Maths

Averages

Key Word	Definition
Mean	the average of a data set, found by adding all numbers together and then dividing the sum of the numbers by the number of numbers
Median	the middle value (or midpoint) after all the data points have been arranged in value order as a list of numbers
Mode	the value that appears the greatest number of times in a data set
Range	the difference between the largest value and the smallest value

Key Equations

$$\text{Mean} = \frac{\text{sum of the terms}}{\text{number of terms}}$$

$$\text{Range} = \text{Highest value} - \text{Lowest value}$$

$$\text{Midpoint} = \frac{a+b}{2}$$ where a and b are the two middle numbers if a data set has an even amount of numbers

Worked Example

Find the mean, median, mode and range for data set A

Data Set A: 3, 8, 5, 3, 9, 2, 4, 1, 5, 7, 2, 4, 2, 11

1st Step: Order data set form smallest to largest

1, 2, 2, 2, 3, 3, 4, 4, 5, 5, 7, 8, 9, 11

2nd Step: Calculate the mean
Add all terms together
1+2+2+2+3+3+4+4+5+5+7+8+9+11= 66
Divide this by the number of terms (in this case, 14)
66/14= 4.71 (3.s.f)

3rd Step: Find the most common number, mode
In this case, it is 2 as there are 3 2's and no other number comes up 3 times

4th Step: Find the median
Since there are 14 terms the median will be the midpoint of 7th and 8th
Therefore, the median = 4+4/2 = 4

5th Step: Find the range
Take the smallest number away from the largest number
Range = 11 – 1 = 10

Finding Averages in Tables

Maths

Key Word	Definition
Continuous Data	is data that falls in a constant sequence, can be any number including decimals e.g. Height (1.83m)
Discrete Data:	is data that has clear spaces between values e.g. number of sweets (4) or shoe size (7.5)
Frequency:	the number of times an event or a value occurs
Grouped Data:	data that is given in the form of class intervals e.g. Number of people who are between 1.7m and 1.8m

Robbie plays 20 games for his school team and records how many goals he scores in each game, find the mean, median and mode

Goals	Frequency
0	5
1	7
2	5
3	3

Mean = $\frac{(0\times5)+(1\times7)+(2\times5)+(3\times3)}{20}$

= 1.3 goals per game

Mode = 1 goal as it happened 7 times which more than any other goal amount

Median= 1 goal as the middle of the data set is between the 10th and 11th term which both occur in the 1 goal group

Worked Example

50 students have the height measure, find the mean and median heights.

Height, h, cm	Frequency	Midpoint
$110 \le h < 120$	3	115
$120 \le h < 130$	8	125
$130 \le h < 140$	9	135
$140 \le h < 150$	23	145
$150 \le h < 160$	7	155

To find mean, firstly find the midpoints of the groups (shown in red), then find the sum of (midpoint x frequency) then divide by the overall frequency

Mean = $\frac{(115\times3)+(125\times8)+(135\times9)+(145\times23)+(155\times7)}{50} = 139.6$

To find the median we need find where the 25th term occurs, which in this case is in $140 \le h < 150$. Then we need to subtract the frequencies from the class prior to this class, 25 – 9 – 8 – 3 = 5, to find where in the class the median falls.
Then we can find the median by dividing this number by the frequency of the median class (23) then multiplying this by the class size (10) and finally adding this to the lower limit (140)

Median = $140 + \left(\frac{5}{23} \times 10\right) = 142.17\ (2.d.p.)$

Displaying Data

Maths

Key Word	Definition
Frequency	The number of times an event or a value occurs
Axes	The x and y lines that cross at right angles to make a graph
Midpoint	The middle of or the halfway point
Median	The middle of a list of numbers in order
Mode	The value that appears the most
Range	The difference between the highest and lowest number

