GRAPHS, CHARTS AND TABLES

Interpretation of graphs

Bar Graph

The following types of bar graphs should be discussed:

horizontal bar graphs vertical bar graphs
joint bar graphs compound bar graphs.

The types of questions which might arise from a bar graph should also be discussed.
(See question 1 of Exercise 1)

Exercise 1 may now be attempted.

Line graph

It should be noted that this type of graph is used to show changes in the trends of graphs, usually, (but not always), involving time. (seconds, minutes, hours, days, months etc.)

'General' trends in graphs should also be discussed, e.g. largest rise, (fall) etc. (See question 1 of Exercise 2)

Exercise 2 may now be attempted.

Pie chart

Note that at Intermediate 1 level no construction of pie charts is necessary.
Only interpretation of pie charts is included.

A pie chart can be described as a neat mathematically calculated precise way of representing data.

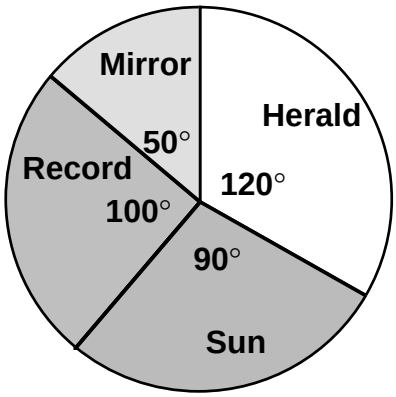
Questions 1 - 3 are fairly straightforward, but a revision of percentages of quantities and fractions of quantitities may be required.

The following simple example could be completed on the board or staff could make up their own from data collected from students.

This pie chart shows the results of a survey into newspapers bought by **120 adults** at a conference.

Students will find it useful to construct a table, similar to the type shown on page 4 to assist in the interpretation of pie charts with angles either given or to measure.

Paper	Angle	Calculation	Number
Herald	120°	$^{120}/_{360} \times$ **120**	40
Record	100°	$^{100}/_{360} \times$ **120**	33
Sun	90°	$^{90}/_{360} \times$ **120**	30
Mirror	50°	$^{50}/_{360} \times$ **120**	17
total	**360°**		**120**



Exercise 3 may now be attempted.

Trends in graphs

General 'trends' in graphs should be discussed, including overall trend and partial (or local) trend. The examples in Exercise 4 could be used to help with the discussion.

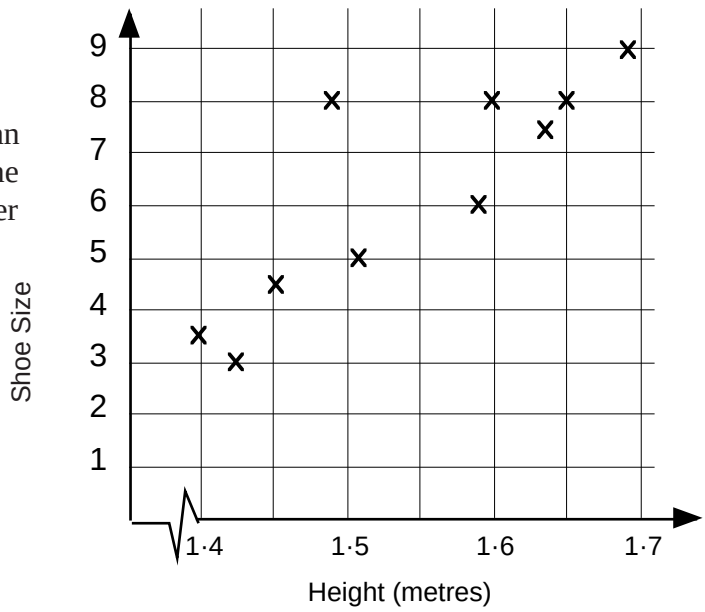
Exercise 4 may now be attempted.

Scatter graphs or scatter diagrams

This type of graph could be introduced using the data collected by the group on Appendix 1, such as height and shoe size, or using the data pre-prepared below.

Name	Bill	Mary	Lucy	Ted	Tim	Anne	Bill	Susie	Niall	Rama
Height	1·60	1·40	1·45	1·63	1·59	1·42	1·65	1·51	1·68	1·49
Shoe size	8	$3^1/_2$	$4^1/_2$	$7^1/_2$	6	3	8	5	9	8

Once the information has been drawn on a scatter graph the general trend can be discussed, highlighting the 'odd one out'. (This example could be used later to find the line of best fit).



Exercise 5 may now be attempted.

Stem-and-leaf diagrams

It is probable that students will not have met this type of graph previously. Stem-and-leaf diagrams can be introduced by means of the following example.

Class 1A's Test Results 56, 45, 37, 57, 82, 92, 36, 39, 54, 65, 67, 30, 48, 51, 59, 73, 86, 91, 58, 64, 37, 62

unordered stem-and-leaf diagram =>

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

5 | 7 represents 57

ordered stem-and-leaf diagram =>

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

5 | 7 represents 57

A second class's scores can be brought in to illustrate a <u>back to back</u> stem-and-leaf diagram.

Class 1B's Test Results

65, 54, 73, 75, 29, 39, 63, 93, 45, 56, 76, 50, 84, 45, 95, 37, 68, 49, 85, 46, 83, 28

Back to back stem-and-leaf diagrams can be used to compare two sets of data.

1B		1A
9 8	2	
9 7	3	0 6 7 7 9
9 6 5 5	4	5 8
6 4 0	5	1 4 6 7 8 9
8 5 3	6	2 4 5 7
6 5 3	7	3
5 4 3	8	2 6
5 3	9	1 2

5 | 7 represents 57

Exercise 6 may now be attempted.

Construction of Graphs

Constructing graphs does not require a great deal of explanation. Note that construction of pie charts is in Mathematics 2 (Intermediate 2).

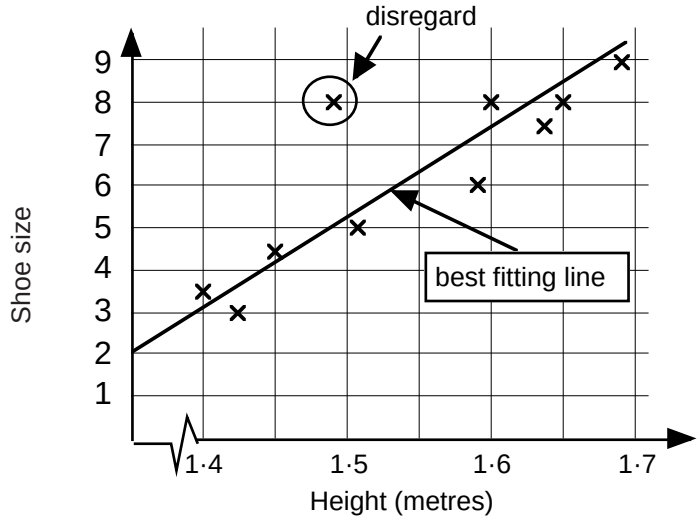
Construction of the line of best fit (or best fitting line) may be a new topic for many students. This can be introduced using the earlier example connecting shoe size to height to introduce the idea of correlation.

Note that at Intermediate 1 level all examples should have 'strong' correlation either positive or negative.

A discussion should take place on how to find the 'best' fitting line.

This line can now be used to estimate the shoe size of someone who is 1·55 metres tall.

(Ans.= 6)



Exercise 7 can now be attempted.

Frequency tables

Students will probably have met frequency tables previously.
Frequency tables are used for organising data and tally marks are used to assist in the calculation of the frequency. 卌 should be used to represent 5, not just five 'strokes'.

Example: A group of 50 year old men were asked, 'How many cars have you owned in your life'?
The answers were:

2	5	4	3	4	2	3
4	8	2	5	2	4	2
3	4	6	3	5	6	4
4	6	3	4	5	3	4

Construct a frequency table to show the results of the survey.

Solution:

Cars owned	*Tally Marks*	*Frequency*
2	卌	5
3	卌 I	6
4	卌 IIII	9
5	IIII	4
6	III	3
7		0
8	I	1
		28

Exercise 8 can now be attempted.

USE OF SIMPLE STATISTICS

Range, mean, median and mode

RANGE should be defined as **RANGE = Highest score – Lowest score**

Example:- Find the range of teachers' ages in a school -

35, 42, 42, 45, 21, 36, 64, 22, 28, 27

Ans.	Highest score	= 64
	Lowest score	= 21
	RANGE	= 43

Mean, median and mode all provide a measure of 'average' - they each have advantages and disadvantages depending on the data given. Examples should be given to illustrate the different uses of these three measures. Suitable examples can be found within the exercises.

MEAN should be defined as - what most people think is 'the average'

To find the mean simply ADD UP the scores and DIVIDE the sum by the number of scores, i.e.

$$\textbf{MEAN} = \frac{\text{Sum of scores}}{\text{Number of scores}}$$

Note that the mean can be calculated exactly or to a specified rounding.... so answers like 3·5 pupils are not uncommon. It should also be stressed that the mean does not have to be one of the numbers in the question, as in Example 2 and 3 below.

Example 1 Find the mean of:

2, 4, 6, 8, 10

Ans. MEAN = $^{30}/_{5}$ = 6

Example 2 Find the mean of:

£2 £6 £12 £15

Ans. MEAN = $^{£35}/_{4}$ = £8·75

Example 3 Find the mean, correct to 1 dec. pl.

6kg, 7kg, 8kg, 3kg, 4kg, 9kg

Ans. MEAN = $^{37}/_{6}$ = 6·2kg.

MEDIAN should be defined as:

the MIDDLE SCORE, once the scores have been <u>written in numerical order</u>.

Note:

- the middle score has the same number of scores above it and below it.
- for an ODD number of scores it is easier to select a median as there is a definite middle score.
- for an EVEN number of scores there is no single middle score ..... so the median in this case is the average of the 'two middle scores'

Example 1 Find the median of:

8, 6, 4, 2, 2, 5, 8

Ans.

Rearrange to:
2, 2, 4, 5, 6, 8, 8

MEDIAN = 5

Example 2 Find the median of:

8, 6, 4, 3, 2, 6, 7, 8

Ans.

Rearrange to:
2, 3, 4, 6, 6, 7, 8, 8

MEDIAN = 6
(lies between the two 'middle sixes')

Example 3 Find the median of:

8, 10, 16, 19, 23, 12, 14, 15

Ans.

Rearrange to:
8, 10, 12, 14, 15, 16, 19, 23

MEDIAN = $\frac{14 + 15}{2}$ = 14·5 (the average of the two middle numbers)

MODE should be defined as: the score which occurs MOST FREQUENTLY
Note that the mode is NOT how many **times** the score occurs.

Example 1 Find the mode: 3 3 3 4 4 5 5 5 5 6 6 6 6 6 6 6 6

Ans. MODE = 6 (there are eight of them)
Note: '6' is the mode, not '8'.

Exercise 1 Questions 1 - 7 could now be attempted

A discussion should take place on which measure of 'average' to use, highlighting the points given below which provide an indication of when each measure is appropriate.

MEAN

- makes use of all the data
- can be calculated exactly if required
- BUT - it can be misleading if there is an unusually high or low score included.

Example, 2 90 90 98 100 has a mean of 76.
Four out of the five scores are well above the mean.
It would not be advisable to use the mean here!
The 'low 2' has affected it adversely.
Better to use median / mode in this case.

MEDIAN

- easy to understand;
- the low/high scores do not affect it;
- BUT - in small groups of numbers which have a rather odd pattern it may not fully represent the group.

For example, 3 3 3 3 3 3 4 4 5 9 has median 3
the mean **4** would be a better average to use here.

MODE

- easy to understand;
- the low/high scores do not affect it;
- useful for finding out what most people want;
- BUT - as in <u>the example above</u> where the mode is also 3, it may not be a good average to use.

Exercise 1 Questions 8 - 13 could now be attempted

The last questions in this exercise involve problems involving the mean. These are extension questions.

Example A golfer has a mean score of 74 for four rounds.
If he scored 68, 80 and 72 for three of his rounds, what did he score in his 4th?

Ans. Total Score = 74×4 = 296
Total for 3 rounds = 220
Round 4 = 296 – 220 = 76

Exercise 1 Questions 14, 15, 16 could now be attempted

Range, Mean, Median, Mode from a Frequency Table

Note that the **RANGE** and the **MODE** are both found in the same way as in Exercise 1.

Example:

Mark	Frequency
2	10
3	12
4	8
5	6
6	4
7	3
8	1

RANGE = Highest mark - Lowest mark
= 8 – 2
= 6

MODE = 3

Students should be shown how to find **the MEAN from a Frequency Table**, i.e.

