

AVERAGES FROM A LIST AND REVERSE MEAN

Statistics

Key Concepts

There are three types of **average** that we use to analyse and compare data. We can calculate averages from a **discrete** data set.

Mode The most common value that appears in the list.

Median Once ordered, the middle value.

Mean $\frac{\text{Total of all data}}{\text{Number of pieces of data}}$

The **range** is used to analyse the **spread** of a data set or how **consistent** the data is.

Range
largest data value – smallest data value

Examples

Here is a discrete data set, calculate the mean, mode, median and range for this data.

2 5 3 9 7 7

Mode: 7

Median: 2 3 5 7 7 9 $\frac{5 + 7}{2} = 6$

Mean: $\frac{2+3+5+7+7+9}{6} = 5.5$

Range: $9 - 2 = 7$

Reverse mean

A hockey team scored the following number of goals in 6 games:

2 3 4 1 0 1

The mean of the goals scored in seven games was 2. How many goals were scored in the seventh game?

$$\frac{2 + 3 + 4 + 1 + 0 + 1 + x}{7} = 2 \longrightarrow \frac{11 + x}{7} = 2 \longrightarrow x = 3$$



62, 130b

Key Words

Discrete
Data
Mean
Mode
Median
Range
Spread

- 1) Calculate the mean, mode, median and range for the following list of data: 5 8 4 2 8 6
- 2) The points scored in a test by 5 students are 32, 38, 21, 25, 29. Another student's test score is included. If the mean of these 6 scores is now 27, what did the 6th student score?

AVERAGES FROM A TABLE

Statistics

Key Concepts

Modal class (mode)

Group with the highest frequency.

Median group

The median lies in the group which holds the $\frac{\text{total frequency}+1}{2}$ position. Once identified, use the cumulative frequency to identify which group the median belongs from the table.

Estimate the mean

For grouped data, the mean can only be an estimate as we do not know the exact values in each group. To estimate, we use the midpoints of each group and to calculate the mean we find $\frac{\text{total } fx}{\text{total } f}$.

Examples

Length (L cm)	Frequency (f)	Midpoint (x)	fx
$0 < L \leq 10$	10	5	$10 \times 5 = 50$
$10 < L \leq 20$	15	15	$15 \times 15 = 225$
$20 < L \leq 30$	23	25	$23 \times 25 = 575$
$30 < L \leq 40$	7	35	$7 \times 35 = 245$
Total	55		1095

- a) Estimate the mean of this data.
step 1: calculate the total frequency
step 2: find the midpoint of each group
step 3: calculate $f \times x$
step 4: calculate the mean shown below

$$\frac{\text{Total } fx}{\text{Total } f} = \frac{1095}{55} = 19.9\text{cm}$$

- b) Identify the modal class from this data set. **"the group that has the highest frequency"**
Modal class is $20 < x \leq 30$

- c) Identify the group in which the median would lie. **Median = $\frac{\text{Total frequency}+1}{2} = \frac{56}{2} = 28\text{th value}$**
"add the frequency column until you reach the 28th value" **Median is in the group $20 < x \leq 30$**



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Key Words

Midpoint
Mean
Median
Modal

Cost (£C)	Frequency	Midpoint	
$0 < C \leq 4$	2		
$4 < C \leq 8$	3		
$8 < C \leq 12$	5		
$12 < C \leq 16$	12		
$16 < C \leq 20$	3		

From the data:

- a) Identify the modal class.
 b) Identify the group which holds the median.
 c) Estimate the mean.

ANSWERS: a) $12 < C \leq 16$ b) $\frac{25+1}{2} = 13\text{th value}$ is in the group $12 < C \leq 16$ c) $\frac{294}{29} = £11.76$

BAR CHARTS AND PICTOGRAMS

Statistics

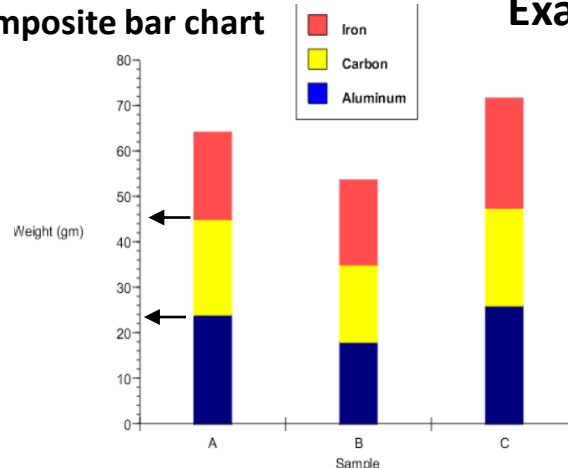
Key Concepts

Bar charts are a visual representation of **categorical data**.

