



Year 9

TYPES OF DATA AND GRAPHS

Key Concepts

Qualitative data: data collected that is described in words **not** numbers.

e.g. race, hair colour, ethnicity.

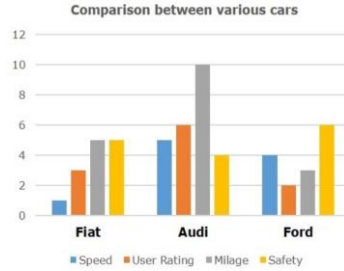
Quantitative data: this is the collection of numerical data that is either discrete or continuous.

Discrete data: numerical data that is categorised into a finite number of classifications.

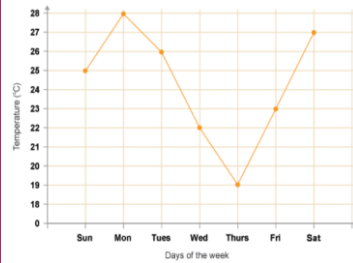
e.g. number of siblings in a family, shoe size, .

Continuous data: numerical data that can take any value. This data is usually measured on a large number scale.
e.g. height, weight, time, capacity.

Comparative bar charts



Line graphs



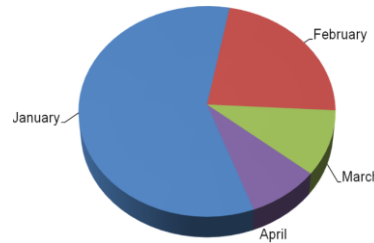
Examples

Tally charts

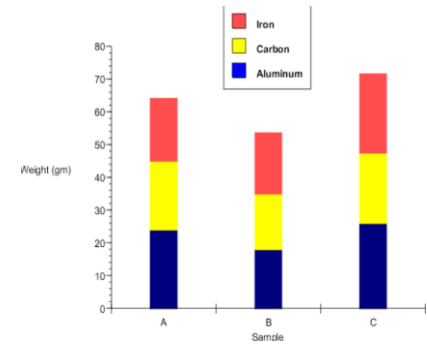
Colour	Tally	Frequency
Red		13
Blue		9
White		24
Black		12
Other		9

Pie charts

Sales split month wise



Composite bar charts



Pictograms



hegartymaths

425,426,427,
430-433,442

Key Words

Data
Discrete
Continuous
Qualitative
Quantitative
Graph

What types of data is each of the following?

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

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

Year 9

AVERAGES FROM A TABLE

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 $20 < x \leq 30$**

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:
- Identify the modal class.
 - Identify the group which holds the median.
 - Estimate the mean.

PIE CHARTS AND SCATTER-GRAPHS

Key Concepts

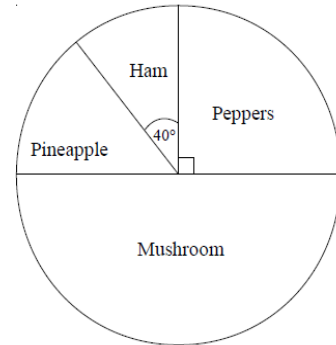
Pie charts use angles to represent, proportionally, the quantity of each group involved.

Pie charts can only be compared to one another when the total frequency or populations are given.

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



Positive Negative No Correlation

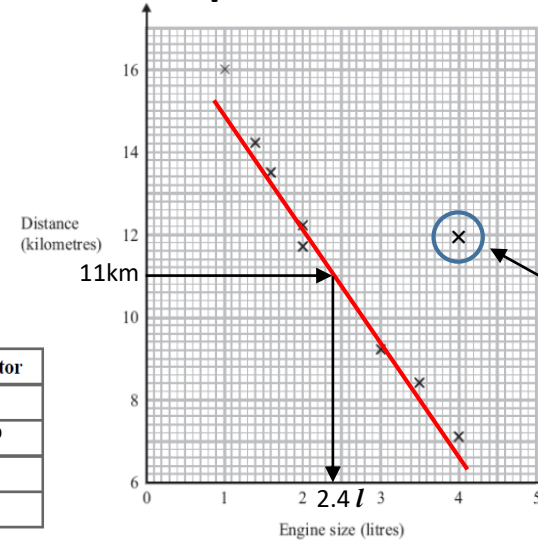


Topping	Frequency	Angle of Sector
Peppers	18	90°
Mushroom	36	180°
Pineapple	10	50°
Ham	8	40°

