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.

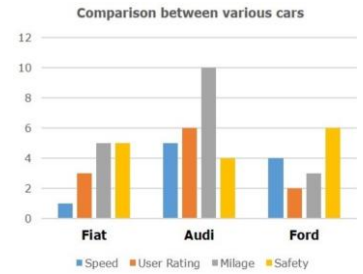
Quantitative data: this is the collection of numerical data that is either discrete or continuous.

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.

Examples

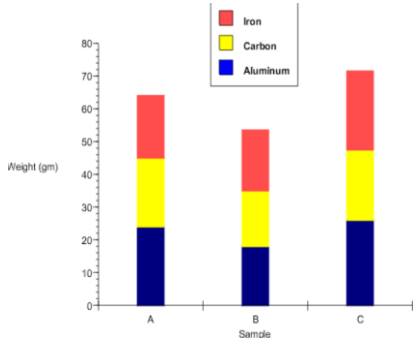
Comparative bar charts



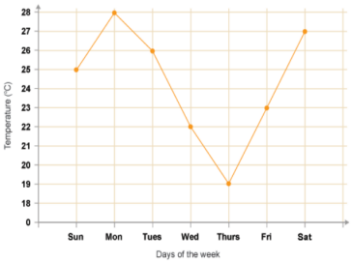
Tally charts

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

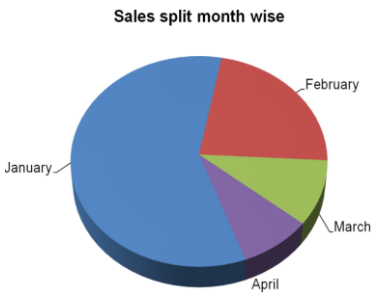
Composite bar charts



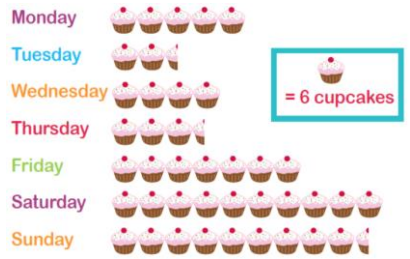
Line graphs



Pie charts



Pictograms



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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 $\frac{total\ frequency+1}{2}$ 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 $\frac{total\ fx}{total\ f}$.

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

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

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 $= \frac{Total\ frequency+1}{2} = \frac{56}{2} = 28th\ value$
" add the frequency column until you reach the 28th value " Median is the in group $20 < x \leq 30$

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414-418

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) $\frac{25+1}{2} = 13^{th}$ value is in the group $12 < C \leq 16$ c) $\frac{294}{25} = £11.76$

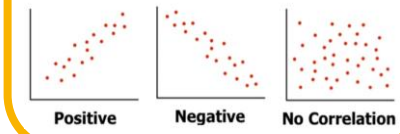
Year 9
PIE CHARTS AND SCATTER-GRAPHS

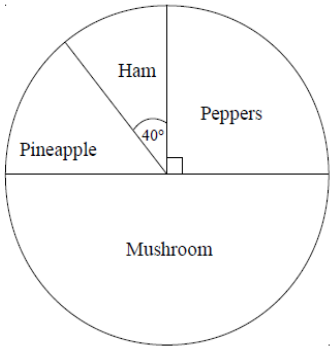
Key Concepts

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**.





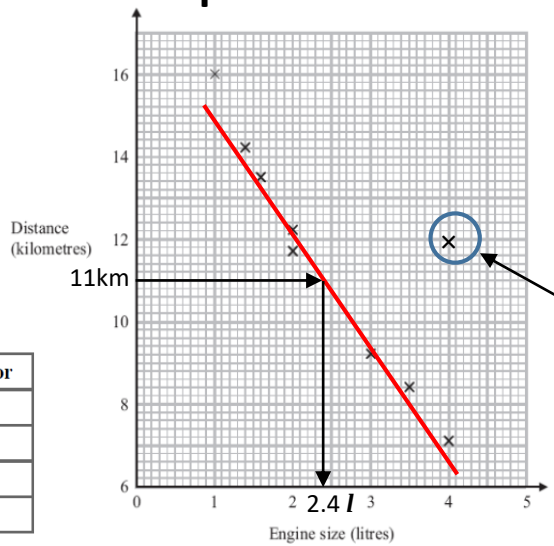
Topping	Frequency	Angle of Sector
Peppers	18	90°
Mushroom	36	180°
Pineapple	10	50°
Ham	8	40°

Total=72 360°

360° ÷ 72

×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.

