PRESENTING AND INTERPRETTING DATA

Key Concept

Pie Charts

There are 360 degrees in a pie chart. So you need angles that add to 360°.

Eye colour	F	
Blue	15	$\times$ 4 = 60
Brown	43	$\times$ 4 = 172
Other	32	$\times$ 4 = 128
$\frac{360}{90} = 4$	= 90	= 360

Key Words

Frequency: Total.
Mean: Total of data divided by the number of pieces of data.
Mode: The value that occurs most frequently.
Median: Middle number when they are in order.
Range: Difference between the largest and smallest values.

Examples

5, 9, 9, 9, 11, 12, 13, 15, 16

Averages

$$Mean = \frac{5+9+9+9+11+12+13+15+16}{9} = \frac{99}{9} = 11$$

Median = 11 (The middle number shown above)

Mode = 9 (This number occurs most often)

Measure of Spread

Range = 16 – 5 = 11
(A bigger range means the data is more spread out)

sparx

M841, M940, M934, M328, M440, M127, M287, M899, M460, M574

Tips

- There can be more than one mode.
- Range is a measure of spread, not an average.
- Bar charts have gaps between the bars.

Questions

1) Find the mean, mode, median and range of:
a) 3, 12, 4, 6, 8, 5, 4 b) 12, 1, 10, 1, 9, 3, 4, 9, 7, 9

2) For the table:
a) Draw a pie chart to show the data.
b) Draw a bar chart to show the data.
c) Work out the mean of the data.

Age	Frequency
11	17
12	11
13	8

ANSWERS: 1) a) Mean = 6, Mode = 4, Median = 5, Range = 9 b) Mean = 6.5, Mode = 9, Median = 8, Range = 11 2) a) Angles 170°, 110 °, 80 ° c) 11.75

TYPES OF DATA AND GRAPHS

Key Concepts

Qualitative data: data collected that is described in words **not** numbers.
e.g. race, hair colour, ethnicity.

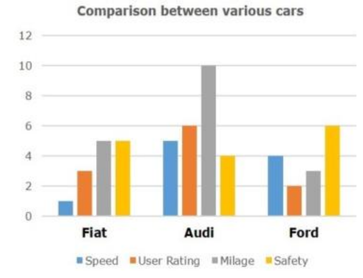
Quantitative data: this is the collection of numerical data that is either <u>discrete</u> or <u>continuous</u>.

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

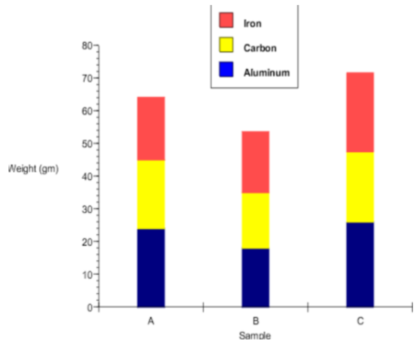
Comparative bar charts



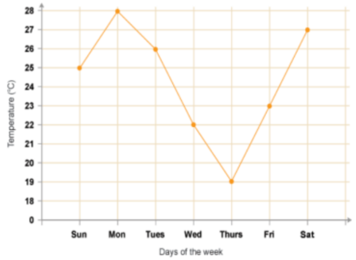
Tally charts

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

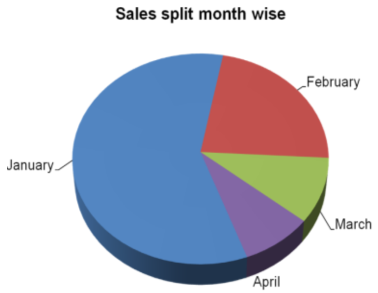
Composite bar charts



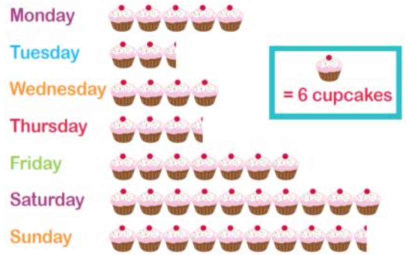
Line graphs



Pie charts



Pictograms



sparx

U363 U557
U506 U508
U983 U814

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

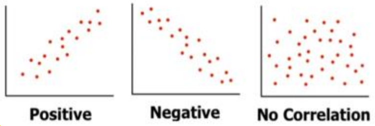
PIE CHARTS AND SCATTER-GRAPHS

Key Concepts

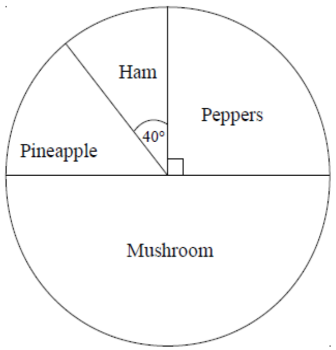
Pie charts use angles to represent, proportionally, the quantity of each group involved.