Composite bar charts are bar charts that display multiple data points stacked on top of one another.

Pictograms use an image relating to a physical object to represent an amount. A **key** must be included to show the value of each picture.

Composite bar chart



- How much aluminium is in sample A? **24g**
- How much carbon is in sample A?
 $46 - 24 = 22g$
 Highest value for carbon in sample A. Lowest value for carbon in sample A.

Examples

Pictogram



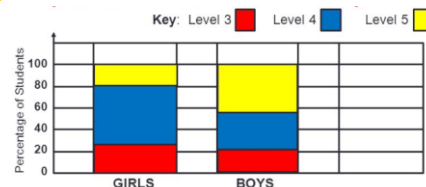
- How many cupcakes were sold on Monday?
 $5 \times 6 = 30$ cupcakes
- What does half a cupcake represent on the pictogram?
 $6 \div 2 = 3$ cupcakes
- How many cupcakes were sold on Thursday?
 $3.5 \times 6 = 21$ cupcakes



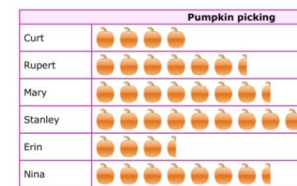
15, 16

Key Words

Bar chart
Composite
Pictogram
Key
Categorical
Data set



- What percentage of boys are level 3?
- What percentage of girls are level 4?



Each = 2 pumpkins

- How many pumpkins were picked by Stanley?
- What does half a pumpkin represent?
- How many pumpkins were picked by Erin?

PIE CHARTS AND SCATTER-GRAPHS

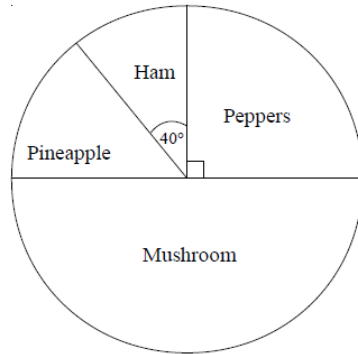
Statistics

Key Concepts

Pie charts use angles to represent proportionally the quantity of each group involved.

Pie charts can only be compared to one another when populations are given.

Scatter-graphs show the relationship between two variables. This relationship is called the **correlation**.



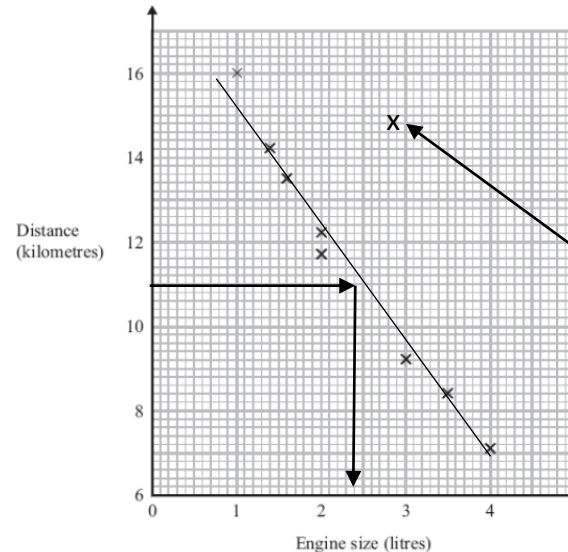
Topping	Frequency	Angle of Sector
Peppers	18	90°
Mushroom	36	180°
Pineapple	10	50°
Ham	8	40°

$$\frac{360}{72} = 5$$

72 360°

× 5

Examples



A scatter-graph is drawn to show the relationship between the engine size of a car and how far it can travel.

It shows negative correlation.

This is an outlier.

We draw a line of best fit through the middle of the data points to read from to estimate readings. For example, estimating the engine size of a car that can travel 11km would be 2.5 litres.

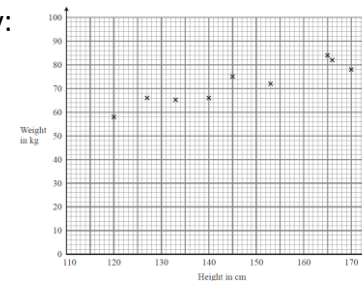


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Key Words
Pie chart
Scatter-graph
Correlation
Outlier
Variable

1) Calculate the angle for each category:

Region	Frequency
Southern England	9
London	23
Midlands	16
Northern England	12
Total	60



2a) What type of correlation is shown?
b) Using a line of best fit estimate the weight when the height is 135cm.

TWO WAY TABLES AND STEM AND LEAF

Statistics

Key Concepts

Two way tables are used to tabulate a number of pieces of information.