Total = 72 360°

$360^\circ \div 72$ $\times 5$

Examples



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

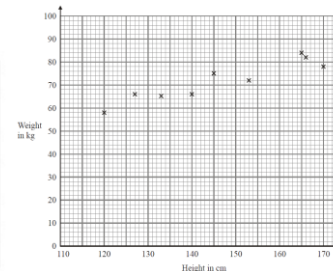
It shows negative correlation.

This is an **outlier**. It does not match the trend.

We draw a **line of best fit** through the data points to help estimate readings, based on the data sample. For example, estimating the engine size of a car that can travel 11km would be 2.4 litres.

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.



Year 9

TWO WAY TABLES AND STEM AND LEAF

Key Concepts

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.

Two way tables are used to tabulate **two variables** or pieces of information.

e.g. gender and school year group

Once completed, probabilities can be formulated easily from two way tables.

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 an ordered 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 mins

Calculate the median value = 15

State the mode = 10

Calculate the range = 35 - 5
= 30

Examples

80 children went on a school trip.
They either went to London or to York.
23 boys and 19 girls went to London.
14 boys went to York.

(a) Complete a two way table for this information.

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

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

(c) A girl is chosen, what is the probability that she went to York? $\frac{24}{38}$



422-424,
430-433

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 this two way table:

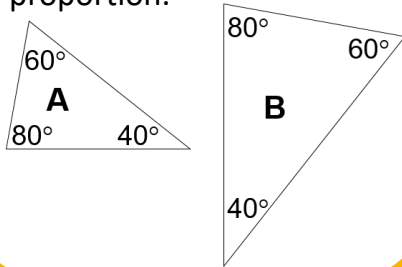
	Year Group			Total
	9	10	11	
Boys			125	407
Girls		123		
Total	303	256		831

ENLARGEMENT, SIMILARITY & CONGRUENCE

Key Concept

Properties of similar shapes:

- The corresponding angles will be the same if shapes are similar.
- Corresponding edges must remain in proportion.



Key Words

Transformation: This means something about the shape has 'changed'.

Reflection: A shape has been flipped.

Rotation: A shape has been turned.

Translation: A movement of a shape.

Enlargement: A change in size, either bigger or smaller.

Congruent: These shapes are the same shape and same size but can be in any orientation.

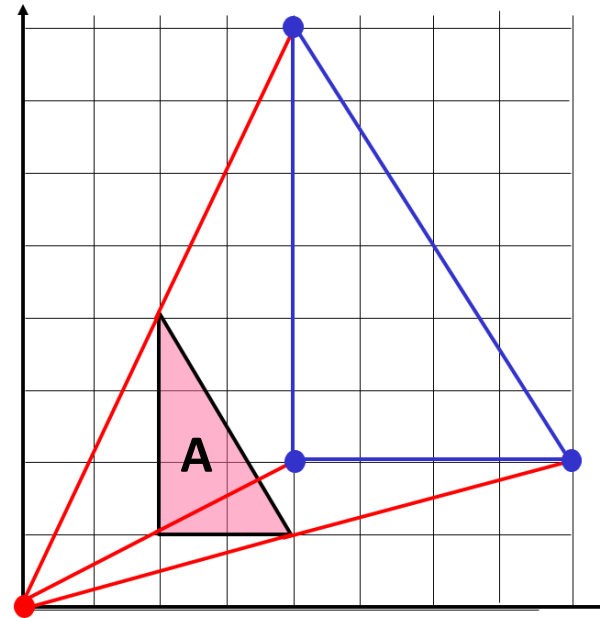
Similar: Two shapes are mathematically similar if one is an enlargement of the other.

Tip

To find the centre of enlargement connect the corresponding vertices.

Examples

Enlarge shape A, scale factor 2, centre (0, 0).



Scale factor 2 - Double the distance between each vertex and the centre of enlargement.

Questions

- 1) A triangle has lengths 3cm, 4cm and 5cm. What will they be if enlarged scale factor 3.
- 2) Rectangle A measures 3cm by 5cm, B measures 15cm by 25cm. What is the scale factor of enlargement?