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**.

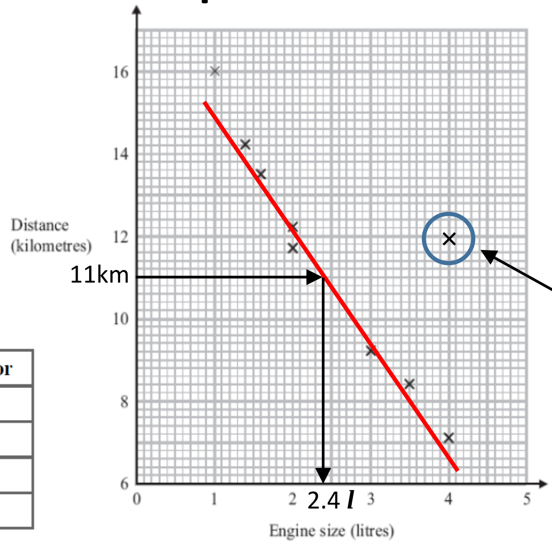


Examples



Topping	Frequency	Angle of Sector
Peppers	18	90°
Mushroom	36	180°
Pineapple	10	50°
Ham	8	40°
	Total=72	360°

360° ÷ 72 → ×5



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.

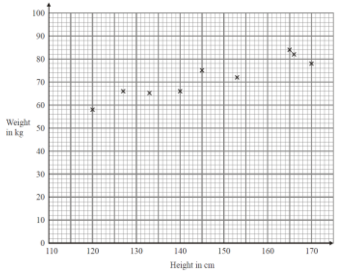
U508 U172
U854 U199
U277 U128

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

BAR CHARTS AND PICTOGRAMS

Key Concepts

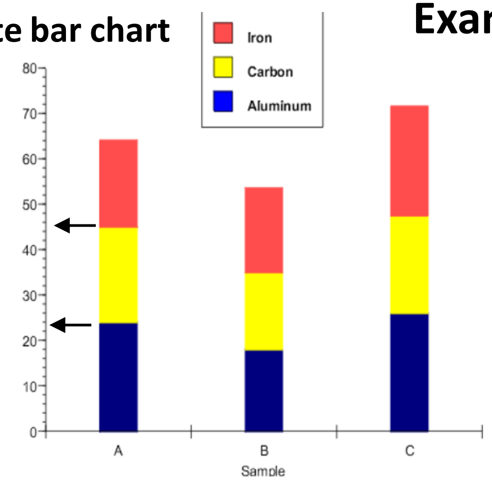
Bar charts are a visual representation of **categorical** data.

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

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

Examples

Composite bar chart



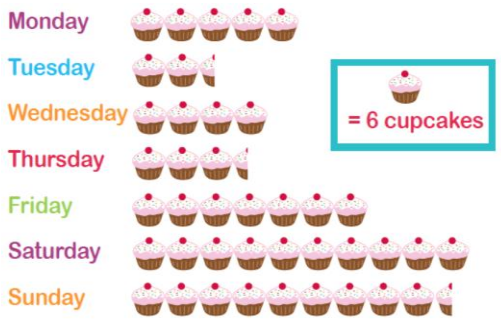
1) How much aluminium is in sample A? 24g
2) Hoe much carbon is in sample A?

46 – 24 = 22g

Highest value for carbon in sample A.

Lowest value for carbon in sample A.

Pictogram



1) How many cupcakes were sold on Monday?

$5 \times 6 = 30$ cupcakes

2) What does half a cupcake represent on the pictogram?

$6 \div 2 = 3$ cupcakes

3) How many cupcakes were sold on Thursday?

$3.5 \times 6 = 21$ cupcakes

sparx

U363 U557

U854 U506

Key Words

Bar chart

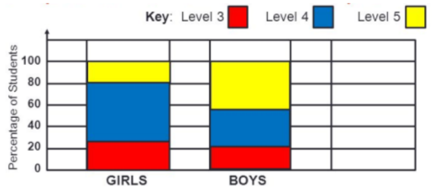
Composite

Pictogram

Key

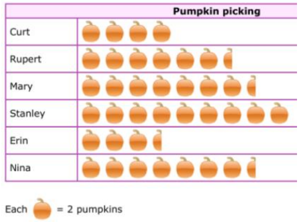
Categorical

Data set



1a) What percentage of boys are level 3?

b) What percentage of girls are level 4?



2a) How many pumpkins were picked by Stanley?

b) What does half a pumpkin represent?

c) How many pumpkins were picked by Erin?

ANSWERS: 1a) 20% b) approximately 55% 2a) 18 b) 1 pumpkin c) 7

AVERAGES FROM A LIST AND REVERSE MEAN

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

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 $\quad \frac{5+7}{2} = 6$

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?

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

sparx

U260 U291 U456 U526

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 students test score is included. If the mean of these 6 scores is now 27, what did the 6th student score?