Probabilities can be formulated easily from two way tables.

Stem and leaf diagrams are used to order and organise data. A **key** must be included.

Averages can be found easily from stem and leaf diagrams.



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Here are the times, in minutes, taken to solve a puzzle.

5 10 15 12 8 7 20 35 24 15
20 33 15 24 10 8 10 20 16 10

Draw a stem and leaf diagram:

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

Key: 2 | 4 = 24

Calculate the median value = 15

State the mode = 10

Calculate the range = 35 - 5
= 30

Examples

80 children went on a school trip. They went to London or to York.

23 boys and 19 girls went to London. 14 boys went to York.

	London	York	Total
Girls	19	24	43
Boys	23	14	37
Total	42	38	80

What is the probability that a person chosen at random went to London? $\frac{42}{80}$

If a girl is chosen, what is the probability that she went to York? $\frac{24}{38}$

Key Words
Two way table
Stem and leaf
Mode
Median
Probability

1) Here are the speeds, in miles per hour, of 16 cars.

31 52 43 49 36 35 33 29
54 43 44 46 42 39 55 48

- Draw an ordered stem and leaf diagram for these speeds.
- Calculate the median, mode and range

2) Complete the two way table:

	Year Group			Total
	9	10	11	
Boys			125	407
Girls		123		
Total	303	256		831

TYPES OF DATA AND GRAPHS

Statistics

Key Concepts

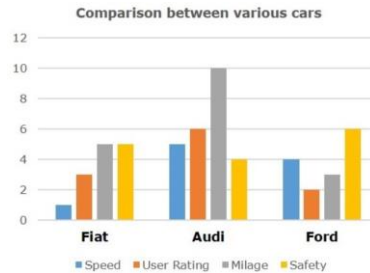
Discrete data: data that can be categorised into a classification, there are a finite number of classifications.
E.g. Hair colour, shoe size, number of children in a class.

Continuous data: data that can take any value. Data that is measured.
E.g. Height, weight, time.

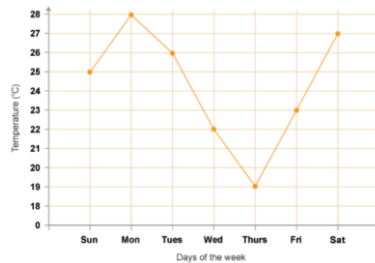
Qualitative data: data that describes something.
E.g. Race, ethnicity.

Quantitative data: data that is in numerical form.
E.g. Statistics, percentages, time.

Comparative bar charts



Line graphs

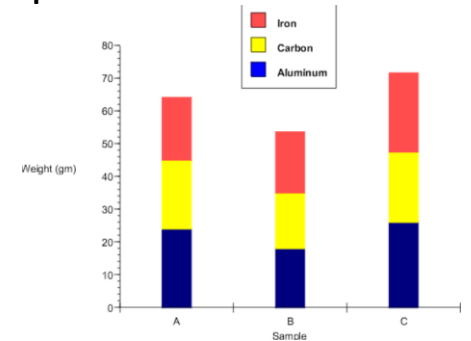


Examples

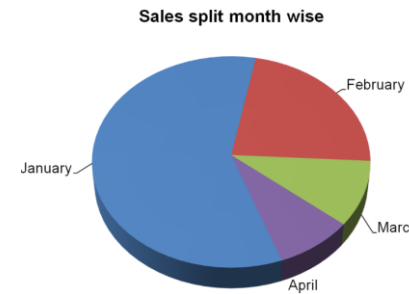
Tally charts

Colour	Tally	Frequency
Red		13
Blue		9
White		24
Black		12
Other		9

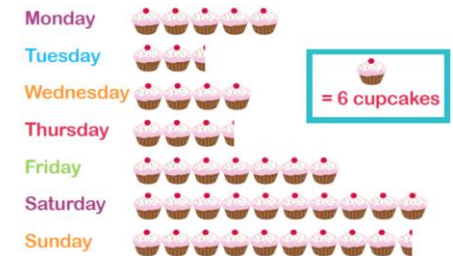
Composite bar charts



Pie charts



Pictograms



15, 16, 63, 64,
65

Key Words
Data
Discrete
Continuous
Qualitative
Quantitative
Graph

What types of data is each of the following?

- 1) Number of goals scored in a match
- 2) Eye colour
- 3) Time it takes to run 100m
- 4) Length of a car
- 5) Number of pets a person owns

ANSWERS: 1) Discrete, quantitative 2) Discrete, qualitative 3) Continuous, quantitative 4) Continuous, quantitative 5) Discrete, quantitative