Year 9

PERCENTAGES

Key Concepts

Calculating percentages of an amount without a calculator:

10% = divide the value by 10
1% = divide the value by 100

Calculating percentages of an amount with a calculator:

Amount \times percentage
as a decimal

Calculating percentage increase/decrease:

Amount \times (1 \pm percentage
as a decimal)

Calculating a percentage – non calculator:

Calculate 32% of 500g:

$$\begin{aligned} 10\% &\rightarrow 500 \div 10 = 50 \\ 30\% &\rightarrow 50 \times 3 = 150 \\ 1\% &\rightarrow 500 \div 100 = 5 \\ 2\% &\rightarrow 5 \times 2 = 10 \end{aligned} \quad \begin{aligned} 32\% &= 150 + 10 \\ &= 160\text{g} \end{aligned}$$

Calculating a percentage – calculator:

Calculate 32% of 500g:

$$\begin{aligned} \text{Value} &\times (\text{percentage} \div 100) \\ &= 500 \times 0.32 \\ &= 160\text{g} \end{aligned}$$

Percentage change:

Examples

A dress is reduced in price by 35% from £80. What is its **new price**?

$$\begin{aligned} \text{Value} &\times (1 - \text{percentage as a decimal}) \\ &= 80 \times (1 - 0.35) \\ &= £52 \end{aligned}$$

A house price appreciates by 8% in a year. It originally costs £120,000, what is the **new value** of the house?

$$\begin{aligned} \text{Value} &\times (1 + \text{percentage as a decimal}) \\ &= 120,000 \times (1 + 0.08) \\ &= £129,600 \end{aligned}$$

Key Words

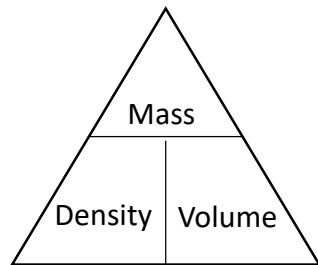
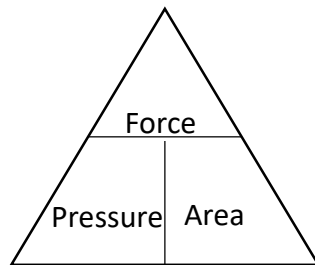
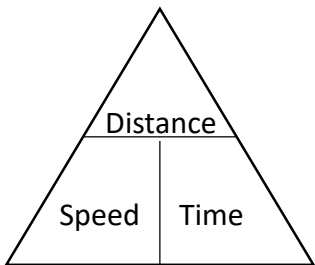
Percent
Increase/decrease
Appreciate
Depreciate
Multiplier
Divide

- 1) Write the following as a decimal multiplier: a) 45% b) 3% c) 2.7%
- 2) Calculate 43% of 600 without using a calculator
- 3) Calculate 72% of 450 using a calculator
- 4a) Decrease £500 by 6%
b) Increase 65g by 24%
c) Increase 70m by 8.5%



Year 10 Foundation COMPOUND MEASURES

Key Concepts

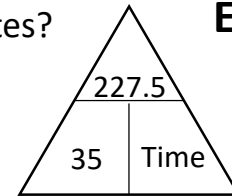


Examples

A car is travelling at a speed of 35mph and is scheduled to travel 227.5 miles. How long will this take in hours and minutes?

$$Time = \frac{distance}{speed}$$

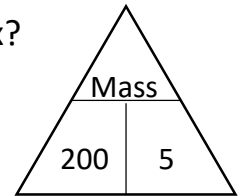
$$Time = \frac{227.5}{35} = 6.5 \text{ hours} = 6 \text{ hours } 30 \text{ minutes}$$



A 5m³ box has a density of 200g/m³. What is the mass of the box?

$$Mass = Density \times Volume$$

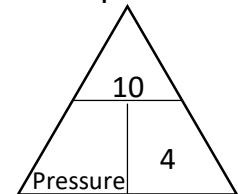
$$Mass = 200 \times 5 = 1000g$$



10N of force are applied to a block with area 4m². Calculate the pressure.

$$Pressure = \frac{force}{area}$$

$$Pressure = \frac{10}{4} = 2.5N/m^2$$



716-723,
725-731,
734-737

Key Words

Speed
Distance
Time
Pressure
Force
Area
Density
Mass
Volume

1) A block exerts a force of 120 Newtons on the ground. The block has an area of 2 m². Work out the pressure on the ground.

