   Translation
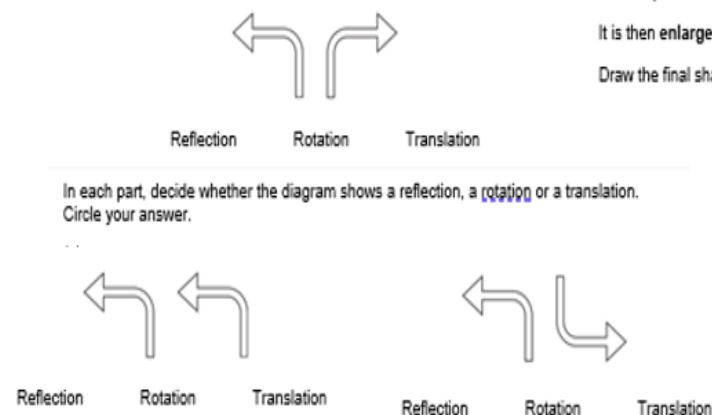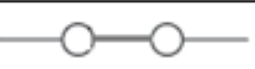
In each part, decide whether the diagram shows a reflection, a rotation or a translation. Circle your answer.

Reflection   Rotation   Translation

Reflection   Rotation   Translation

The shape is **rotated** 90° clockwise about point A.

It is then **enlarged** by scale factor −2, centre B.
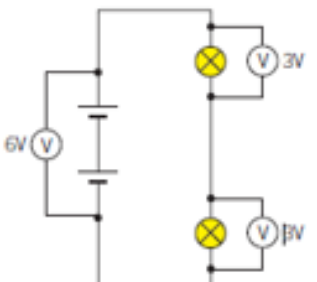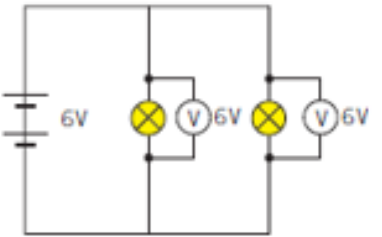
Draw the final shape on the diagram.

(Total 3 mark

ATHERTON COMMUNITY SCHOOL
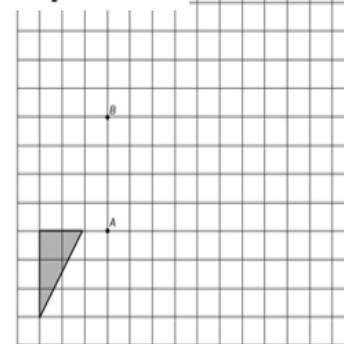
1. Circuit symbols / components

Cell		Battery	
Bulb		Motor	**M**
Switch		Closed switch	
Ammeter	**A**	Voltmeter	**V**
Resistor		Variable resistor	

2. Series and parallel circuits

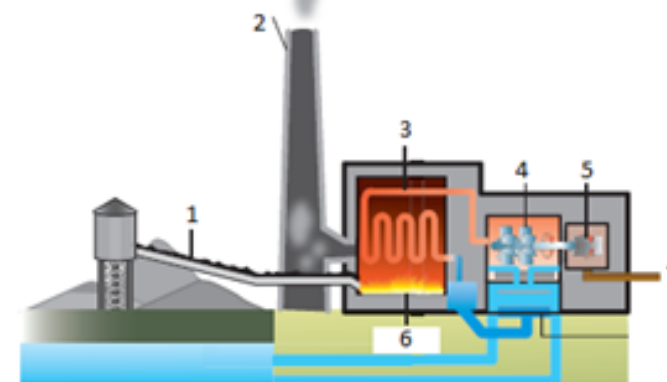| Series circuit	Parallel circuit
Only one loop	More than one loop
If a component breaks, circuit will not work	If component breaks, rest of the circuit will work
Current is the same everywhere in the circuit	Current is shared between the different loops
Potential difference is shared between components in the circuit	Potential difference is the same across all components

3. Power

Power	How much energy is transferred per second, measured in watts (W)
Current	Is the flow of electrons around a circuit, measured in amps (A)
Potential difference	The force that pushes the current around a circuit, measured in volts (V)
Power rating	States how quickly an appliance uses energy

Power can be calculated using these equations

Power (W) = $\dfrac{\text{Energy (j)}}{\text{Time (s)}}$	Power (W) = potential x current difference (V) (A)

4. Generating electricity

Non-renewable energy	Renewable energy
Cannot be replaced in our lifetime	Can be replaced in our lifetime
Examples: fossil fuels (coal, gas, oil) & nuclear resources	Examples: wind, tidal wave, biomass, solar, hydroelectric and geothermal

Generating electricity at a power station

1	Coal
2	Chimney
3	Steam
4	Turbine
5	Generator
6	Boiler
7	Electricity out

Fuel is burnt underneath water in the boiler	Water is heated and turns into steam	The seam turns a turbine which turns a generator	Electricity is generated