ANSWERS: 1) mode = 8, median = 5.5, mean = 5.5, range = 6 2) 17

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 × 5 = 50
$10 < L \leq 20$	15	15	15 × 15 = 225
$20 < L \leq 30$	23	25	23 × 25 = 575
$30 < L \leq 40$	7	35	7 × 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 $20 < x \leq 30$

sparx

U569 U877 U717

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) $\frac{294}{25} = £11.76$

LISTING OUTCOMES AND SAMPLE SPACE

Key Concepts

When there are a number of different possible outcomes in a situation we need a **logical** and **systematic** way in which to view them all.

We can be asked to **list** all possible outcomes e.g. choices from a menu, order in which people finish a race.

We can also use a **sample space diagram**. This records the possible outcomes of two different events happening.

Examples

Starter	Main
Fishcake Melon	Lasagne Beef Salmon

List all of the combinations possible when one starter and one main are chosen.

F, L   M, L
F, B   M, B
F, S   M, S

Note: You can write the initials of each option in a test. You do not need to write out the full word.

Two dice are thrown and the possible outcomes are shown in the sample space diagram below:

	1	2	3	4	5	6
1	(1,1)	(1,2)	(1,3)	(1,4)	(1,5)	(1,6)
2	(2,1)	(2,2)	(2,3)	(2,4)	(2,5)	(2,6)
3	(3,1)	(3,2)	(3,3)	(3,4)	(3,5)	(3,6)
4	(4,1)	(4,2)	(4,3)	(4,4)	(4,5)	(4,6)
5	(5,1)	(5,2)	(5,3)	(5,4)	(5,5)	(5,6)
6	(6,1)	(6,2)	(6,3)	(6,4)	(6,5)	(6,6)

1) What is the probability that 2 numbers which are the same are rolled?

$$\frac{6}{36} = \frac{\textit{outcomes where numbers are the same}}{\textit{total number of outcomes}}$$

2) What is the probability that two even numbers are rolled?

$$\frac{9}{36} = \frac{\textit{outcomes where numbers are both even}}{\textit{total number of outcomes}}$$

sparx

U104
U296

Key Words
List
Outcome
Sample space
Probability

1) Abe, Ben and Carl have a race. List all of the options for the order that the boys can end the race.

		Spinner		
Coin		Red	Green	Blue
	Heads	H,R	H,G	H,B
	Tails	T,R	T,G	T,B

2a) What is the probability that a head is landed on?
b) What is the probability that a head and a green are landed on?

ANSWERS: 1) ABC, ACB, BAC, BCA, CAB, CBA 2a) $\frac{3}{6}$ b) $\frac{1}{6}$

VENN DIAGRAMS

Key Concepts

Venn diagrams show all possible relationships between different sets of data.

Probabilities can be derived from Venn diagrams. Specific notation is used for this:

$P(A \cap B)$ = Probability of A **and** B

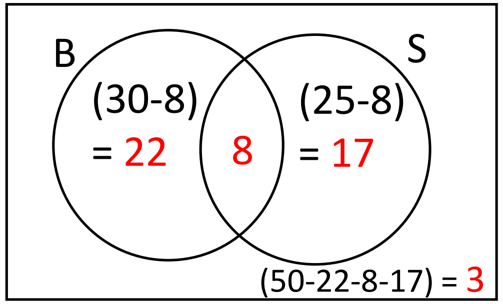
$P(A \cup B)$ = Probability of A **or** B

$P(A')$ = Probability of **not** A

Example

Out of 50 people surveyed:

30 have a brother
25 have a sister
8 have both a brother and sister



a) Complete the Venn diagram

b) Calculate:

i) $P(A \cap B)$ $= \frac{8}{50}$ ii) $P(A \cup B)$ $= \frac{47}{50}$ iii) $P(B')$ $= \frac{20}{50}$

iv) The probability that a person with a sister, does not have a brother. $= \frac{8}{25}$

U476 U748 U699

Key Words
Venn diagram
Union
Intersection
Probability
Outcomes

40 students were surveyed:

20 have visited France
15 have visited Spain
10 have visited both France and Spain

a) Complete a Venn diagram to represent this information.

b) Calculate:

i) $P(F \cap S)$ ii) $P(F \cup S)$ iii) $P(S')$

iv) The probability someone who has visited France, has not gone to Spain.

ANSWERS: bi) 10/40 ii) 25/40 iii) 25/40 iv) 10/40 = 1/4

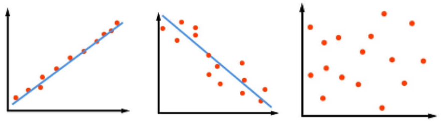
STATISTICAL DIAGRAMS

Key Concepts

A **frequency polygon** is a line graph which connects the midpoints of grouped data.

A **pie chart** represents data into proportional sections.

A **scatter-graph** shows the relationship between two variables. **Correlation** is used to describe the relationships.