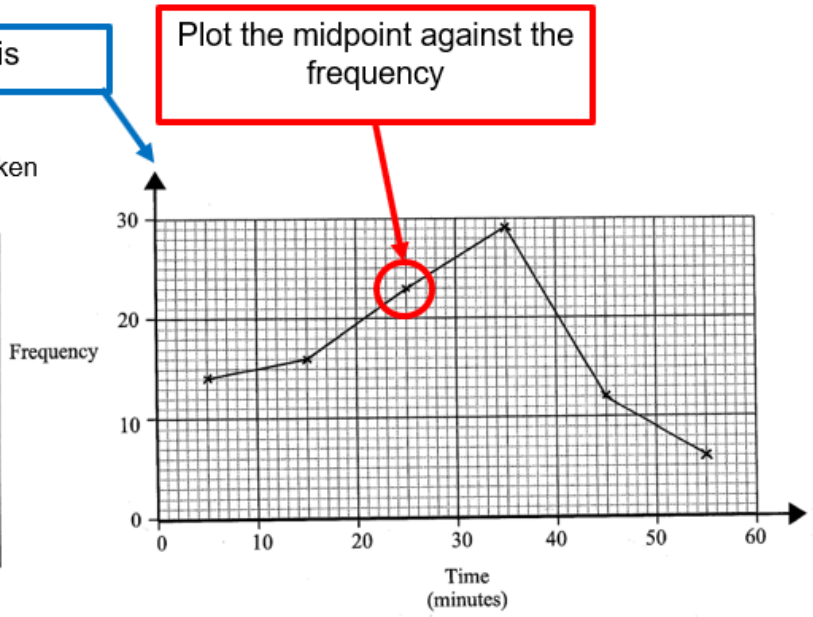
Frequency Polygons

Frequency on the y axis

Plot the midpoint against the frequency

The frequency table shows the time taken for 100 people to travel to an event

Time (minutes)	Frequency
$0 < t \leqslant 10$	14
$10 < t \leqslant 20$	16
$20 < t \leqslant 30$	23
$30 < t \leqslant 40$	29
$40 < t \leqslant 50$	12
$50 < t \leqslant 60$	6



Stem and Leaf Diagrams

- A way to represent a list of data
- Easy to read and show the trend of the data
- Can find the median, mode and range

Year 8 scores in a French test

Stem	Leaf
1	1 3 4 5 7
2	0 1 1 1 8
3	1 1 2 3 7 7
4	0 0 1 2 6 8 8

Key: 1 | 1 = 11 marks

Leaf

Stem

Mode = 21
Median = 48 – 11 = 37
Median = 31

Pictographs and Bar Charts

Pictographs

Some KEY information:
A Key tells you what each symbol represents

Both charts show frequency - "How many of something"

By symbols

Key:
● represents 4 peaches

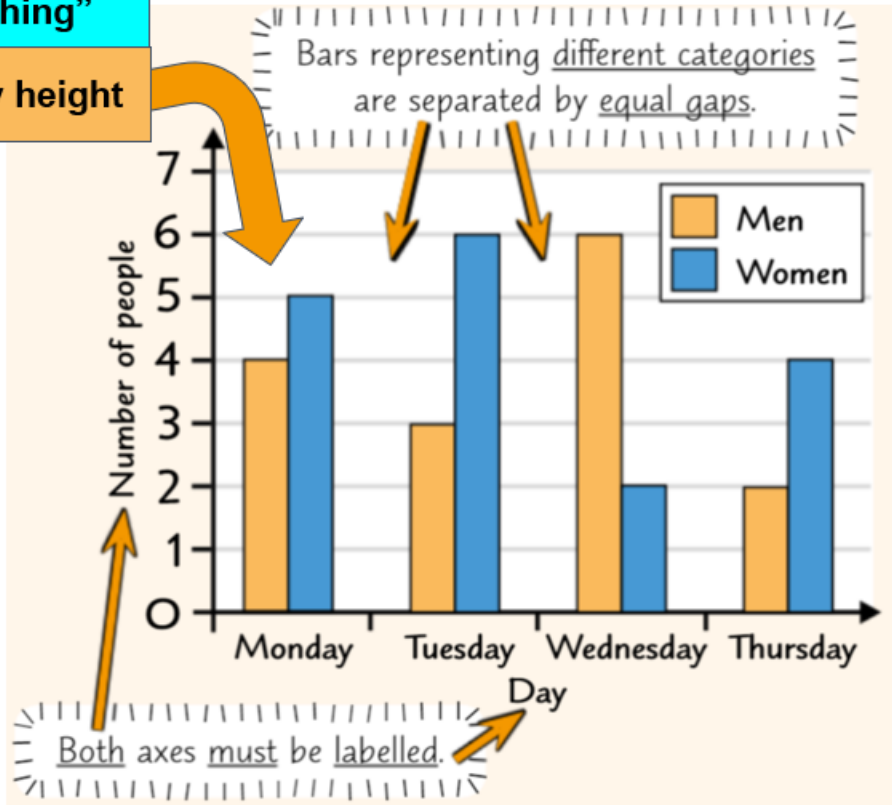
Monday	●
Tuesday	● ●
Wednesday	● ● ● ◔
Thursday	● ◗
Friday	