- an extra column is required in the table;
- totals must be found.

Example

Ans. MEAN $= \dfrac{\text{Total Fx}}{\text{Total F}}$

$= {}^{43}/_{13}$

$= 3{\cdot}3$

(correct to 1 dec.pl.)

	F	**Fx**
Age (yrs.)	Frequency	Age × Frequency
1	1	1
2	3	6
3	4	12
4	2	8
5	2	10
6	1	6
	13	43

Students should now be shown how to find **the MEDIAN from a Frequency Table**

Note that it is still the MIDDLE NUMBER which is sought, as before.

Example Find the median of these scores.

Score	51	52	53	54	55	56
Frequency	4	3	6	7	1	3

Ans. Total Frequency = 24 so Median must lie between 12th and 13th numbers.

51, ..., 51, 52, 52, 52, 53, ..., 53, 53, 54,...

4 terms + 3 terms + 6 terms = 13

12th number = 53 13th number = 53

MEDIAN = 53

Exercise 2 could now be attempted.

'Simple' Probability

The following points should be included in a discussion on 'simple' probability.

- A 'cert.' is 1 or 100%.
- A 'no chance' is 0.
- $P = \dfrac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$.

Answers can be expressed as fractions, decimals or percentages.

Students should be encouraged to always leave their answers in simplest form.

A simple introductory example is the rolling of a die, showing a 1, 2, 3, 4, 5 or 6.
i.e. there are 6 possible outcomes.

There is a one in six chance of getting a five, i.e. $^1/_6$.
Similarly the probability of getting a two can be found.

Further examples which could be introduced are the probability of - 'a prime number', 'a square number', 'a 7', etc.

Example 1. A fish pond has 30 trout, 20 salmon and 10 eels in it.
What is the probability that a fisherman will catch:

a) a trout b) a salmon c) an eel d) a herring?

Ans. a) 30 poss. out of 60 = $^{30}/_{60}$ = $^1/_2$
b) 20 poss. out of 60 = $^{20}/_{60}$ = $^1/_3$
c) 10 poss. out of 60 = $^{10}/_{60}$ = $^1/_6$
d) No chance! Prob. = 0

Exercise 3 Questions 1 - 12 could now be attempted

Data could also be presented in tabular form. The following example is the same kind of dice problem, but in the form of a frequency table:-

Example 2. A boy rolls a dice 50 times and records the numbers in the table below.
From the table what is the probability that
a) a 3 appears b) a 2 appears c) a number greater than 3 appears?

Ans. a) $^{10}/_{50}$ = $^1/_5$
b) $^{20}/_{50}$ = $^2/_5$
c) $^{15}/_{50}$ = $^3/_{10}$

Number on Die	Frequency
1	5
2	20
3	10
4	5
5	8
6	2

Exercise 3 could now be completed

APPENDIX 1

Introductory Data Collection

Name: ..... Sex: M ☐ F ☐

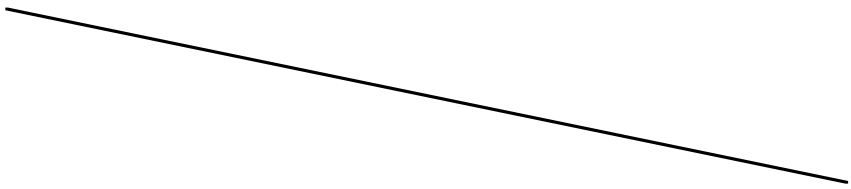
Month of Birth: .....

Favourite Colour from the list:

Red	–	☐
Green	–	☐
Blue	–	☐
Yellow	–	☐
Purple	–	☐

Take out any coin at random from your pocket (purse) and write down the date on it .....

Without any ruler or measuring device, estimate (in millimetres) the length of this line:



What is your shoe size? ..... What is your height? .....

Without measuring, place a neat cross at the point you think is exactly in the middle of the following line.

How many people, including yourself, normally stay in your house? .....

MATHEMATICS 2 (INT 1) – STATISTICS – STUDENT MATERIALS

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GRAPHS, CHARTS AND TABLES

By the end of this set of exercises, you should be able to

(a) extract and interpret data from **bar charts**, **line graphs**, **pie charts** and **stem-and-leaf diagrams**, and interpret trends in graphs.

(b) construct **bar charts**, **line graphs**, **stem-and-leaf diagrams**, and **scattergraphs** (scatter diagrams) from given data. Also, draw a **best-fitting line** by eye on a scattergraph and use it to estimate the value of one variable given the other.

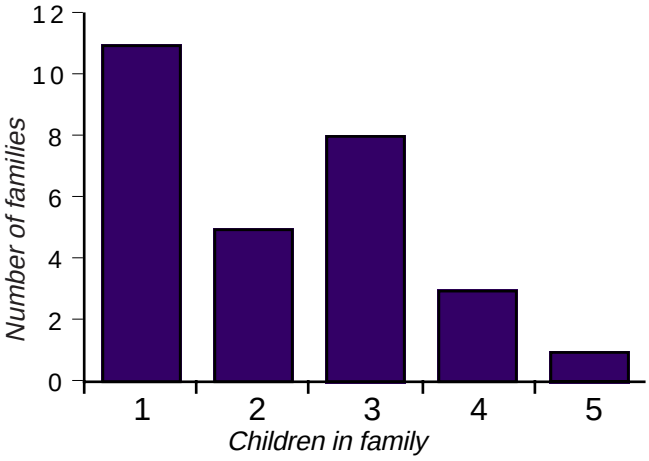
(c) construct **frequency tables** from data <u>without</u> class intervals.

The Bar Graph (Chart)

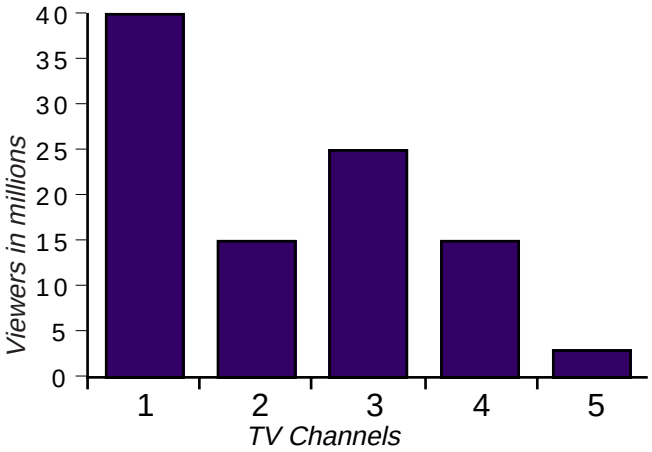
Exercise 1

1. The bar graph shows the results of a survey into how many children were in the families of an S1 class. All the pupils took part.

   (a) How many pupils had four children in their family?
   (b) How many pupils had less than three children in their family?
   (c) How many children were there in the class?
   (d) How many of the class had no brothers or sisters? Explain.



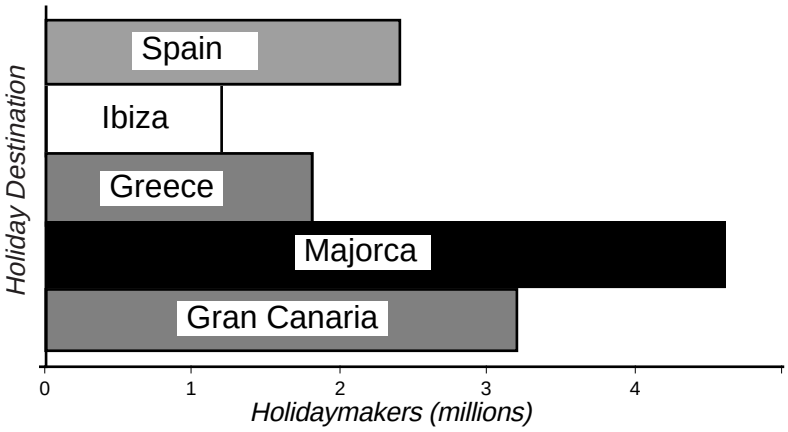
2.



This bar chart shows how many viewers regularly watch Channels 1 to 5 on television.

(a) Which TV Channel is the favourite one?
(b) Which one is watched by the least number of viewers?
(c) Which two channels have the same number of viewers?
(d) How many people in total watch the channels?
(e) Which TV Channel has about one quarter of the viewers?

3. This diagram shows the number of people (in millions) who went abroad on holiday in 1997.

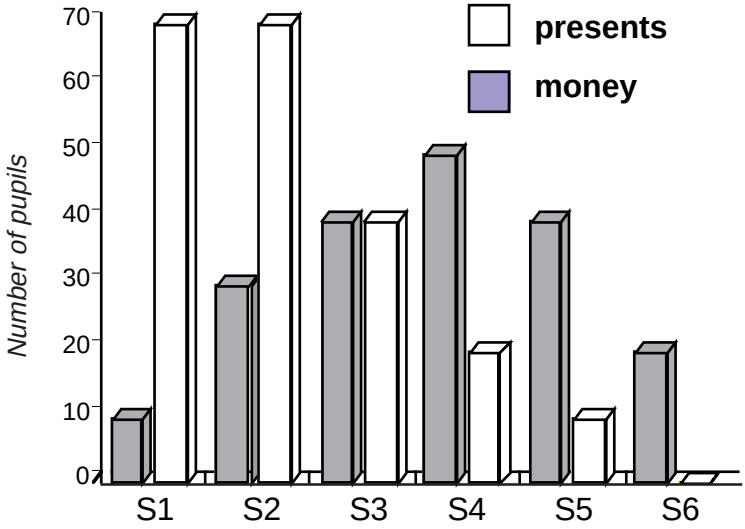


(a) Which country was: (i) the most popular (ii) the least popular?

(b) Why is it difficult to give exact numbers?

(c) Write down the names of the countries and estimate how many people went to each country.

4. A survey was carried out in a secondary school about the preference of pupils for presents or money for their Christmas gift. All pupils voted and the results are displayed in this compound bar chart.



(a) Which year group has the greatest difference in the vote?

(b) In which year groups did less than 30 pupils vote for presents?

(c) In S4, what was the difference in the vote?

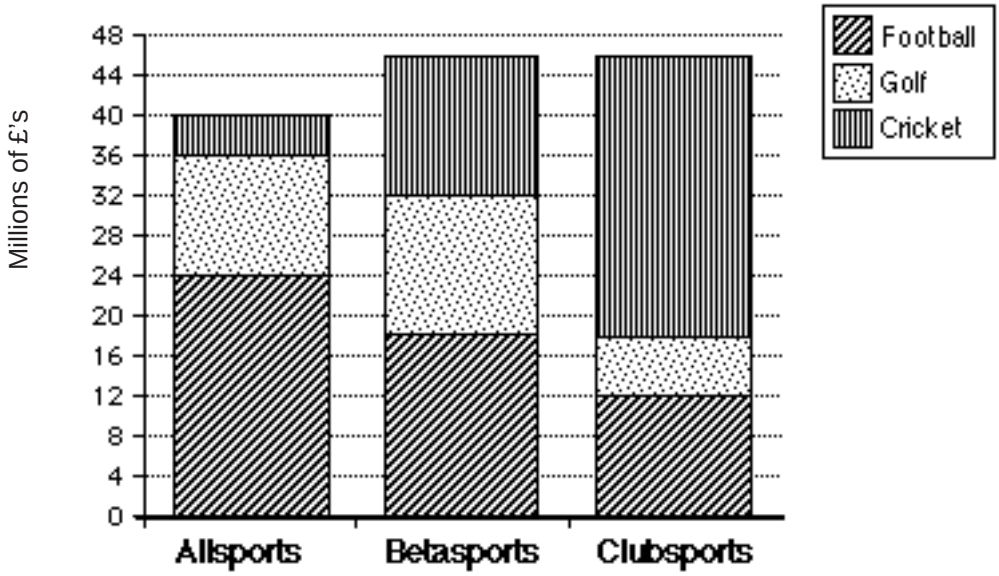
(d) Which year groups have the same number of pupils voting for presents?

(e) In which year group is the vote for presents the same as that for money?

(f) How many pupils are in S1?

(g) Why is there only one ‘bar’ for S6?

5. The diagram refers to the sales of three large sports shops in Scotland.
Their major sales are in football gear, golf clubs and cricket equipment.



(a) How much were the golf sales in Allsports?

(b) What is the total sales for football gear in the three shops?