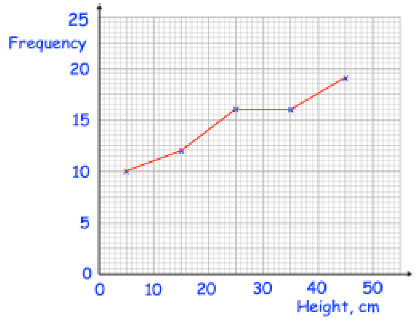


Positive Correlation **Negative Correlation** **No Correlation**

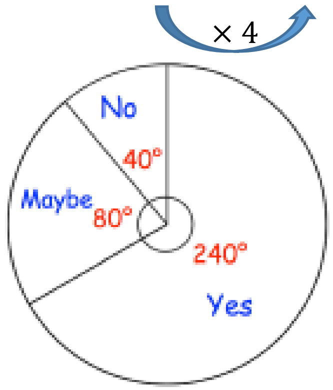
Examples

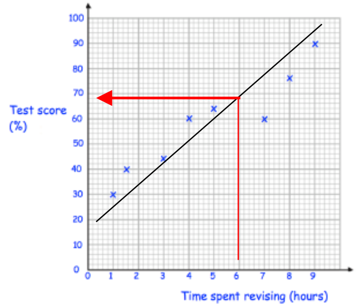
Plot at the midpoint

Length, cm	Frequency
0 < x ≤ 10	10
10 < x ≤ 20	12
20 < x ≤ 30	16
30 < x ≤ 40	16
40 < x ≤ 50	19



Answer	Frequency	Angle
Yes	60	240
No	10	40
Maybe	20	80
Total	90	360





a) What type of correlation is shown?
Positive correlation

b) Another student spent 6 hours revising for the test. Find an estimate of their test score.
Draw a line of best fit and read from it - 68%

c) Explain why it might not be sensible to use the scatter graph to estimate the score for a student that spent 15 hours revising.
It is out of the data range.

U840, U508, U172, U854, U277, U128

Key Words

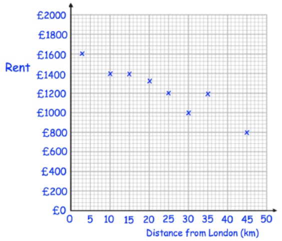
Midpoint
Pie chart
Degrees
Scatter graph
Correlation
Line of best fit

1) Draw a frequency polygon using this data.

Marks	Frequency
0 < m ≤ 10	8
10 < m ≤ 20	11
20 < m ≤ 30	23
30 < m ≤ 40	19
40 < m ≤ 50	15

2) Draw a pie chart using this data.

Make	Frequency
Ford	8
Mazda	14
Volkswagen	21
Fiat	20
Honda	9



3a) What type of correlation is shown?

b) The distance from London of a house is 22km. What is an estimate of the rent it will cost?

ANSWERS: 2) Angles – 40, 70, 105, 100, 45 3a) Negative correlation b) Between £1200 and £1300

CUMULATIVE FREQUENCY AND BOX PLOTS

Key Concepts

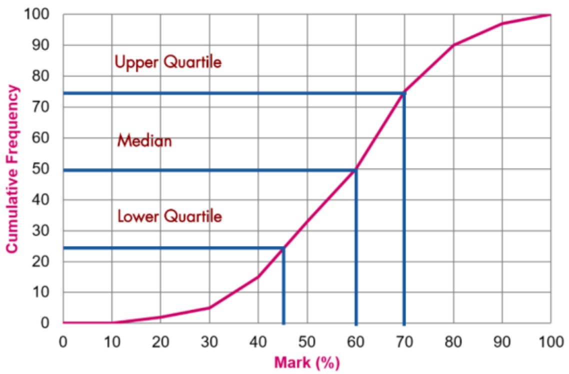
A **cumulative frequency** graph shows a running total of frequency.

We can read the **median** and the **interquartile range** from this graph.

A **box plot** shows the distribution of data using **minimum**, **maximum**, **median** and **quartiles**.

Mark	Freq	CF
$0 < x \leq 10$	0	0
$10 < x \leq 20$	4	4
$20 < x \leq 30$	1	5
$30 < x \leq 40$	10	15
$40 < x \leq 50$	17	32
$50 < x \leq 60$	18	50
$60 < x \leq 70$	24	74
$70 < x \leq 80$	16	90
$80 < x \leq 90$	6	96
$90 < x \leq 100$	4	100

Plot at the upper bound



Median and quartiles are found from the y axis:

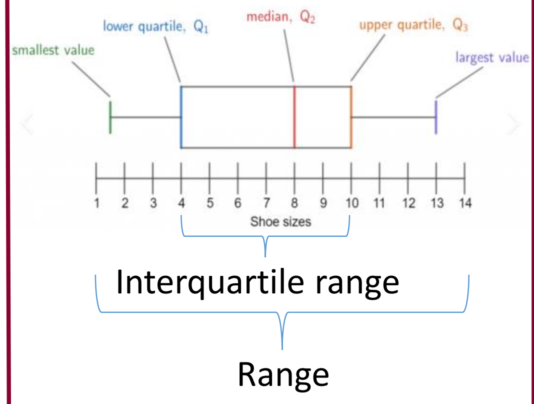
Lower quartile = 25% of the way through the data = 45

Median = 50% of the way through the data = 60

Upper quartile = 75% of the way through the data = 70

Interquartile range = UQ – LQ = 70 – 45 = 25

Examples



sparx

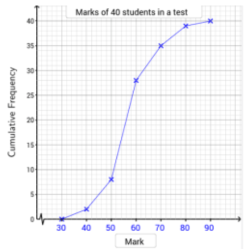
U879

U507

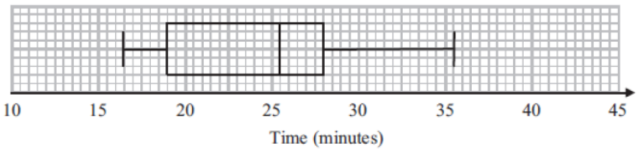
Key Words

Cumulative frequency
Box plot
Range
Interquartile range
Median
Quartiles
Minimum/maximum values

1) Read from the cumulative frequency graph to find the median and the interquartile range.



2) Read from the box plot the median, range and interquartile range.

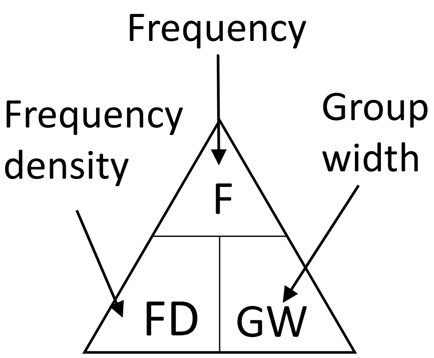


ANSWERS: 1) Median = 56, Interquartile range = 64 – 52 = 12 2) Median = 26, Range = 35.5 – 16.5 = 19, Interquartile range = 28 – 19 = 9

HISTOGRAMS

Key Concepts

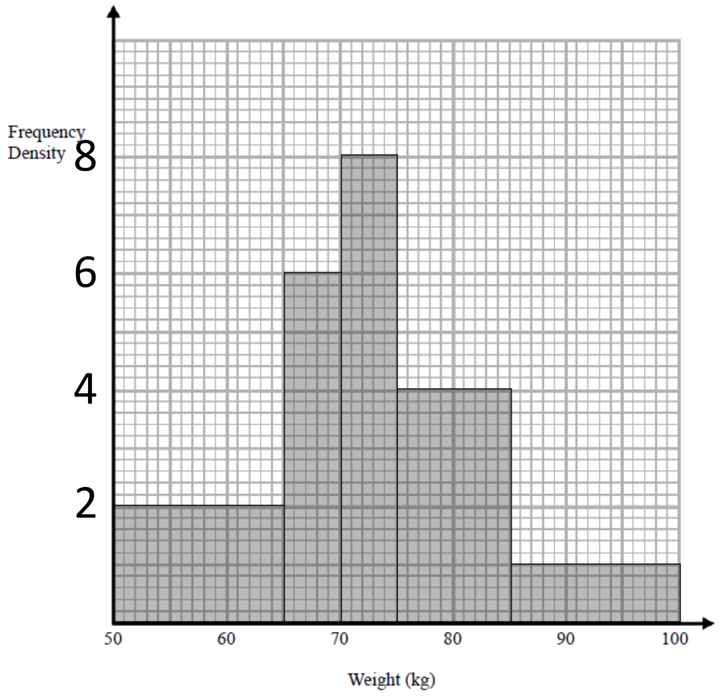
A **Histogram** is a graphical representation of data consisting of rectangles whose **area is proportional to the frequency** of a variable and whose **width is equal to the group width**.



Example

A group of people are weighed and their results recorded. Below is their data.
A histogram is used to represent this data.

Weight	Frequency	Frequency density
50 < w ≤ 65	30	30 ÷ 15 = 2
65 < w ≤ 70	30	30 ÷ 5 = 6
70 < w ≤ 75	40	40 ÷ 5 = 8
75 < w ≤ 85	40	40 ÷ 10 = 4
85 < w ≤ 100	15	15 ÷ 15 = 1



sparx

U983

U814

Key Words

Histogram

Frequency density

Group width

Median

Speed (mph)	Frequency
40 < s ⩽ 55	6
55 < s ⩽ 60	10
60 < s ⩽ 65	46
65 < s ⩽ 75	48
75 < s ⩽ 90	6

Calculate the frequency density for this table of information.

On a separate set of axes, draw your histogram.