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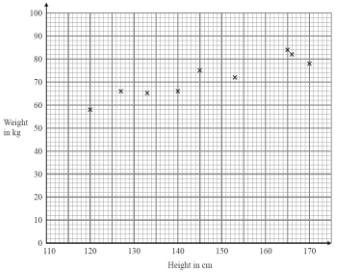
427-429, 453,454

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.

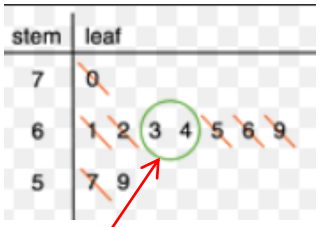
ANSWERS: 1) 360°÷60=6° , Angles = 54°, 138°, 96°, 72° 2) a) positive b) 64kg-66kg

Year 9
TWO WAY TABLES AND STEM AND LEAF

Key Concepts

A **two way table** is used to represent categorised data.

A **stem and leaf diagram** orders large data sets. It can be used to calculate the median.



Median = 63.5

Examples

This **two way table** gives information on how 100 students travelled to school.

	Walk	Car	Other	Total
Boy	15	25	14	54
Girl	22	8	16	46
Total	37	33	30	100

Always double check that your rows and columns add up to the total value.

Stem and leaf diagrams

Phone Battery Comparison

"Brand A" "Brand B"

LEAF	STEM	LEAF
8 8 7 5	0	7
9 7 4 1 0	1	0 5 5 5 7 9
2 2 2 1	2	0 2 2 6 7
8 6 4 2 0	3	0 2 4 6 8
	4	
	5	6
1	6	
	7	5

Key : 6 | 1 = 61 hours

Must be ordered from smallest to largest

A key must be included

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422-424, 430-433

Key Words

Two way table
Stem and Leaf
Median
Compare

Complete a two way table using this information:
Felicity asked 100 students how they came to school one day. Each student walked or came by bicycle or came by car.
49 of the 100 students are girls.
10 of the girls came by car.
16 boys walked.
21 of the 41 students who came by bicycle are boys.
Work out the total number of students who walked to school.

Year 9
ENLARGEMENT

Key Concepts

An **enlargement** changes the size of an image using a scale factor from a given point.

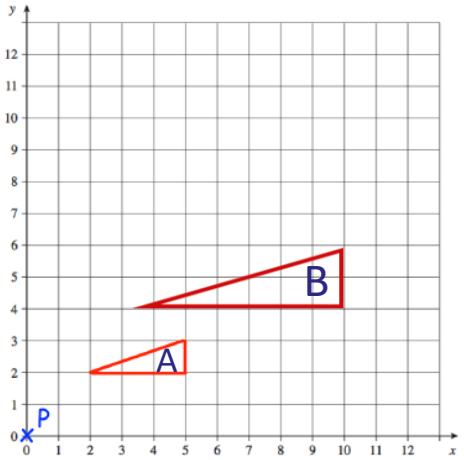
A **positive scale factor** will increase the size of an image.

A **fractional scale factor** will reduce the size of an image.

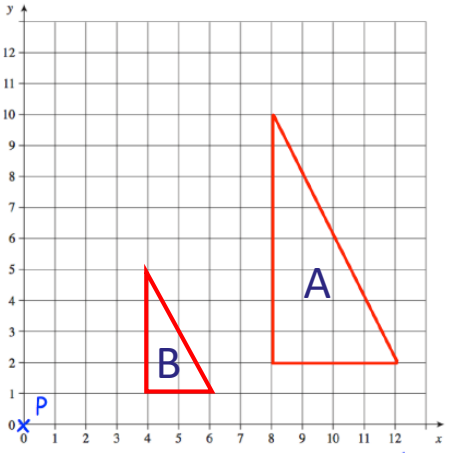
A **negative scale factor** will place the image on the opposite side of the centre of enlargement, with the image inverted.