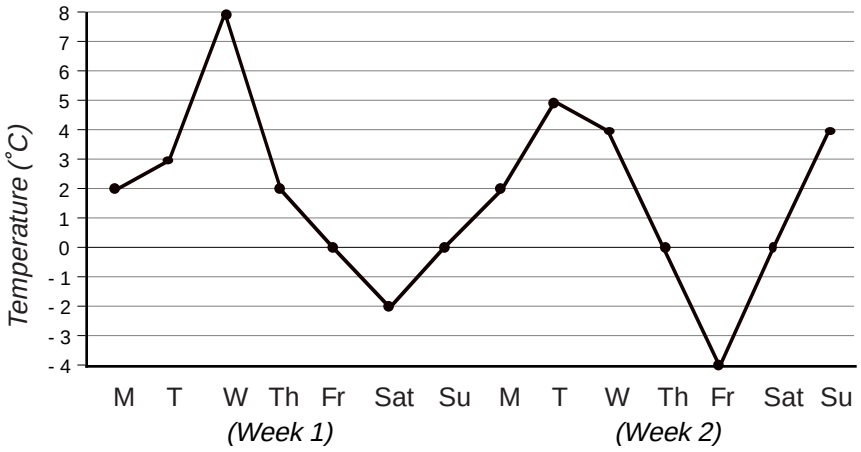
(c) What is the difference between the amount of golf sales in Allsports compared with Clubsports?

(d) What is the total sales of cricket gear in Betasports and Clubsports?

The Line Graph

Exercise 2

1. The temperature on top of a town hall was taken every morning at 11.00 a.m. This line graph was made up from the recordings.



(a) What was the temperature on:

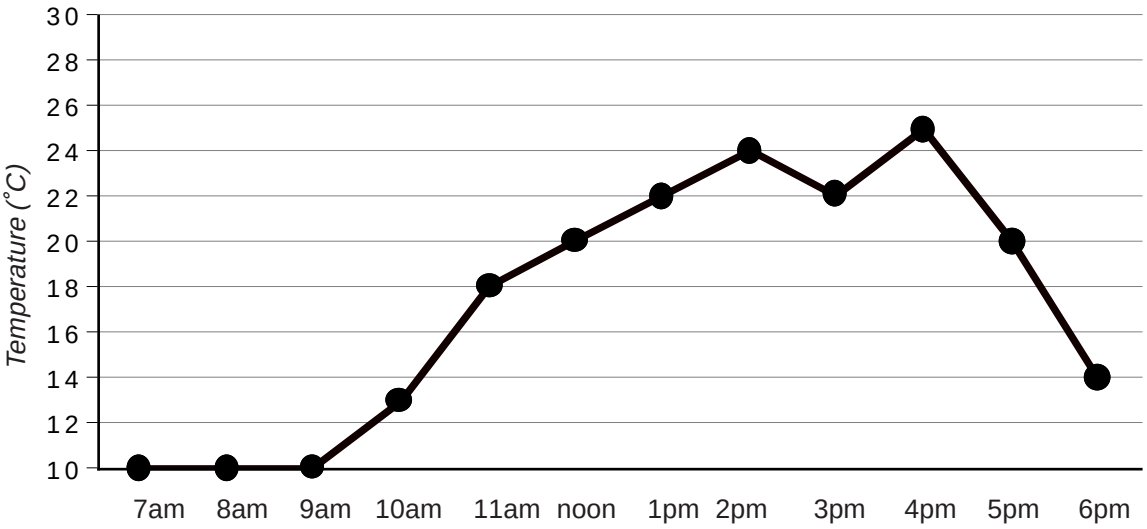
(i) the Wednesday of week 1 (ii) the Friday of week 2?

(b) What was the fall in temperature from Tuesday, week 2 - until Friday, week 2?

(c) Between which two days was there the biggest rise in temperature?

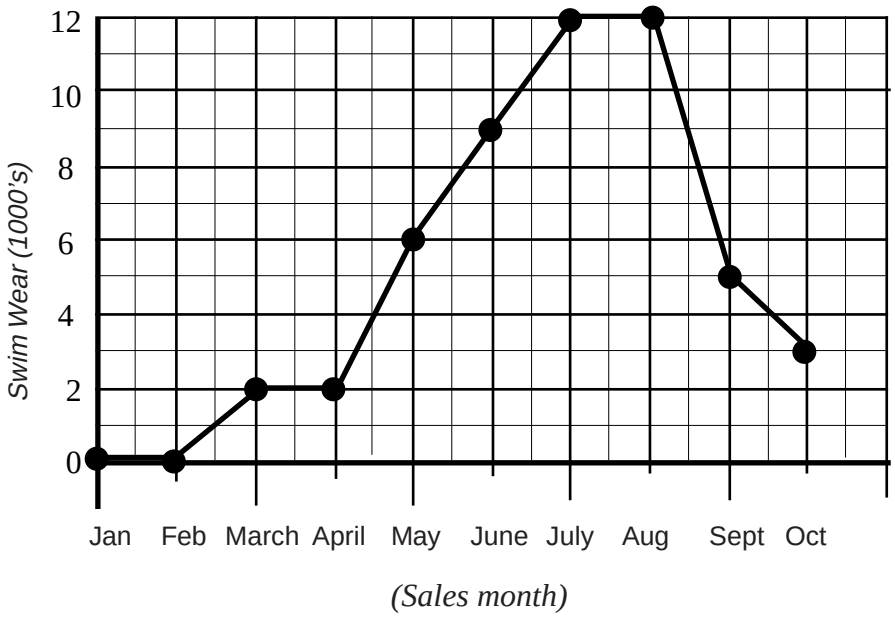
(d) What was the trend of the graph from Wednesday to Saturday of the first week?

2. Someone was also recording the temperature of the rooms inside the town hall every hour from when she arrived at 7 a.m. until 6 p.m.



(a) When do you think that the heating was switched on?
(b) What was the highest temperature?
(c) When was this?
(d) Suggest a reason for the sudden dip from 2 p.m. till 3 p.m.
(e) Between which times did the temperature rise the most slowly?
(f) What was the longest time that the temperature kept rising?
(g) When was the heating officially switched off?

3. The line graph shows the number of swimming trunks, bikinis etc. bought in a superstore during the months of January to October in a normal year.



(a) Why are sales so low during January?
(b) When do the sales remain the same?
(three answers required).
(c) During which month do the sales rise the most?
(d) When is the most dramatic fall in sales and by how much?
(e) When are sales at a peak? Why is this?
(f) Although sales are not great in September - why do you think that swim wear is still being bought?

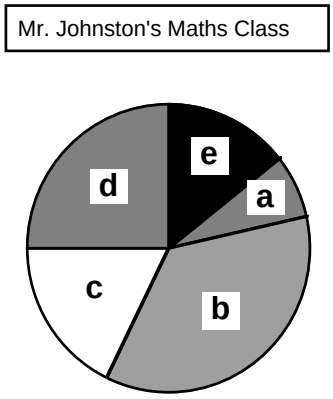
The Pie Chart

Exercise 3

1. Mr. Johnston's Maths class has 28 pupils in it. They were persuaded to vote for their favourite maths topic.

   The pie chart shows how they voted

Sums	4
Trigonometry	2
Calculus	10
Statistics	5
Measurement	7.



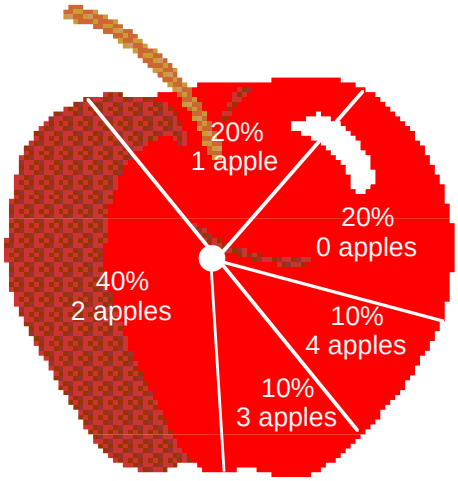
   (a) Which topic is represented by the letter:

   (i) a (ii) b in the diagram?

   (b) What percentage of the class is represented by letter d?

   (c) What fraction of the class liked Sums?

2. A college canteen draws up a pie chart showing the number of apples eaten in a week by each of the 200 students who use the canteen.



   (a) Calculate how many of the 200 students eat:

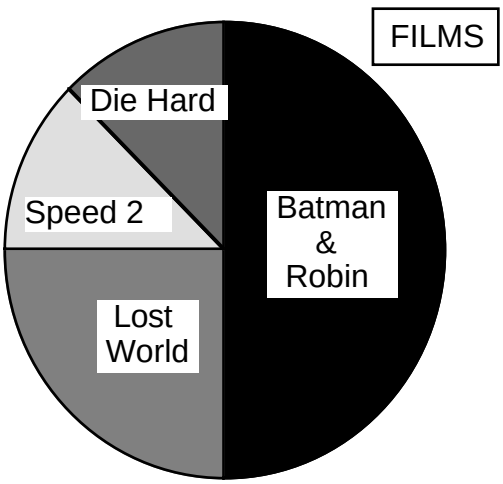
   (i) 3 apples in a week

   (ii) 1 apple in a week.

   (b) Use the answer to i) to find how many apples are actually eaten by these '3 apple' students.

   (c) Calculate the **total** number of apples eaten in a week.

3.



Mrs. Abraham asked her primary six class of 32 pupils to choose their favourite film.

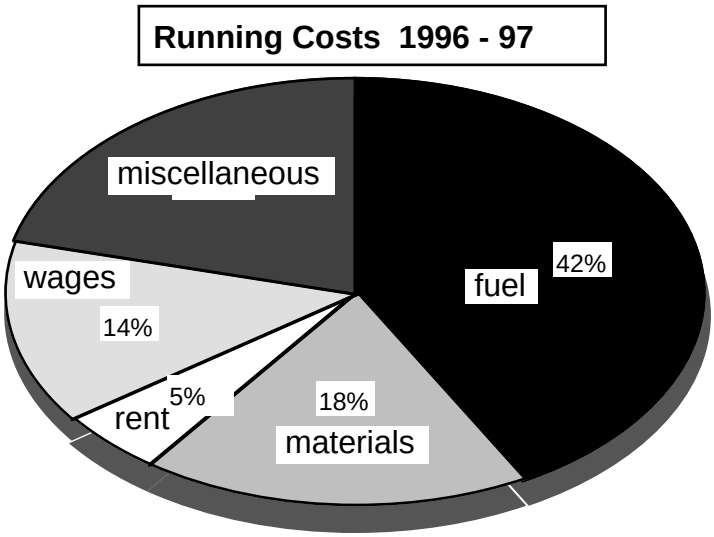
(a) What fraction of the class chose

(i) Batman & Robin

(ii) Die Hard?

(b) How many pupils chose the Lost World?

4. For the year 1996 - 1997, the gross income of a company was £3 700 000. After taking off the costs of running the company, a profit of £500 000 was declared.



This pie-chart shows how the running costs were used.

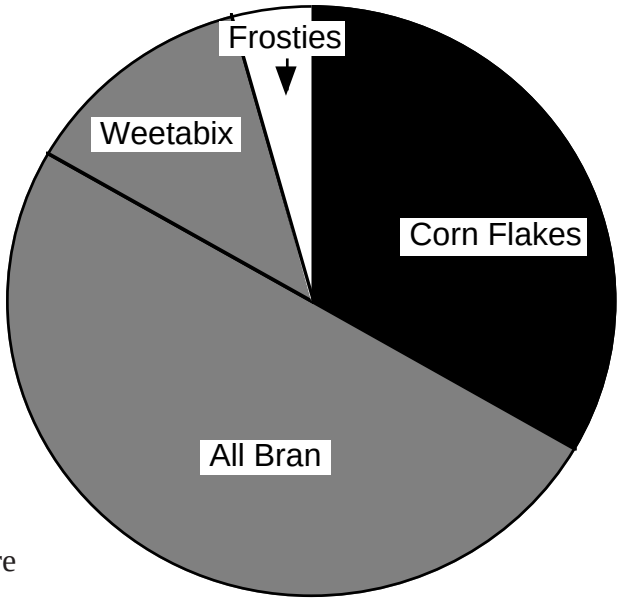
(a) Calculate how much the running costs must have been.

(b) From the pie chart, find what percentage of the running costs was 'miscellaneous'.

(c) What was the actual amount of money spent on wages?

(d) **Calculate** (do not measure) the size of the angle used to represent 'rent' in the pie chart.