3 quarters of this shape means 3 peaches

You MUST have a KEY

Bar Charts

By height



This bar chart shows the number or men and women visiting a coffee shop.

Dual Bar Charts show two things at once - Helping compare data.

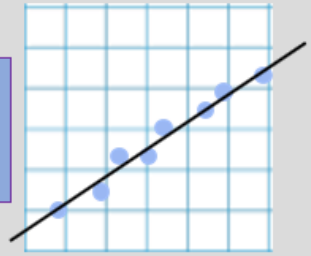
Scatter Graphs

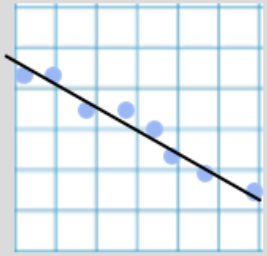
Maths

KEY WORDS AND DEFINITIONS	
Data	Values, typically shown as numbers or letters.
Line of best fit	A straight line that goes through all of the points or tracks them as accurately and evenly as possible.
Positive Correlation	As one variable increases so does the other. There is a positive connection.
Negative correlation	As one variable increases the other variable decreases. There is a negative connection.
No correlation	There is no connection being shown between the two variables.
Interpolation	Estimating values using the line of best fit from within the data set.
Extrapolation	Estimating values outside the data set following the patterns from the data set.