Examples

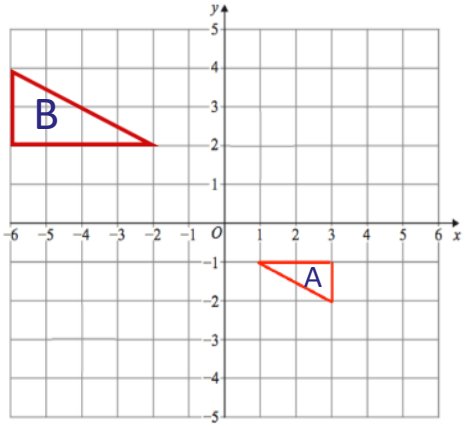
Enlarge shape A by scale factor 2 from point P.



Enlarge by scale factor $\frac{1}{2}$ from point P.



Enlarge by scale factor -2 from (0,0).



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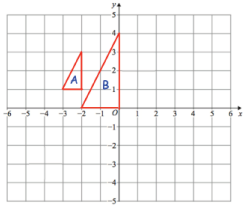
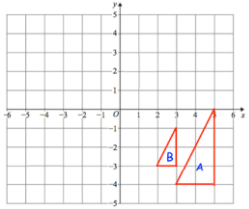
637,638,650, 642-645, 651

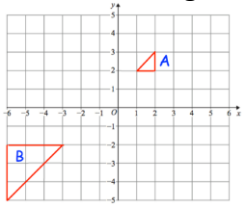
Key Words

Enlargement
Scale factor
Centre
Positive
Negative

Describe the **single** transformation you see on each coordinate grid from A to B:







ANSWERS: a) enlarge, centre (-4,2) scale factor 2 b) enlarge, centre (1,-2) scale factor $\frac{1}{2}$
c) enlarge, centre (0,1) scale factor -3

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 × percentage as a decimal

Calculating percentage increase/decrease:

Amount × (1 ± percentage as a decimal)

Percentage change:

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

$Value \times (1 - percentage\ as\ a\ decimal)$
$= 80 \times (1 - 0.35)$
= £52

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

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

Reverse percentages: This is when we are trying to find out the original amount.

A pair of trainers cost £35 in a sale. If there was 20% off, what was the **original price** of the trainers?

$Value \div (1 - 0.20)$
$= 35 \div 0.8$
= £43.75

A vintage car has increased in value by 5%, it is now worth £55,000. What was it worth **originally**?

$Value \div (1 + 0.05)$
$= 55{,}000 \div 1.05$
= £52,380.95

Examples

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88-92, 96

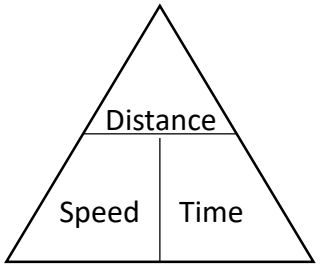
Key Words
Percent
Increase/decrease
Reverse
Multiplier
Inverse

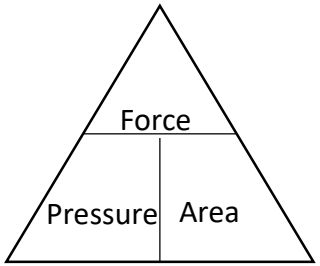
1a) Decrease £500 by 6%
b) Increase 70 by 8.5%
2) A camera costs £180 in a 10% **sale**. What was the **pre-sale** price
3) The cost of a holiday, including **VAT** at 20% is £540. What is the **pre-VAT** price?