5. This pie chart represents the results of a survey of 240 senior citizens as to what their favourite breakfast cereal was.



(a) Use a PROTRACTOR to measure the size of each angle.

(b) Calculate **how many** senior citizens liked:

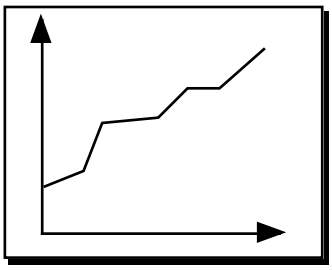
(i) All Bran (ii) Corn Flakes

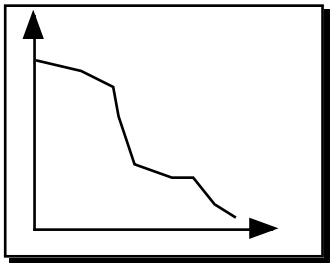
(iii) Weetabix (iv) Frosties.

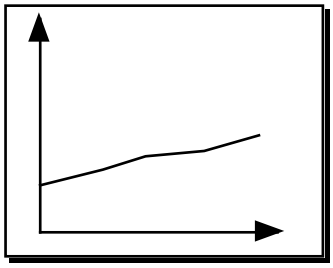
Trends in Graphs

Exercise 4

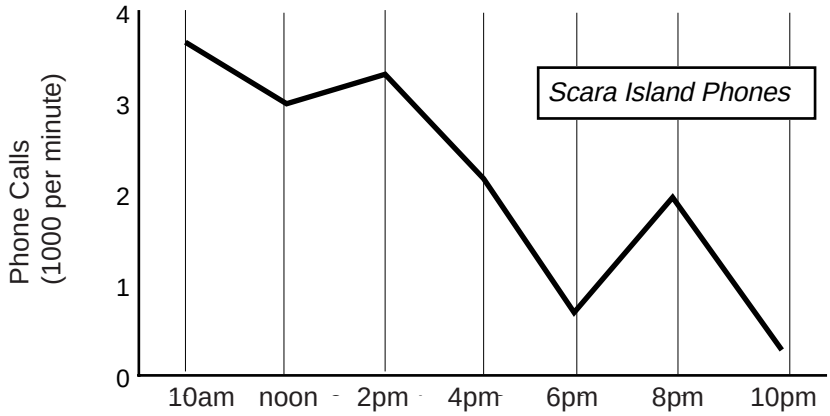
1. Describe the trend in each of these line graphs:

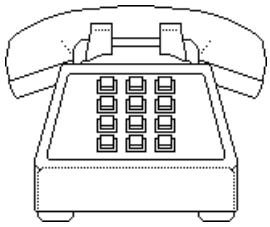
a) 

b) 

c) 

2. This line graph shows the average number of phone calls made from Scara Island over a certain period of time in a normal day.

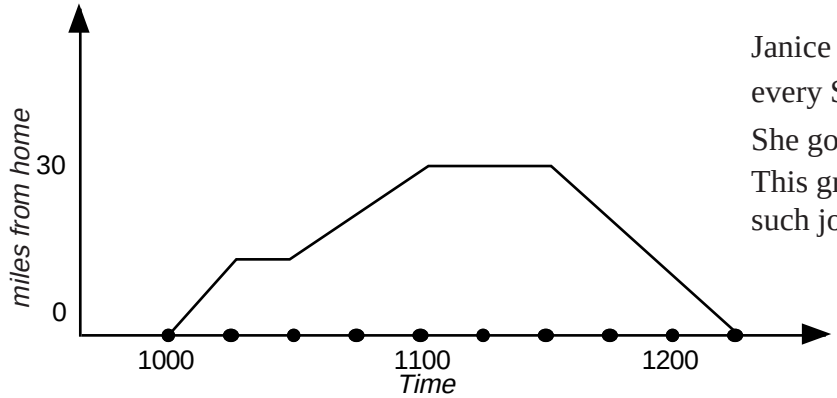




(a) What is the peak time for calls? (Give a reason.)

(b) Why is there an increase in the number of calls after 6 p.m.?

(c) Describe the trend of the graph over the period.

3. 

Janice visits her gran every Sunday.
She goes by car.
This graph, shows one such journey.

(a) When did Janice leave home?

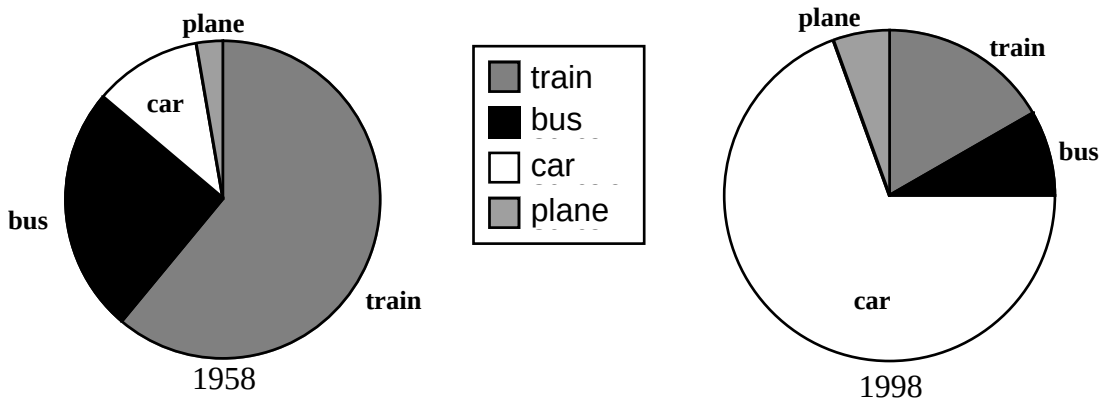
(b) When did she get home?

(c) Roughly how far away from Janice does her gran stay?

(d) Describe what might have happened round about quarter past ten.

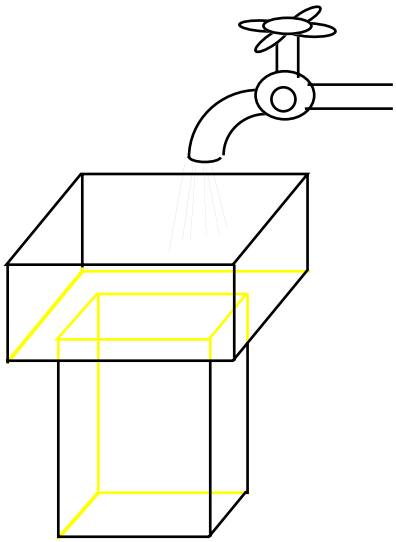
(e) How long did she stay at her gran's?

4.

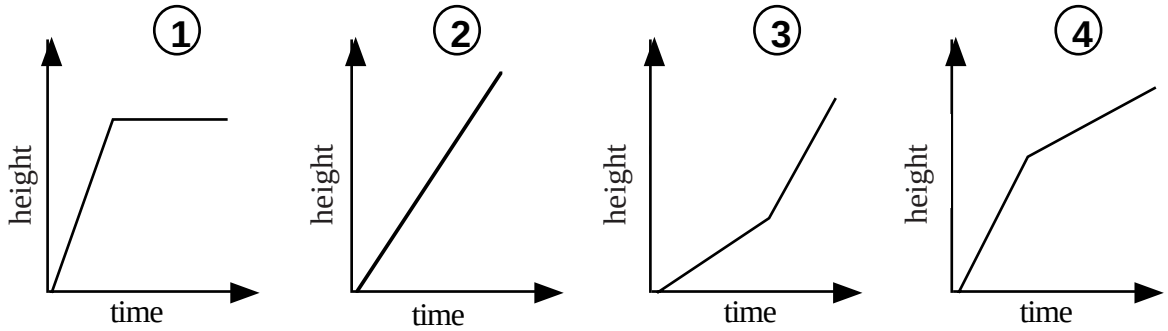


These pie charts give some indication of the changes in methods of transport over the past 40 years.
Describe in detail the major changes, giving reasons for your answers.

5. A modern two-tier fish tank is filled with water from a tap at a steady rate.



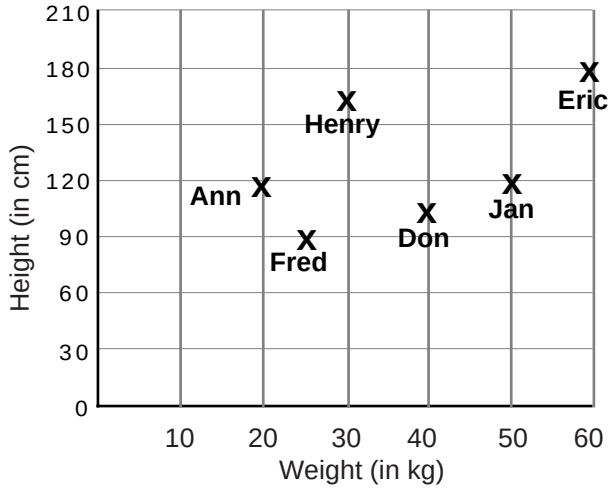
One of the graphs below indicates the change in the height of the water as the tank fills.
Which graph is it? ..... and give a reason for your choice.



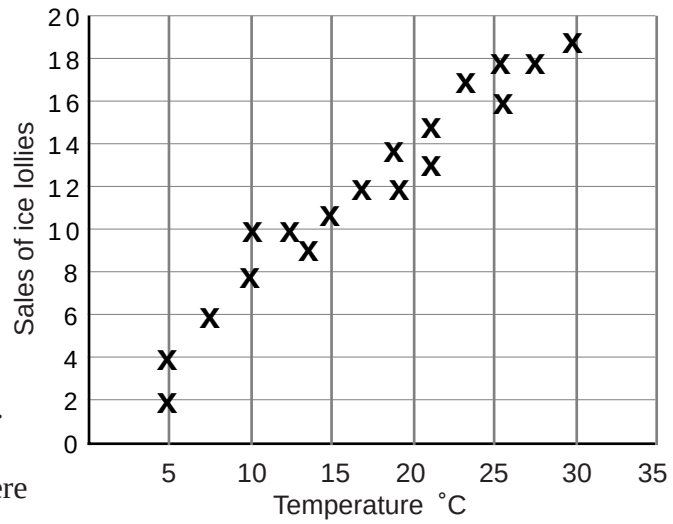
The Scattergraph

Exercise 5

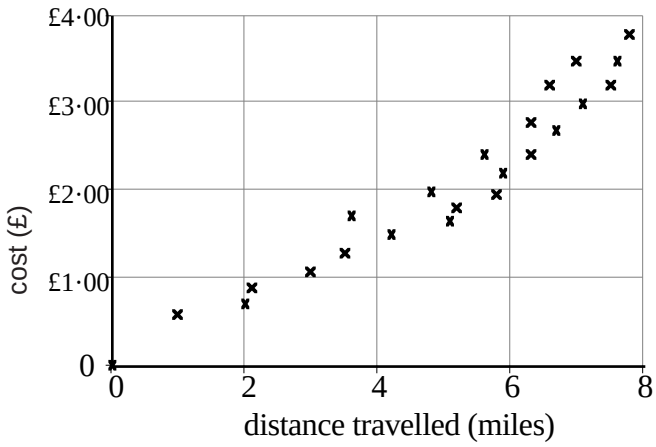
1. The scattergraph shows the height and weight of six children.
   (a) What height is Fred?
   (b) What weight is Eric?
   (c) Which two children are the same height?
   (d) Who is the lightest?
   (e) Who is the shortest?



2. This graph shows a relation between the temperature during the day and the sales of ice lollies on that day.
   (a) Suggest a connection between the temperature and the sales of ice lollies.
   (b) Use the chart to estimate the number of ice lollies which might be sold when the temperature reaches 35 degrees.
   (c) Estimate what the temperature was when thirteen ice lollies were sold?



3. This scattergraph shows the prices which taxi cabs charge for fairly short distances.
   (a) Suggest a connection between the fare and the number of miles travelled.
   (b) Why is there a cross at (0,0)?
   (c) Use the chart to give a reasonable guess at how far you could go in a taxi for £1·50.
   (d) How much do you think a 6 mile journey would cost?