ANSWERS: Frequency densities = 0.4, 2, 9.2, 4.8, 0.4

TWO WAY TABLES AND PROBABILITY TABLES

Key Concepts

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

Probabilities can be formulated easily from two way tables.

Probabilities can be written as a **fraction, decimal or a percentage** however we often work with fractions. You do not need to simplify your fractions in probabilities.

Estimating the number of times an event will occur

Probability × no. of trials

Examples

There are only red counters, blue counters, white counters and black counters in a bag.

Colour	Red	Blue	Black	White
No. of counters	9	$3x$	x-5	$2x$

A counter is chosen at random, the probability it is red is $\frac{9}{100}$. Work out the probability is black.

$$9 + 3x + x - 5 + 2x = 100$$
$$6x + 4 = 100$$
$$x = 16$$

Number of black counters = 16 – 5

= 11

Probability of choosing black = $\frac{11}{100}$

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 is chosen that went to London? $\frac{42}{80}$

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

sparx

U683

U981

Key Words

Two way table

Probability

Fraction

Outcomes

Frequency

	1	2	3
Prob	0.37	$2x$	x

1a) Calculate the probability of choosing a 2 or a 3.

b) Estimate the number of times a 2 will be chosen if the experiment is repeated 300 times.

2a) Complete the two way table:

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

b) What is the probability that a Y10 is chosen, given that they are a girl .

ANSWERS: 1) a) P(2) = 0.42 P(3) = 0.21 b) 0.42×300=126   2b) 123/424

FOUR OPERATIONS WITH FRACTIONS

Key Concept

Mixed numbers

These are made up of a whole number and a fraction.

$$4\frac{3}{5}$$

$$=\frac{4\times5+3}{5}$$

$$=\frac{23}{5}$$

Key Words

Fraction: A fraction is made up of a numerator (top) and a denominator (bottom).

Add Sum Total All together Plus In all	Multiply Product Times Twice Total Multiplied by
Subtract Remain Difference Less than Fewer How many more Minus	Divide Quotient Goes into Split Equally Each

Examples

4 Rules Fractions

$\frac{3}{5}+\frac{2}{7}$

Make the denominators the same

$$\frac{3}{5}+\frac{2}{7}$$

×7 ×5

$$\frac{21}{35}+\frac{10}{35}=\frac{31}{35}$$

$\frac{3}{5}-\frac{2}{7}$

$$\frac{3}{5}-\frac{2}{7}$$

×7 ×5

$$\frac{21}{35}-\frac{10}{35}=\frac{11}{35}$$

$\frac{3}{5}\times\frac{2}{7}$

Just multiply the tops and bottoms

$$=\frac{3\times2}{5\times7}=\frac{6}{35}$$

$\frac{3}{5}\div\frac{2}{7}$

Flip the second fraction and change to a times

$$\frac{3}{5}\times\frac{7}{2}=\frac{21}{10}$$

sparx

M671, M939, M601, M835, M931, M157, M197, M110

Tip

- A larger denominator **does not** mean a larger fraction.
- To find equivalent fractions multiply/divide the numerator and denominator by the same number.

Questions

1) $\frac{3}{5}+\frac{4}{15}$ 2) $\frac{2}{7}+\frac{5}{8}$ 3) $\frac{7}{9}-\frac{2}{5}$ 4) $\frac{3}{7}\times\frac{4}{9}$ 5) $\frac{3}{11}\div\frac{14}{22}$

ANSWERS: 1) $\frac{13}{15}$ 2) $\frac{51}{56}$ 3) $\frac{17}{45}$ 4) $\frac{4}{21}$ 5) $\frac{3}{7}$

INTEGERS, ROUNDING AND PLACE VALUE

Key Concepts

Digits are the individual components of a number.

Integers are whole numbers.

Rounding rules:
A value of 5 to 9 rounds the number up.
A value of 0 to 4 keeps the number the same.

Examples

Order the following numbers starting with the smallest:

1) 5, -3, 4, 7, -2

-3, -2, 4, 5, 7

2)	0.067	0.6	0.56	0.65	0.605
Rewrite	0.067,	0.600,	0.560,	0.650,	0.605
	0.067	0.56	0.6	0.605	0.65

Round 3.527 to:

a) 1 decimal place

3 . 5 | 2 7 → 3.5

b) 2 decimal places

3 . 5 2 | 7 → 3.53

c) 1 significant figure

3 | . 5 2 7 → 4

sparx

M696

M365

Key Words

Integer
Even
Digit
Odd
Decimal place
Significant figures

A) Order the following numbers starting with the smallest:

1) 6, -2, 0, -5, 3 2) 0.72, 0.7, 0.072, 0.07, 0.702

B) Round the following numbers to the given degree of accuracy

1) 14. 1732 (1 d.p.) 2) 0.0568 (2 d.p.) 3)3418 (1 S.F)

ANSWERS: A1) -5, -2, 0, 3, 6 2) 0.07, 0.072, 0.7, 0.702, 0.72
B1) 14.2 2) 0.06 3) 3000

DECIMALS

Key concepts

Place value:

Th H T U . t h th

When adding and subtracting decimals we must ensure the decimal places are underneath each other when setting up.