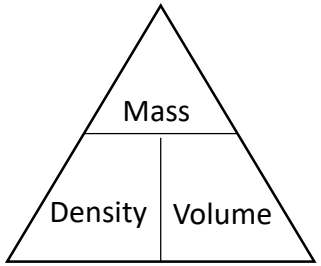
ANSWERS A 1a) £470 b) £75.95 2) £200 3) £450

Year 9
COMPOUND MEASURES

Key Concepts





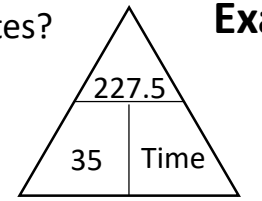


Examples

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?

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

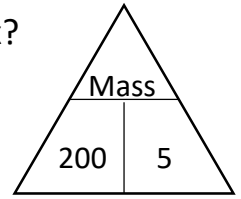
$$Time = \frac{227.5}{35} = 6.5hours = 6\ hours\ 30\ minutes$$



A 5m^3 box has a density of 200g/m^3. What is the mass of the box?

$$Mass = Density \times Volume$$

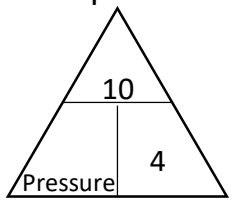
$$Mass = 200 \times 5 = 1000g$$



10N of force are applied to a block with area 4m^2. Calculate the pressure.

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

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



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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 m^2.
Work out the pressure on the ground.

2) A piece of gold has a mass of 760 grams and a volume of 40 cm^3.
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?

ANSWERS 1) 60N/m^2 2) 19g/cm^3 3) 10:20am

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:

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

In recipe terms we use:

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

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

600 ÷ 5 = 120g → weight of 4 apples

7 × 4 = 28 apples 7 × 120 = **840g**

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

$$A = \frac{£1.40}{8} = £0.175 \qquad B = \frac{£3.40}{20} = £0.17$$

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 ÷ 10 = 8
8 × 25 = **200g**

30 ÷ 10 = 3
3 × 25 = **75g**

60 ÷ 10 = 6
6 × 25 = **150g**

36 ÷ 10 = 3.6
3.6 × 25 = **90g**

Method 2: 5 flapjacks

80 ÷ 2 = 40
40 × 5 = **200g**

30 ÷ 2 = 15
15 × 5 = **75g**

60 ÷ 2 = 30
30 × 5 = **150g**

36 ÷ 2 = 18
18 × 5 = **90g**

hegartymaths

335-337

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?

ANSWERS 1) 270g flour, 60g ginger, 165g butter, 45g sugar 2) Packet B 30p per roll 3) 500g

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

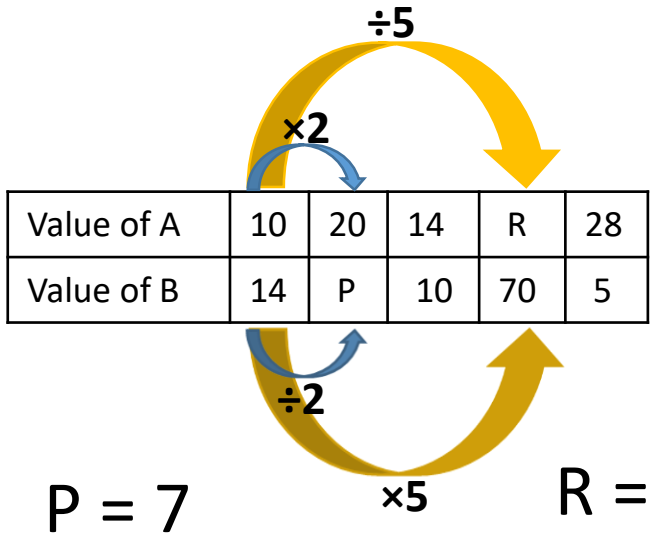
Ratio constant: $20 \div 32 = \frac{5}{8}$

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

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

$P = 30 \div \frac{5}{8} = 48$ $\quad$ $R = 20 \times \frac{5}{8} = 12.5$

Inverse proportion:



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

P = 7 $\quad$ R = 2

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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

ANSWERS 1) P = 16, Q = 39.6 2) P = 12, Q = 2