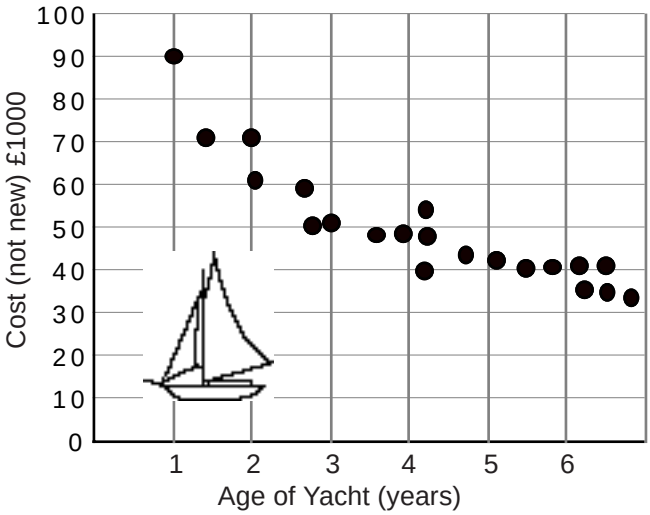
4. ‘Trylin Yachts’ cost £100 000 new. The graph shows what price second hand Trylin yachts are sold for.

(a) Between which years do yachts fall in value by the largest amount?

(b) Suggest a connection between what you would have to pay for a yacht and its age.

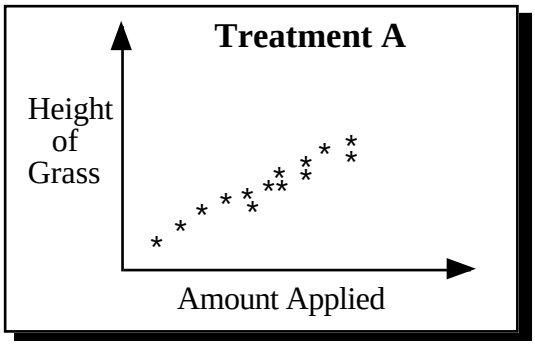
(c) Use the graph to estimate how old a yacht might be if you spent £50 000 buying it second hand.

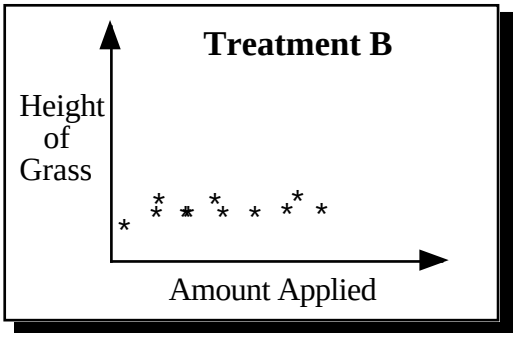
(d) From the graph, how much do you think an two year old yacht would cost?

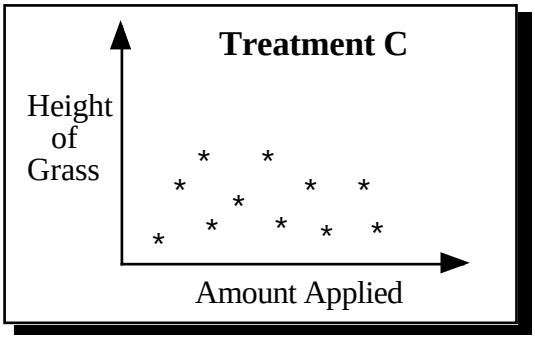


5. A green keeper at Grey Golf Club had terrible trouble trying to get grass to grow in the rough. He was recommended to try three new grass growing treatments, one on each of three holes. He hoped for good, steady growth which would then let him cut the grass to his desired height.

The results are shown in the scatter graphs:







(a) Comment on the effect each treatment (and the amount used) has on the grass.

(b) If you were the greenkeeper which one would you use? Why?

The Stem-and-Leaf Diagram

Exercise 6

1. The stem-and-leaf diagram shows the number of cases of dog food sold at a supermarket each week over a 6 month period.

   Write out the weekly sales, in order, and find how many weeks the sales were more than the target of 35.

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

3 | 1 represents 31

2.

1	87
2	19 25
3	24 37 69
4	13
5	22 33 55
6	30 58
7	45 73

4 | 13 represents £413

This 'two digit' stem-and-leaf diagram shows the daily takings over a fortnight (in pounds) for Grant's Sweet Shop.

Write out (in order) the fourteen daily takings.

3. A machine weighs out coffee and puts it into packets.
   The machine is checked at 11 a.m. and again at 4 p.m. to see if its output is satisfactory.
   The results of the inspection on 15/9/98 are shown below in a back-to-back stem-and-leaf chart. The weights are in grams.

11 a. m.		4 p. m.
	38	
2 0 3 7	39	6 4
1 3 5 0 3 4	40	7 0 6 5 4
0 1 7 2 2 6	41	5 2 7 2
2 0 0 2	42	9 8
	43	0 1 4 1

41 | 7 represents 417g

A sample of 20 packets was weighed both times.

(a) At which time (11 a.m. or 4 p.m.) did the machine produce:

   (i) 411 grams (ii) 434 grams?

(b) Of the 20 packets sampled at 11 a.m., how many weighed from 391 to 406 grams?

Construction of Graphs

Exercise 7

1. The Park Sports Centre began its winter programme with the following number of under 16s enrolling on the opening night.

	Swimming	*Fencing*	*Football*	*Aerobics*	*Keep Fit*
Girls	120	108	9	62	19
Boys	85	32	05	22	5

Draw a compound BAR CHART to illustrate this information.

2. The following table shows the weekly wages of young, part-time workers in Orkam Superstore.

Wage in £'s	10 -19	20 - 29	30 - 39	40 - 49	50 - 59	60 - 69	70 - 79
No. Workers	3	7	23	29	38	14	1

Draw a BAR CHART of the distribution.

3. The height of a sun flower was measured each week for 8 weeks.
Here are the results:

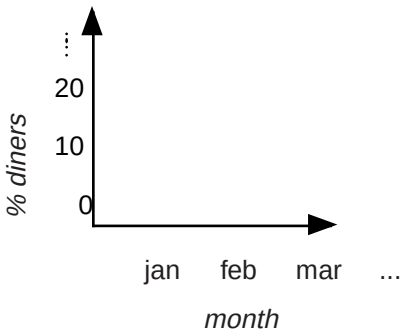
Week Number	1	2	3	4	5	6	7	8
Height (cm)	5	8	20	30	45	59	65	89

Show this information in a LINE GRAPH.

4. A sample of school children was looked at in 1997 for 6 months, regarding their eating habits in school at lunchtime. A comparison was made between those who had school lunches and those who brought their own food.
The results are shown in the table:

Month	*Jan*	*Feb*	*March*	*April*	*May*	*June*
% school lunch	75	70	60	60	30	5
% own food	10	10	30	35	40	65

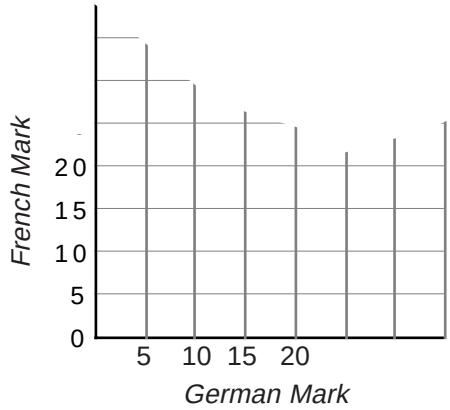
(a) Use the scale shown to draw LINE GRAPHS of the data <u>on the same diagram</u>.
(b) Make at least **three** comments on the results of the survey.



5. Here is a table of exam marks (out of 50) from a modern languages department.

Pupils Name	**Ali**	**Bo**	**Ed**	**Dan**	**Flo**	**Hal**	**Nan**	**Pen**	**Rab**	**Sid**
French Mark	5	10	10	20	15	30	30	40	40	45
German Mark	5	5	10	15	20	25	30	35	35	45

(a) Draw a diagram similar to the one shown, using the same scale for each axis.
(b) Plot the information from the table to make a SCATTER DIAGRAM.
(c) Describe some connections between the French marks and the German marks.
(d) Draw a line of best fit through points.
(e) Use the graph to estimate what the German mark would be if French was 35.
(f) One person seems to go against the trend. Who is it?.... and what makes you think that?



6. Brad and his pals record the number of take-away meals they deliver each evening, and the time it takes them.

Time (mins)	25	22	20	20	15	13	9	15	17	14
No. Meals	40	33	30	32	22	20	13	20	21	19

The average time is 17 minutes and the average number of take-away meals is 25.
(a) Draw up a set of axes on squared paper, with meals on the horizontal axis and time on the vertical axis. Using suitable scales draw a SCATTER DIAGRAM.
(b) Draw a line of best fit through the point (25,17). (meals = 25, time = 17)
(c) Estimate the time it would take Brad & Co. to deliver 28 meals.

7. Dino, the cafe owner, measured the amount of fresh orange juice he was losing from a large container due to a faulty tap. The table shows the results.

Time (minutes)	0	1	2	3	4	5	6	7	8
Juice (cm^3)	0	6	11	18	25	30	35	43	48

(a) Show the results in a scatter diagram.
(b) On the graph, draw the line of best fit through the points.
(c) Use the line to estimate the volume of orange juice lost in:
(i) $2^1/_2$ minutes (ii) $7^1/_2$ minutes

8. The results in the table below make you believe that the warmer it gets, the less rainfall there is.

Ave Temp (°C)	5	10	10	12	15	18	20	24	28	30	35	40
Ave Rainfall (mm)	90	80	70	68	58	35	15	17	17	15	12	8

(a) Draw a scatter graph with Temperature (°C) along the horizontal axis and the rainfall (mm) on the vertical axis.

(b) Draw a line of best fit through these points on your diagram.

(c) Estimate, (see line), the temperature which best matches a rainfall of 50 mm.

(d) Estimate what the rainfall might be when the temperature was 25°C.

9. The table shows the weight of a gorilla in a Zoo at various times in its life, and the corresponding daily weight of food (in kg) eaten by the gorilla at those times.

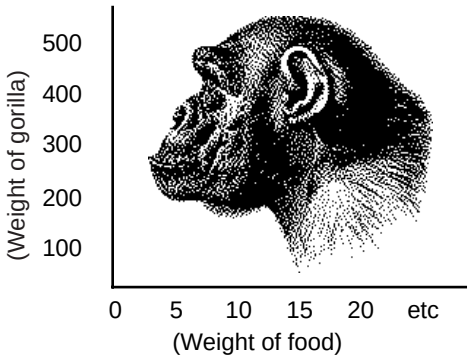
Food per day (in kg)	3	9	10	15	15	18	25	26	30	35	40	45	50
Weight (in kg) of gorilla	5	50	100	90	100	100	200	180	200	350	350	450	500

(a) Draw a scatter diagram to represent the information.

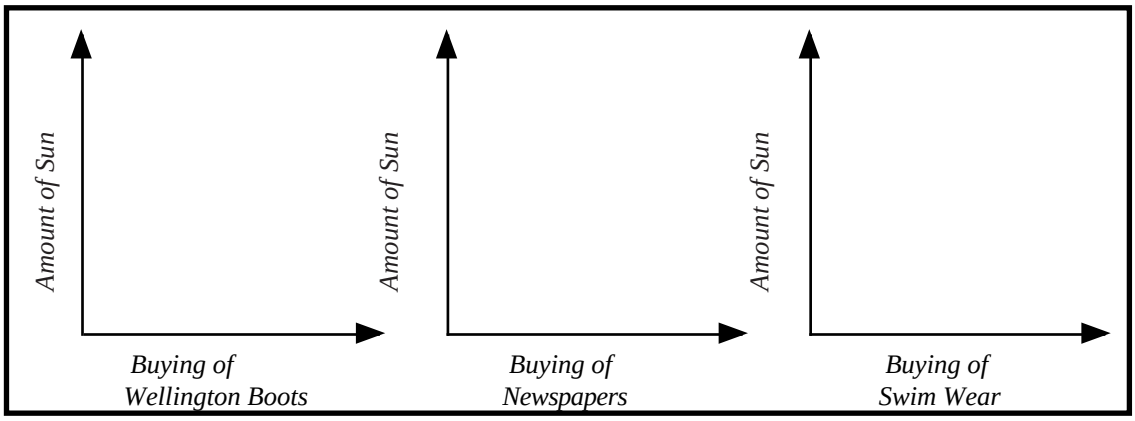
(b) Draw the line of best fit.

(c) Use the graph to estimate:
the weight of the gorilla when its daily food consumption was
(i) 20 kg (ii) 60 kg.

(d) Estimate the daily food intake of the gorilla when it weighed 400 kg.



10. Copy these axes and draw SCATTER DIAGRAMS which show the connections between the items shown.



11. Construct a simple stem-and-leaf diagram to display the following golf scores, shot by the USA team in The Ryder Cup, Spain in 1997.