When multiplying decimals, calculate without the decimal point and use estimation to help replace it.

Examples

345.461

- 3 hundreds
- Forty or 4 tens
- 5 units
- 4 tenths
- 6 hundredths
- 1 thousandths

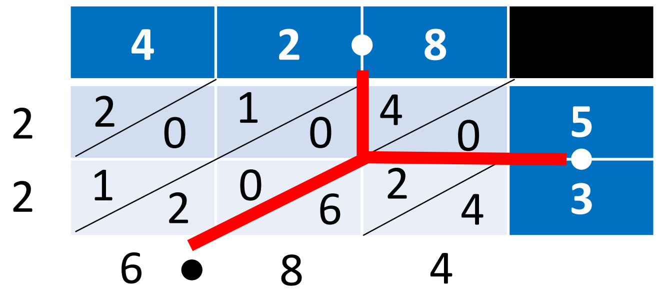
42.8 + 5.32

```
  42.80
+  5.32
-------
  48.12
```

42.8 − 5.32

```
  3 1 7 1
  42.80
-  5.32
-------
  37.48
```

42.8 × 5.3



2 2 6 . 8 4

Estimated answer 40 × 5 = 200

sparx
M135, M608, M105, M608, M150

Key Words

Decimal
Tenths
Hundredths
Thousandths

A) What is the value of the 4 in each number?
1) 498 2) 8746 3) 6.243 4) 1.004

B) Work out:
1) 3.1 + 5.27 2) 16.4 – 9.18 3) 0.03 × 500 4) 3.4 × 5.6
5) 4.79 × 6.8

ANSWERS: A 1) 4 hundred 2) forty 3) 4 hundredths 4) 4 thousandths
B 1) 8.37 2) 7.22 3) 15 4) 19.04 5) 32.572

CUMULATIVE FREQUENCY AND BOX PLOTS

Key Concepts

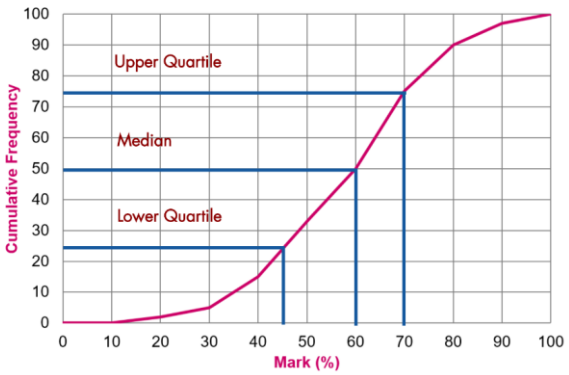
A **cumulative frequency** graph shows a running total of frequency.

We can read the **median** and the **interquartile range** from this graph.

A **box plot** shows the distribution of data using **minimum**, **maximum**, **median** and **quartiles**.

Mark	Freq	CF
$0 < x \le 10$	0	0
$10 < x \le 20$	4	4
$20 < x \le 30$	1	5
$30 < x \le 40$	10	15
$40 < x \le 50$	17	32
$50 < x \le 60$	18	50
$60 < x \le 70$	24	74
$70 < x \le 80$	16	90
$80 < x \le 90$	6	96
$90 < x \le 100$	4	100

Plot at the upper bound



Median and quartiles are found from the y axis:

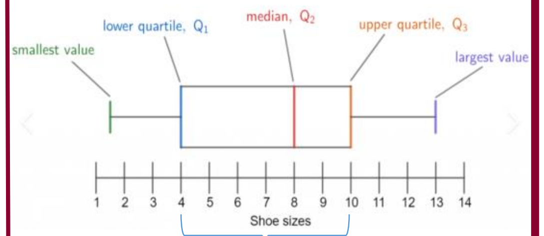
Lower quartile = 25% of the way through the data = 45

Median = 50% of the way through the data = 60

Upper quartile = 75% of the way through the data = 70

Interquartile range = UQ – LQ
= 70 – 45
= 25

Examples



Interquartile range

Range

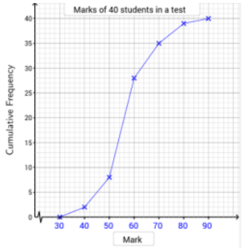
Key Words

Cumulative frequency
Box plot
Range
Interquartile range
Median
Quartiles
Minimum/maximum values

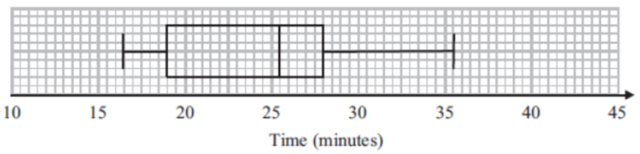
sparx

U879
U507

1) Read from the cumulative frequency graph to find the median and the interquartile range.