2) A piece of gold has a mass of 760 grams and a volume of 40 cm³. Work out the density of the piece of gold.

3) Dani leaves her house at 08 00. She drives 63 miles to work. She drives at an average speed of 27 miles per hour. At what time does Dani arrive at work?



Year 9

RATIO AND DIRECT PROPORTION

Key Concepts

To calculate the **value** for a single item we can use the **unitary method**.

When working with best value in monetary terms we use:

$$\text{Price per unit} = \frac{\text{price}}{\text{quantity}}$$

In recipe terms we use:

$$\text{Weight per unit} = \frac{\text{weight}}{\text{quantity}}$$

If 20 apples weigh 600g. How much would 28 apples weigh?

$$600 \div 20 = 30\text{g} \longrightarrow \text{weight of 1 apple}$$

$$30 \times 28 = \mathbf{840\text{g}}$$

Box A has 8 fish fingers costing £1.40.
Box B has 20 fish fingers costing £ 3.40.
Which box is the better value?



$$A = \frac{\pounds 1.40}{8} = \pounds 0.175$$

$$B = \frac{\pounds 3.40}{20} = \pounds 0.17$$

Therefore Box B is better value as each fish finger costs less.

Examples

The recipe shows the ingredients needed to make 10 Flapjacks.
How much of each will be needed to make 25 flapjacks?

Ingredients for 10 Flapjacks

80 g rolled oats

60 g butter

30 ml golden syrup

36 g light brown sugar

Method 1: Unitary

$$80 \div 10 = 8 \qquad 30 \div 10 = 3$$

$$8 \times 25 = \mathbf{200\text{g}} \qquad 3 \times 25 = \mathbf{75\text{g}}$$

$$60 \div 10 = 6 \qquad 36 \div 10 = 3.6$$

$$6 \times 25 = \mathbf{150\text{g}} \qquad 3.6 \times 25 = \mathbf{90\text{g}}$$

Method 2: 5 flapjacks

$$80 \div 2 = 40 \qquad 30 \div 2 = 15$$

$$40 \times 5 = \mathbf{200\text{g}} \qquad 15 \times 5 = \mathbf{75\text{g}}$$

$$60 \div 2 = 30 \qquad 36 \div 2 = 18$$

$$30 \times 5 = \mathbf{150\text{g}} \qquad 18 \times 5 = \mathbf{90\text{g}}$$

Key Words

Unitary
Best Value
Proportion
Quantity

Ingredients to make 16 gingerbread men

180 g flour
40 g ginger
110 g butter
30 g sugar

1) How much will we need to make 24 gingerbread men?

2) Packet A has 10 toilet rolls costing £3.50.
Packet B has 12 toilet rolls costing £3.60.
Which is better value for money?

3) If 15 oranges weigh 300g. What will 25 oranges weigh?



Year 9

DIRECT AND INVERSE PROPORTION

Key Concepts

Variables are **directly proportional** when the **ratio is constant** between the quantities.

Variables are **inversely proportional** when **one quantity increases in proportion to the other decreasing**.

Examples

Direct proportion:

Value of A	32	P	56	20	72
Value of B	20	30	35	R	45

Ratio constant: $20 \div 32 = \frac{5}{8}$

From A to B we will multiply by $\frac{5}{8}$.

From B to A we will divide by $\frac{5}{8}$.

$P = 30 \div \frac{5}{8} = 48$

$R = 20 \times \frac{5}{8} = 12.5$

Inverse proportion:

Value of A	10	20	14	R	28
Value of B	14	P	10	70	5

$P = 7$

$R = 2$



339-341

Key Words

- Direct
- Inverse
- Proportion
- Divide
- Multiply
- Constant

Complete each table:

1) Direct proportion

Value of A	5	P	22
Value of B	9	28.8	Q

2) Inverse proportion

Value of A	4	P	18
Value of B	9	3	Q