66	79	80	78	69	66	68	80	77
78	93	78	67	62	74	64	81	75
60	66	78	77	84	76	72	69	90
63	62	84	75	75	71	65	64	73

12. A factory has two machines for packing flour into 2 kg packets. 40 packets from each machine were weighed, in grams, and the results were as follows.

MACHINE 1

2020	2014	2019	2005	2020	2023	2015	2006	2013	2012
2021	2011	2019	2021	2013	2000	2020	2026	2018	2007
2038	2018	2016	2017	2010	2019	2013	2012	2020	2021
2002	2015	2013	2017	2019	2020	2016	2025	2014	2028

MACHINE 2

2005	2016	2019	2017	2029	2018	2020	2023	2014	2022
2020	2018	2020	2000	2020	2033	2010	2013	2030	2005
2013	2019	2021	2016	2012	2017	1999	2021	2014	2009
1998	2002	2004	2005	2007	2011	2016	2020	2001	2003

Make a back to back stem-and-leaf diagram for the figures.
State one or two things you notice about the two graphs and compare them.

13. A teacher wanted to compare the marks of her two first year classes in a test. She had the feeling that one class was a good bit better than the other. Here are the results of the test:

CLASS 1X

5 7 14 17 19 24 24 25 26 26 26 27 27
27 27 28 29 29 31 31 33 36 38 39 43

CLASS 1Y

8 10 11 13 15 17 18 18 18 19 20 22 23
23 24 25 25 26 26 48 49 50 50 50 50

As the mean (average) mark of each class is almost identical the teacher has to find another method to compare the marks.

(a) Make a back to back stem-and-leaf diagram as shown and complete it.

(b) If the teacher made the ‘pass’ mark ‘25 out of 50’, comment on the results with regard to numbers who ‘passed’ and how many got high marks.

class 1X		class 1Y
	0	
	1	
	2	
	3	
	4	
	5	

Frequency Tables

Exercise 8

1. What numbers do these tally marks stand for?

   (a) 𝍸 𝍸 𝍸 I (b) 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 IIII

2. A group of Primary Seven children were asked to vote for their class captain. The ballot papers unfolded as follows:

DAVID	FRED	LOUISE	FRED	LOUISE	FRED
FRED	DAVID	DANIEL	GINA	GINA	DANIEL
GINA	DANIEL	GINA	GINA	DANIEL	FRED
LOUISE	FRED	FRED	DAVID	FRED	GINA
DANIEL	GINA	LOUISE	LOUISE	GINA	GINA
ALICE	FRED	FRED	FRED	LOUISE	DAVID

Construct a frequency table like the one shown and answer the following questions:

Name	*Tally*	*Frequency*

(a) Who won the election?

(b) One person voted for him/herself, and that was the only vote he/she got. Who was it?

(c) How many more votes did Gina get than Louise?

3. The results for the Scottish Hockey League on the last Saturday in Sept. 2010 are:

Airdrie Thistle	1	Airdrie Athletic	4	Ayr Rovers	8	Ayr Thistle	5
Dundee Thistle	0	Dundee Rovers	0	Jedburgh	4	Peebles	4
Edinburgh Thistle	1	Edinburgh Athletic	2	Kilmarnock Rovers	2	Kilmarnock United	0
Stranraer Thistle	4	Stranraer Rovers	4	Aberdeen Rovers	1	Aberdeen Thistle	1
Elgin Thistle	6	Elgin Rovers	1	Oban Rovers	7	Oban Thistle	7
Stornoway Thistle	9	Stornaway United	3	Brechin Thistle	2	Brechin United	2
Dunfermline Rovers	1	Dunfermline Athletic	1	Troon Thistle	5	Prestwick United	2
Arbroath Rovers	2	Arbroath Thistle	1	Paisley Thistle	1	Johnstone Rovers	3
Bishopton Rovers	0	Clydebank Thistle	1	Perth Flyers	10	Perth Rovers	0

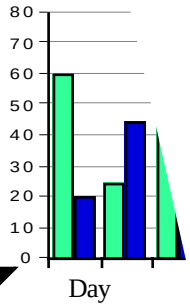
Construct a frequency table to illustrate the number of goals which will be scored!!!

MATHEMATICS 2 (INTERMEDIATE 1)

Checkup Exercise 1

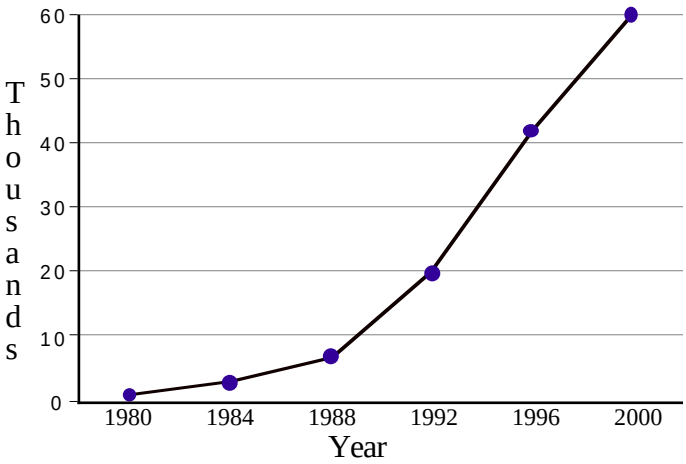
1. A number of children decided to spend their October week's holiday swimming or playing badminton. The table shows those who took part.

Day	Mon.	Tues.	Wed.	Thurs.	Fri.
Swimming	60	25	75	60	10
Badminton	20	45	15	55	70



Illustrate this information on a BAR GRAPH. (similar to this one)

2. The number of games consoles being bought by children in Scotland since 1980 is illustrated by a line graph.



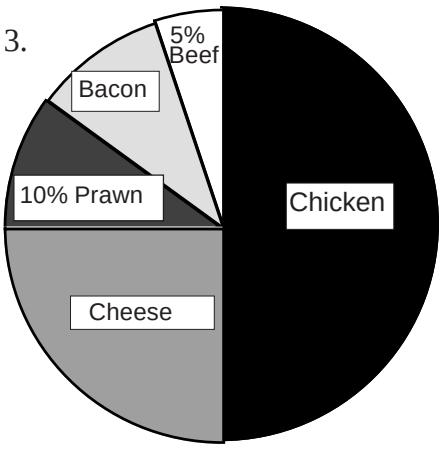
(a) How many children bought a console in (i) 1980 (ii) 1996?

(b) What is the increase from 1996 - 2000?

(c) Between which two periods was there the greatest increase?

(d) Describe the general trend of the graph.

3.



A survey on 'crisps' was carried out among 600 shoppers in a supermarket one Saturday morning. The pie chart shows the results.

(a) What percentage chose:

(i) Chicken (ii) Cheese (iii) Bacon?

(b) How many people chose:

(i) Prawn (ii) Beef (iii) Cheese?

(c) Calculate the **total** number of shoppers who liked prawn, bacon and beef crisps.

4. A plumber decided to monitor the number of call-outs the 10 plumbers in his company had to make in the early hours of one cold winter's morning.
His results are shown.

Time (am)	1	1.30	2	2.30	3	3.30	4	4.30	5	5.30
No. call-outs	2	1	3	3	4	5	6	6	8	

(a) Draw a SCATTER GRAPH.
Put Time along the x -axis and Call-outs up the y -axis.
(b) What is the general trend of the graph?

5. The marks of 36 pupils in a maths test (out of 50) are noted below.

23	12	47	35	27	42	6	44	50	48	44	39
18	25	45	28	36	14	39	50	46	44	22	37
4	29	45	47	38	44	28	47	41	25	3	19

Construct a simple stem-and-leaf diagram to display the marks.

6. A survey was being carried out as people entered DucMonald's Fast Food Store.
As they arrived people were asked 'what are you going to buy today'?

The codes which the researchers used were:

B = Beefburger
C = Cheeseburger
Ch = Chicken burger
CN = Chicken Nuggets
V = Vegetarian Food
H = Hot Dog
U = Ultrabargain

Here are the results:

B	C	B	Ch	B	Ch	Ch	U	Ch	B	CN	C	CN
B	H	U	H	Ch	C	B	Ch	B	Ch	B	C	B
Ch	B	C	Ch	B	H	C	B	Ch	B	CN	B	CN
B	CN	V	B	C	CN	CN	H	B	H	Ch	V	C
CN	CN	Ch	B	Ch	B	CN	B	C	Ch	C	B	H

(a) Construct a FREQUENCY TABLE to illustrate the results of the survey.
(b) How many were going to buy a vegetarian meal?
(c) What kind of food was the most popular?
(d) How many more chicken burgers were sold than chicken nuggets?
(e) How many people were asked?

USE OF SIMPLE STATISTICS

By the end of this set of exercises, you should be able to

(a) calculate the **mean**, **median**, **mode** and **range** of a set of data.
(b) calculate the **mean**, **median**, **mode** and **range** of data presented in an ungrouped frequency table and interpret the results of calculated statistics.
(c) state the **probability** of a simple outcome.

Range, Mean, Median and Mode

Exercise 1

1. For each set of data, find the **range**:
   (a) 8, 6, 2, 9, 7, 7, 4, 5, 12, 3, 9, 5, 6, 4.
   (b) 67, 83, 69, 65, 28, 36, 37, 95, 21, 25, 22, 47, 29, 54, 32, 65, 78, 94.
   (c) 2·1, 3·6, 5·8, 4·7, 2·5, 1·4, 8·9, 4·6, 2·5, 1·4, 2·3, 6·5, 6·8, 2·7, 2·9, 1·3, 4·4, 3·7.

2. Calculate the **mean** in each case:
   (a) 8, 6, 6, 5, 7, 9, 9, 8, 6, 5, 4, 8, 7, 6, 3, 4, 5, 5, 4, 3.
   (b) 5·8, 7·2, 8·1, 4·9, 7·3, 7·7, 9, 6, 6·9, 8·1, 5·2, 7·8, 9·3, 6·7, 7, 7, 5·9, 9·1, 8·2, 4·8.
   (c) £12·20, £12·60, £13·50, £14·20, £16·80, £12·80, £11·40, £15·60, £17·20, £18.

3. Find the **median**:
   (a) 6, 3, 5, 5, 2, 4, 7, 7, 8, 9, 1, 1, 4, 5, 8, 8, 7, 4, 5, 2, 9.
   (b) £16, £16, £17, £19, £20, £21, £16, £17, £18, £15.
   (c) 35 kg, 28 kg, 27 kg, 24 kg, 5 kg, 26 kg, 27 kg, 19 kg, 23 kg, 25 kg, 27 kg, 15 kg, 15 kg, 35 kg.

4. In the following, what is the **mode**?
   (a) 2, 2, 3, 3, 3, 3, 4, 4, 4, 4, 4, 5, 5, 6, 6, 6, 6, 7, 7, 7, 7, 8, 8, 9.
   (b) 5, 3, 9, 2, 3, 6, 8, 1, 2, 5, 5, 8.
   (c) 256, 250, 257, 251, 251, 251, 259, 250, 251 251, 252, 253, 253, 250, 254, 254, 250, 255, 256, 251, 256, 258, 259.

5. The children of Langbank took part in a fun-run around the village to raise money for charity. These are the number of laps completed by the under 7s.

15	24	13	26	22	17	8	26
16	26	18	26	21	20	14	21

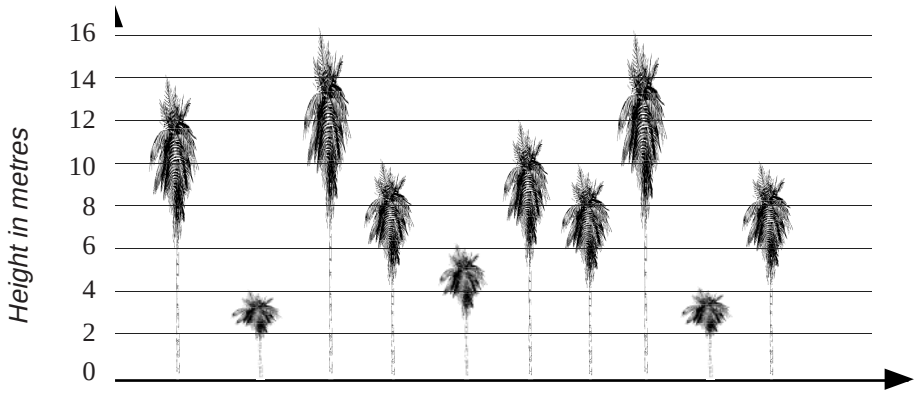
   For the number of laps completed, find:
   (a) the range (b) the mean (c) the median (d) the mode.