2) Read from the box plot the median, range and interquartile range.



ANSWERS: 1) Median = 56, Interquartile range = 64 – 52 = 12 2) Median = 26,
Range = 35.5 – 16.5 = 19, Interquartile range = 28 – 19 = 9

RATIONALISE THE DENOMINATOR

Key Concepts

A surd can be written within a fraction. However, we do not want an irrational number on the denominator of a fraction therefore we must rationalise it.

To rationalise a surd we can multiply it by itself.

Examples

Rationalise $\frac{1}{\sqrt{5}}$

$$\frac{1}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$$

$$= \frac{\sqrt{5}}{5}$$

Rationalise $\frac{5}{2\sqrt{3}}$

$$\frac{5}{2\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$$

$$= \frac{5\sqrt{3}}{2 \times 3} = \frac{5\sqrt{3}}{6}$$

Rationalise $\frac{2+\sqrt{3}}{\sqrt{5}}$

$$\frac{2+\sqrt{3}}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$$

$$= \frac{\sqrt{5}(2+\sqrt{3})}{5}$$

$$= \frac{2\sqrt{5}+\sqrt{15}}{5}$$

Change the sign

Rationalise $\frac{2+\sqrt{3}}{3-\sqrt{5}}$

$$\frac{2+\sqrt{3}}{3-\sqrt{5}} \times \frac{3+\sqrt{5}}{3+\sqrt{5}}$$

$$= \frac{(2+\sqrt{3})(3+\sqrt{5})}{(3-\sqrt{5})(3+\sqrt{5})}$$

$$= \frac{6+3\sqrt{3}+2\sqrt{5}+\sqrt{15}}{9-3\sqrt{5}+3\sqrt{5}-5}$$

$$= \frac{6+3\sqrt{3}+2\sqrt{5}+\sqrt{15}}{4}$$

sparx

U707

U281

Key Words

Surd

Rationalise

Multiply

Denominator

1) Rationalise $\frac{1}{\sqrt{7}}$

2) Rationalise $\frac{3}{2\sqrt{5}}$

3) Rationalise $\frac{4+\sqrt{5}}{\sqrt{2}}$

4) Rationalise $\frac{2-\sqrt{2}}{1+\sqrt{5}}$

ANSWERS 1) $\frac{\sqrt{7}}{7}$ 2) $\frac{3\sqrt{5}}{10}$ 3) $\frac{4\sqrt{2}+\sqrt{10}}{2}$ 4) $\frac{2+\sqrt{10}-\sqrt{2}-2\sqrt{5}}{-4}$

Year 10 Higher
SURDS

Key Concepts

Surds are irrational numbers that cannot be simplified to an integer from a root.

Examples of a surd:
$\sqrt{3}, \sqrt{5}, 2\sqrt{6}$

Examples

Simplify:

$$4\sqrt{20} \times 2\sqrt{3} = 8\sqrt{20 \times 3}$$
$$= 8\sqrt{60}$$
$$= 8\sqrt{4}\sqrt{15}$$
$$= 16\sqrt{15}$$

$$3\sqrt{40} \div \sqrt{2} = 3\sqrt{40 \div 2}$$
$$= 3\sqrt{20}$$
$$= 3\sqrt{4}\sqrt{5}$$
$$= 6\sqrt{5}$$

Simplify:

$$\sqrt{3}(5 + \sqrt{6}) = 5\sqrt{3} + \sqrt{18}$$
$$= 5\sqrt{3} + \sqrt{9}\sqrt{2}$$
$$= 5\sqrt{3} + 3\sqrt{2}$$

$$(3 + \sqrt{2})(4 + \sqrt{12}) = 12 + 4\sqrt{2} + 3\sqrt{12} + \sqrt{24}$$
$$= 12 + 4\sqrt{2} + 3\sqrt{4}\sqrt{3} + \sqrt{4}\sqrt{6}$$
$$= 12 + 4\sqrt{2} + 6\sqrt{3} + 2\sqrt{6}$$

hegartymaths

111 – 117

DELTA Academies Trust

Key Words

Rational
Irrational
Surd

Simplify fully:

1) $2\sqrt{27}$ 2) $2\sqrt{18} \times 3\sqrt{2}$ 3) $\sqrt{72}$ 4) $12\sqrt{56} \div 6\sqrt{8}$
5) $3\sqrt{2}(5 - 2\sqrt{8})$ 6) $(2 + \sqrt{5})(3 - \sqrt{5})$

ANSWERS: 1) $6\sqrt{3}$ 2) 36 3) $6\sqrt{2}$ 4) $2\sqrt{7}$ 5) $15\sqrt{2} - 24$ 6) $1 + \sqrt{5}$