Line of best fit

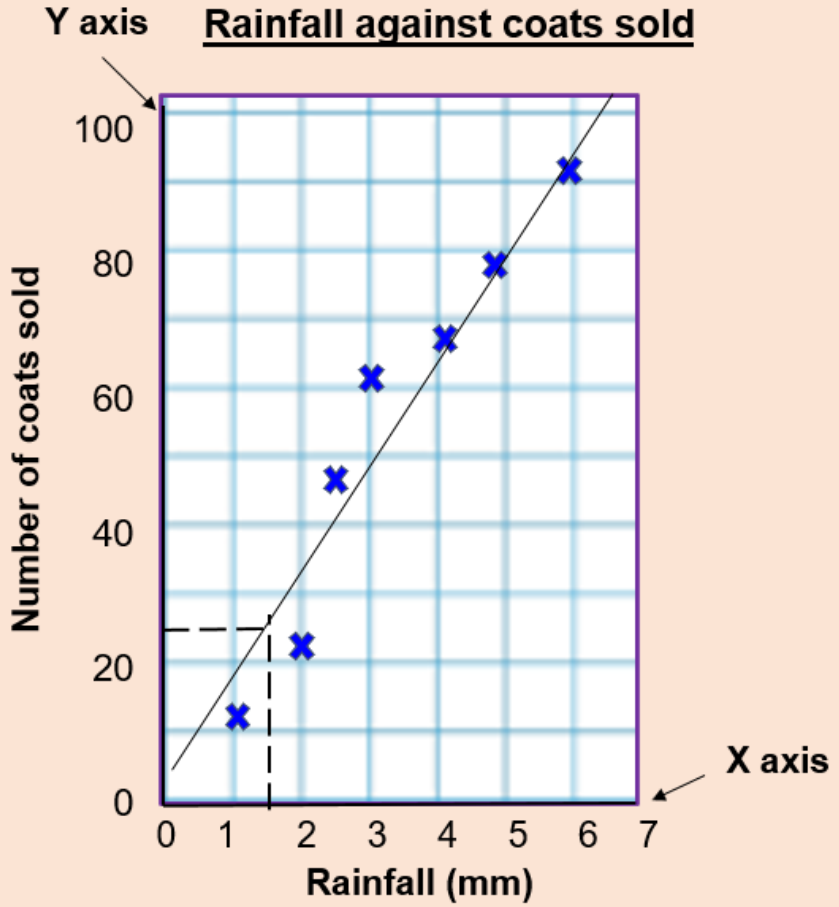
Strong positive correlations





Strong negative correlations

Plotting scatter graphs



When there was 1.5mm of rain, 25 coats were sold.

Pie Charts

What is a pie chart?

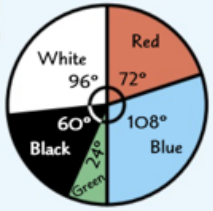
A diagram that shows **proportions**, *not numbers*

Golden Rule of the pie chart – THE TOTAL OF EVERYTHING

1) Fraction of the Total = Angle ÷ 360°

GRADE 3

EXAMPLE:



This pie chart shows the colour of all the cars sold by a dealer. What fraction of the cars were red?

$$\text{Fraction of red cars} = \frac{\text{angle of red cars}}{\text{angle of everything}} = \frac{72^\circ}{360^\circ} = \frac{1}{5}$$

Key Words:
Frequency – How much of something
Protractor – mathematical equipment required to measure angle
Proportion – amount of something compared to another thing

2) Find a Multiplier to Calculate Your Angles

GRADE 3

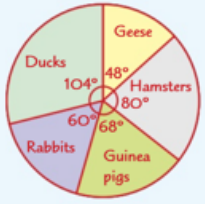
EXAMPLE: Draw a pie chart to show this information about the types of animal in a petting zoo.

Animal	Geese	Hamsters	Guinea pigs	Rabbits	Ducks
Number	12	20	17	15	26

1) Find the total by adding. 12 + 20 + 17 + 15 + 26 = 90
2) 'Everything = 360°' — so find the multiplier that turns your total into 360°. Multiplier = 360 ÷ 90 = 4
3) Multiply every number by 4 to get the angle for each sector.

Angle	12 × 4 = 48°	20 × 4 = 80°	17 × 4 = 68°	15 × 4 = 60°	26 × 4 = 104°

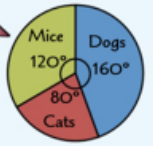
4) Draw your pie chart accurately using a protractor.



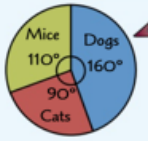
3) Find How Many by Using the Angle for 1 Thing

GRADE 3

EXAMPLE: The pie chart on the right shows information about the types of animals liked most by different students. There were 90 students altogether.



a) Work out the number of students who liked dogs most.
1) 'Everything = 360°', so... ⇒ 90 students = 360°
2) Divide by 90 to find... ⇒ 1 student = 4°
3) Divide the angle for dogs by the angle for 1 student to get: ⇒ 160° ÷ 4° = 40 — 40 students liked dogs most



b) The pie chart on the left shows information about the types of animals liked most by a different group of students. Dave says, "This means that 40 students in this group like dogs most." Explain why Dave is not correct.
We don't know how many students in total the pie chart represents, so we can't work out how many students liked dogs most.