6. Here are the heights, to the nearest cm, of nine girls:

   166 cm 176 cm 162 cm 180 cm 161 cm 176 cm 165 cm 175 cm 172 cm

   Calculate: (a) the range of heights
   (b) the mean height (to the nearest cm)
   (c) the median height.

7. Every morning of his Caribbean holiday, Gerald would climb a different palm tree. The top of each figure in the diagram shows the heights of the trees which he climbed.



Find: (a) the range (b) the mean (c) the median (d) the mode.

8. In the following examples, calculate the range, the mean, the median and the mode. In each case, state which 'average' best illustrates the catalogue of numbers.

(a) 18 18 19 20 20 20 21 25 163.
(b) 34 34 34 34 36 36 37 57 85.
(c) 56 56 57 58 59 60 62 65 67.

9. Brenda and her brother went to Disneyland for Easter. They kept a note as to how long they had to queue to get on the rides. Here are their results (in minutes):

16 30 25 20 10 110 10 22 40 17

(a) Calculate the mean time waited.
(b) Find the median and modal times waited.
(c) Say which 'average' should be chosen to give a fair representation of the data. Give two reasons for your choice.

10. Frank and his pals decided to have a day at an army assault course. They each recorded the number of press-ups they could do in one minute before attempting the assault course and again at the end of the course.
The results were:

Name	Alf	Bert	Karl	Dino	Ed	Flo	Jim	Ned	Ian	Jan
Before	48	46	48	40	45	51	47	40	50	46
After	36	38	42	35	36	46	32	28	41	38

(a) Which person seemed to be affected most by the assault course? Reason??
(b) Find the RANGE for (i) the 'before' data (ii) the 'after' data.
(c) Calculate the MEAN for both sets of data.
(d) Comment on the results.
(e) Was Ian above or below average both times?

11. Mary and Beth played eight rounds of golf together during their summer holidays.

Mary scored:	71	78	76	76	79	75	75	74
Beth scored:	76	73	74	77	74	74	75	73

(a) Calculate the range and mean for Mary.
(b) Calculate the range and mean for Beth.
(c) Who had: (i) the lowest score (ii) the highest score?
(d) Who scored better most of the time ?

12. Thirty pupils in Primary Four were given a 30 word spelling test.
The teacher was to set a 'pass' mark. Here are the marks out of 30:

18	21	23	19	24	25	17	20	18	18
17	22	20	25	22	19	16	21	22	16
18	23	24	19	15	18	24	23	30	29

(a) Rewrite the marks in order, starting at the lowest.
(b) What is the range of marks?
(c) Calculate the mean, mode and median.
(d) If you were the teacher, what would your pass mark have been? Give a reason!

13. Mrs. Potts buys Bargain T Bags with an advertised 'average 50 T Bags' in every box.
She buys 6 boxes and counts the tea bags in each box! Here is what she finds:

49 49 52 50 52 52

(a) Calculate the mean number of tea bags.
(b) What is the mode?
(c) Should she take the boxes back to the shop and complain?
(d) What gives a clearer picture here..... the mean or the mode?

14. East Athletic had a mean score of four goals per game in their first nine games!
a) How many goals had they scored?
b) In their next game they scored six, but failed to score in their next four matches.
What was their mean score then?

15. Five sisters have an average (mean) age of 19.
Jean is 14, Joan is 18, Jan is 20 and Josephine is 17.
What age is the eldest sister, Mags?

16.

17	9
42	11
18	63
26	18
80	

Here are the number of runs scored by a cricketer, but unfortunately <u>one</u> score is missing.

If his **mean** score is 29 over the ten games, calculate what the missing score must have been.

Range, Mean, Median and Mode from a Frequency Table

Exercise 2

1. Jasmine is playing a game of Junior Darts on her children's dart board.
   The highest she can score is seven. Here are some of her early scores:

4	3	2	2	4	6	7	5	4	7
1	2	1	1	3	5	6	4	1	4

   (a) Draw up the frequency table and complete it.

SCORE	TALLY	FREQUENCY	SCORE × FREQUENCY
1			
2			
3			
..			
..			
..			

   (b) Calculate her mean score, using the frequency table above.
   (c) What is the range of the distribution?
   (d) What is i) the modal ii) the median score?

2. These frequency tables show the points given to two teams in a TV challenge quiz.
   For each team, calculate:
   (a) the mean
   (b) the median
   (c) the mode
   (d) which team has the better 'average' if:
      (i) the mean is used
      (ii) the median is used
      (iii) the mode is used.

The Groupies

Points	0	1	2	3	4	5	6
Frequency	2	0	3	5	4	2	3

The Magpies

Points	0	1	2	3	4	5	6
Frequency	1	4	3	5	2	6	0

3. Abid made a survey of the ages of children who appeared on a bouncy castle in a park one summer's morning.

AGE	2	3	4	5	6	7	8	9	10
Frequency	1	10	11	10	7	5	4	3	2

   (a) What was the range of the distribution?
   (b) What was the modal age?
   (c) Copy the diagram and add in another row to enable you to calculate the mean age. (correct to 1 decimal place)
   (d) Find the median age.

4. The pupils in Castle High School's top maths class looked out of their classroom window and noticed that the grass had not been cut for a long time.
Their teacher, Mrs. McKenneth, estimated that the grass was about 15 cm high, but the pupils wanted to give their estimates.
A table of results was drawn up.

Height (cm)	Frequency	Height x Frequency
13	2	COPY
14	4	
15	2	
16	2	
17	10	
18	1	

(a) Copy and complete the table and say how many pupils took part.
(b) What was the range?
(c) Calculate:
  (i) the mean
  (ii) the median
  (iii) the mode.
(d) What do you think of Mrs. McKenneth's estimate?

5. Quix's Chocolate Company claim that there are 20 mini-quix bars in an economy pack. Some economy packs were purchased and the contents were as follows:-

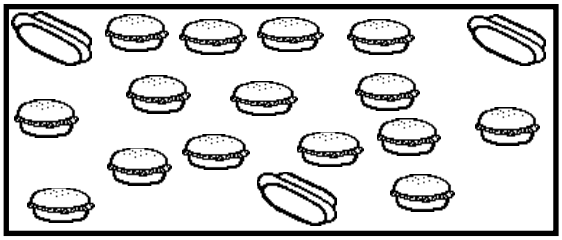
No. Bars	Frequency	Number x Frequency
18	2	COPY
19	9	
20	8	
21	5	
22	5	
23	5	
Total		

(a) Copy and complete the table.
(b) What was the range in the number of bars?
(c) Calculate: (i) the mean (ii) the median (iii) the mode.
(d) Which average did the company use to back their claim?

Probability

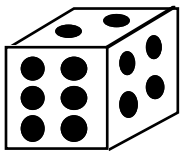
Exercise 3

1. Blind-folded, Jason pointed to an advert for fast-food.

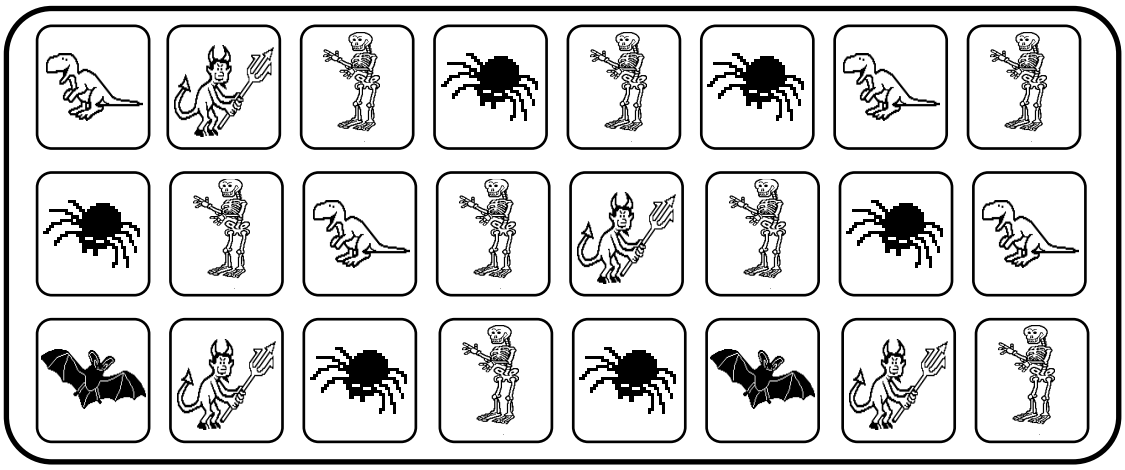


If he pointed to a picture, what is the probability that he pointed to:
(a) a hot dog
(b) a hamburger?

2. On a normal six-sided die (numbered 1 to 6), what is the probability of rolling:
(a) a four (b) an odd number
(c) a number less than 3 (d) a prime number?



3. The 'ghostly' dart board is shown below. You are allowed 1 throw only with a dart.



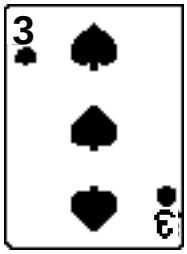
What is the probability that if you hit a picture, it will contain:
(a) a skeleton (b) a devil (c) a bat
(d) a spider (e) a dinosaur?

4. There are 49 numbers which can be drawn in the National Lottery.
What is the probability that the first number out will be:
(a) 44 (b) even
(c) a square number (d) a multiple of 7?

5. Arnold reckons that his chances of holing a putt is 70% (or 7 out of 10).
What is the probability that he won't hole it?

6. A pack of 52 playing cards are laid out, face down on a table. You have to pick a card. What is the probability that it will be:

(a) a three (b) the three of spades
(c) a face card (d) a black card
(e) a heart?



7. Henrietta watches five TV channels

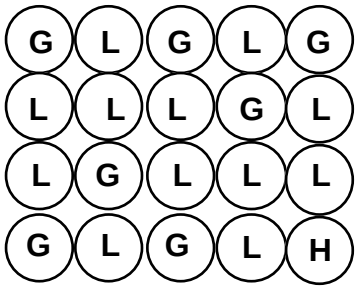
BBC1 – BBC2 – STV – Channel 4 – Channel 5.

What is the probability that that she will select at random:
a) STV b) a channel with no breaks for adverts?

8. **Win a Goldfish or a Hamster!**

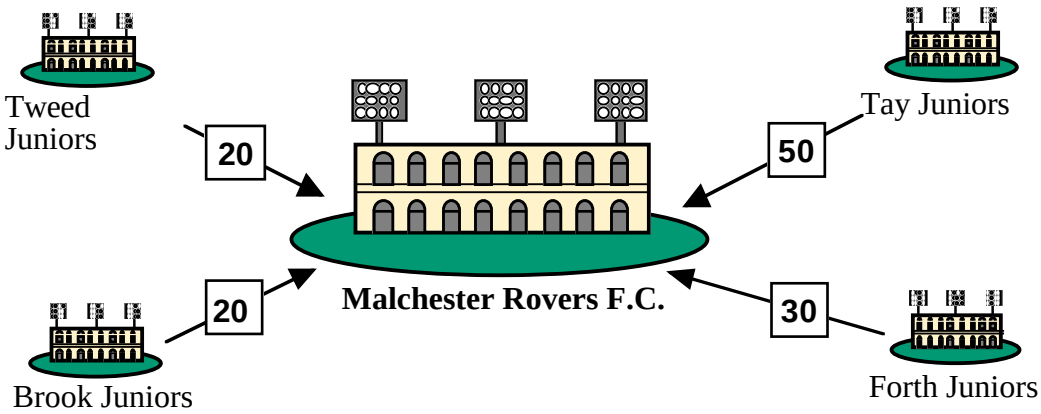
All you have to do is throw a ping-pong ball into a narrow-neck bowl.

G for Goldfish. **H** for Hamster. **L** for Lose.



If your ball lands in a bowl, what is the probability of:
(a) winning a goldfish (b) winning a hamster
(c) winning (d) losing?

9. Malchester Rovers get most of their young players from four junior clubs. The diagram below indicates the number which they called up last season.



(a) How many new young players were called up?

If one of these young players was chosen at random,

(b) what was the probability that the player came from Tweed Juniors?

(c) what was the probability that the player came from Tay Juniors?

(d) what was the probability that the player did **not** come from Forth Juniors?

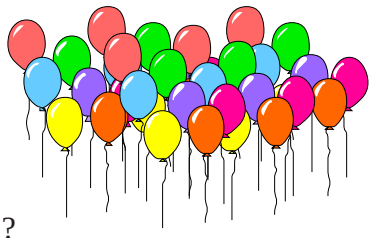
10. A letter is chosen at random from the name THE ROLLING STONES**.**
Calculate:

(a) the probability it is an L

(b) the probability it is a vowel.

(c) the probability it is <u>not</u> a vowel.

11. At the town fair, **700** red, **800** blue and **1000** yellow balloons were let off.
Each of them had a prize-winning ticket attached.
If you were to catch a balloon, what is the probability that it would be:



(a) red (b) yellow
(c) red or yellow (d) not blue (e) green?

12. At Flo's cafe, Flo carried out a survey on what people had to drink after church on a Sunday.
The results are shown below:

Tea	𝍸 𝍸 𝍸 𝍸 𝍸 II	**Coffee**	𝍸 𝍸 𝍸 𝍸
Milk	𝍸 𝍸 𝍸 𝍸 III	**Fresh Juice**	𝍸 I
Coke	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 IIII	**Others**	𝍸 IIII

What is the probability that if one person was chosen at random, he/she would be drinking:

(a) Tea (b) Coke (c) Others?

MATHEMATICS 2 (INTERMEDIATE 1)

Checkup exercise 2

1. Find the **range**, the **mean**, the **mode** and the **median** in the following:
   (a) 1, 3, 5, 7, 9, 11, 14, 14
   (b) £11, £15, £3, £6, £2, £14, £7, £13, £11, £10, £7
   (c) 5cm, 2cm, 2cm, 1cm, 3cm, 3cm, 3cm, 4cm,
   4cm, 3cm, 3cm, 4cm, 2cm, 3cm, 2cm, 4cm.

2. In a maths exam, everyone who sat it got between 51% and 56%.
   Here is a frequency table displaying the results.

Mark	Frequency
51	3
52	4
53	7
54	6
55	3
56	1

   (a) What is the **range** of marks?
   (b) What is the **modal** mark?
   (c) Find the **median** mark.
   (d) Calculate the **mean** mark, giving your answer correct to 1 decimal place.

3. A paper boy was informed by his new employer that previous paper boys had been paid:
   £6·56 £9·81 £4·81 £5·96 £8·46 £5·56 per week.

   He was now being offered the **median** of these amounts, but being a true statistician, he said that he would prefer the **mean**!
   Was he correct? Explain fully!

4. A Sunday school teacher was asked about the ages of those in her group.
   She replied:
   4, 5, 5, 6, 6, 7, 7, 7, 7 and 19!!
   (a) Calculate the **mean** age.
   (b) How many of the group were below the mean age?
   (c) Was the mean a good choice for ‘average’?
   (d) What ‘average’ (**mean**, **mode** or **median**) should have been used here?

5. The owner of a shoe shop is ordering from the manufacturer. In order to find out which size of shoe to order most of, he looks carefully for a while at the size of shoes which ladies buy in his shop.
Here is one common sample of shoe size he found:

3 3 3 3 4 4 5 5 6 6 6 6 6 6 7

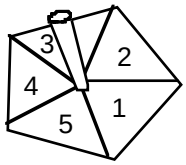
(a) Calculate the mean, mode and median.
(b) For **his** own purpose, which one should the shop owner make the most use of?

6. Richard gets the following marks (out of 10) for his spelling tests.

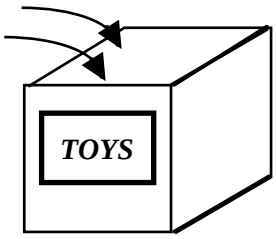
9 5 5 4 8 9 7 3 4 4 6

(a) Find: (i) the mean (correct to the nearest whole number).
(ii) the mode.
(iii) the median.
(b) Richard's 'average' mark will be used by the teacher in his report.
Which 'average' - mean, mode or median, would Richard prefer?

7. A five-sided spinner has a number (1 - 5) on each of its sides.
When it is spun,
(a) what is the probability that it stops at:
(i) a 2 (ii) an even number (iii) an odd number?
(b) what is the probability that:
(i) it won't stop (ii) it will stop at one of the numbers 1 - 5?



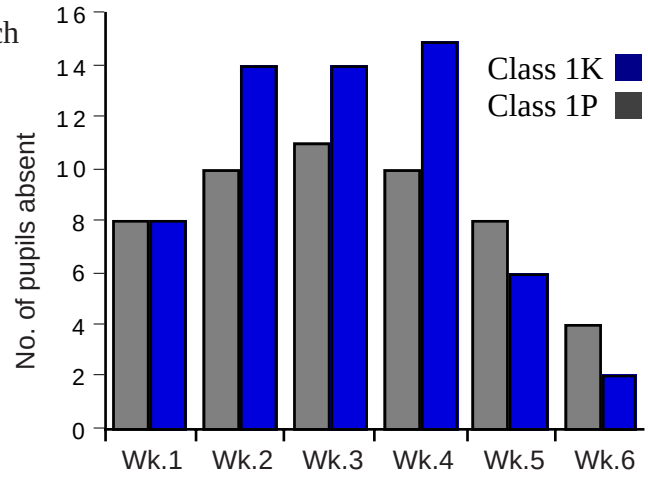
8. Mrs. Young put her two sons' toys into **one** box in the dark attic.
Albert's toys were - **3** planes, **4** cars, **2** jigsaws and **1** construction set.
Andrew's toys were - **5** books, **4** cars and **1** football.
Albert sneaks into the attic looking for a football.
In the darkness, he plunges his hand into the box!
What is the probability that he will first touch:



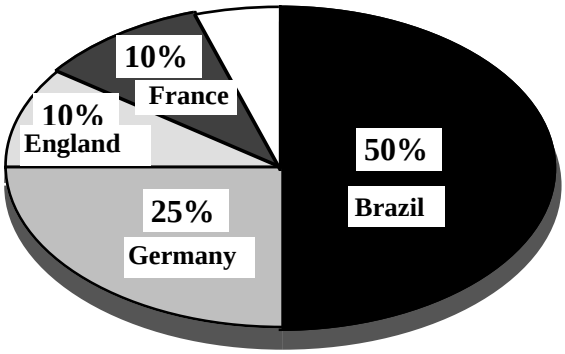
(a) a book (b) a plane
(c) a car (d) the football
(e) one of his own toys (f) one of Andrew's toys?

MATHEMATICS 2 (INTERMEDIATE 1)
Specimen assessment questions for Graphs, Charts and Tables

1. The graph shows class absences which were recorded during a chicken-pox epidemic over 6 weeks in 1996.
   (a) Which class was more affected first by the epidemic?
   (b) On how many weeks were there more than 10 pupils absent in class 1K?
   (c) What was the largest number of pupils absent on any day in either class?
   (d) How many pupils, in total, were absent over the period?



2. On Sat. 11th. Oct. 1997 Scotland defeated Latvia 2-0 to qualify for the World Cup finals in France in 1998.
   To assess Scotland's chances, a survey was carried out, asking people in the street which team would win the World Cup.
   The replies from **500** people are shown in the pie-chart.



   (a) How many said
      (i) Brazil (ii) Germany (iii) France?
   (b) The remaining section of the chart shows the people who said 'Scotland'.
   How many was that?

3. The marks of eight pupils from tests in History and Geography are shown below.

Pupil's Name	Alice	Dawn	Gerry	Colin	Freda	Sally	Harry	Will
History	5	6	10	11	13	15	18	22
Geography	8	10	13	14	16	17	20	25

   (a) Draw a SCATTER DIAGRAM using the History marks for the *horizontal* axis and the Geography marks for the *vertical* axis.
   (b) Describe the general trend of the graph.
   (c) Draw in a line of best fit.
   (d) Use the line to estimate the Geography mark if the History mark was 20.

4. The following marks are those scored by pupils in a Primary 4 science test.
   (a) Draw a FREQUENCY TABLE to show this.
   (b) How many sat the test and what was the top mark ?
   (c) How many scored more than 7?

9	3	3	4	6	7	5	4	2	5	5	7	1	7	6
3	6	5	7	4	8	7	5	4	5	8	6	2	6	4
7	5	3	6	4	8	6	4	4	5	6	5	7	10	7
6	9	7	8	6										

MATHEMATICS 2 (INTERMEDIATE 1)
Specimen assessment questions for Use of Simple Statistics

1. The heights (to the nearest cm) of some girls are given below.

163 157 161 169 166 157 167 163 157 161

What is:

(a) the range
(b) the median height
(c) the modal height
(d) the mean height?

2. A golfer (who, of course, likes to shoot low scores), plays a round of golf every day on his week's holiday.

He scores: 69 70 90 73 71 70 82

(a) Which of his three 'average' scores - the mean, the median or the mode, would he prefer?
(b) If he accepts this 'average', comment on his round of 69.

3. The following table shows the number of children per family in the families of the pupils in a second year class.

Number of Children	1	2	3	4	5	6	7	8
Frequency	4	3	10	6	4	2	1	0

(a) Draw a frequency table to show this, but with an extra column for 'Number of Children $\times$ Frequency'.
(b) Calculate (to 1 decimal place), the mean number of children per family.
(c) Find: (i) the median (ii) the mode of the distribution.

4. A bag contains 40 sweets. 30 are 'Cola Bottles' and 10 are 'Mint Chews'.

If a sweet is picked at random, what is the probability that it will be:

(a) a 'Cola Bottle'
(b) a 'Mint Chew'
(c) a 'Pineapple Chunk'
(d) a 'Cola Bottle' or a 'Mint Chew'?

Answers to Graphs, Charts and Tables

Exercise 1

1. (a) 3 (b) 16 (c) 28 (d) 11 (only child) - no brother/sister
2. (a) Ch 1 (b) Ch 5 (c) Ch 2 Ch 4 (d) 97·5 million (e) Ch 3
3. (a) i) Majorca ii) Ibiza (b) Scale too large to read
   (c) Sp 2·4 million Ibiza 1·3 m Greece 1·8m Maj 4·7m Gran C 3·2m
4. (a) S1 (b) S4/5/6 (c) 30 (d) S1 & S2
   (e) S3 (f) 80 (g) All S6 prefer money
5. (a) £12 million (b) £54 million (c) £6 million (d) £30 million

Exercise 2

1. (a) i) 8°C ii) –4°C (b) 9°C (c) Tues- Wed Wk 1 (d) Falling Temp.
2. (a) 9 a.m. (b) 25°C (c) 4 p.m. (d) Heating off / open window?
   (e) 11 a.m. - 2 p.m. (f) 5 hours (g) 4 p.m.
3. (a) Cold weather (b) Jan-Feb, March-Apr, July-Aug (c) April
   (d) Aug-Sept by 7000
   (e) July-Aug - summer holidays (f) Go on winter holiday to sun

Exercise 3

1. (a) i) Trigonometry ii) Calculus (b) 25% (c) $^1/_7$
2. (a) i) 20 ii) 40 (b) 60 apples (c) 340 apples
3. (a) i) $^1/_2$ ii) $^1/_8$ (b) 8
4. (a) £3 200 000 (b) 21% (c) £448 000 (d) 18°
5. (a) All Bran = 180° Corn Fl. = 120° Frost. = 15° Weet. = 45°
   (b) i) 120 ii) 80 iii) 30 iv) 10

Exercise 4

1. (a) Rising (b) Falling (c) Slow rise.
2. (a) 10 a.m. (b) Cheaper rate
   (c) Before 10 - high, then fall to noon, slight rise at lunch, then fall away till 6p.m.
   - quite a rise till 8 p.m. then as day ends, trend falls.
3. (a) 1000 (b) 1215 (c) 30 miles (d) Flat tyre?? (e) 30 mins. approx.
4. Decrease in use of train - bus about same - increase in car & plane
   More people have cars and more confidence in air travel.
5. Graph 4. Fills steadily, but quickly - then fills steadily, but slower.

Exercise 5

1. (a) 90 cm (b) 60 kg (c) Ann & Jan (d) Ann (e) Fred
2. (a) As temp rises - sales rise (b) 20 (c) Around 18 - 20°C
3. (a) More miles travelled - dearer the fare (b) no travel - no cost (c) Around 4 miles
   (d) about £2·40 – £2·50

4. (a) 1 & $1^1/_2$ (b) the older the yacht - the smaller its value
(c) 3-4 years (d) about £60000

5. (a) A - the more you apply, the better the growth B - apply more, but growth static
C - apply more, but height varies
(b) Use A, - for better, more reliable, controlled growth.

Exercise 6

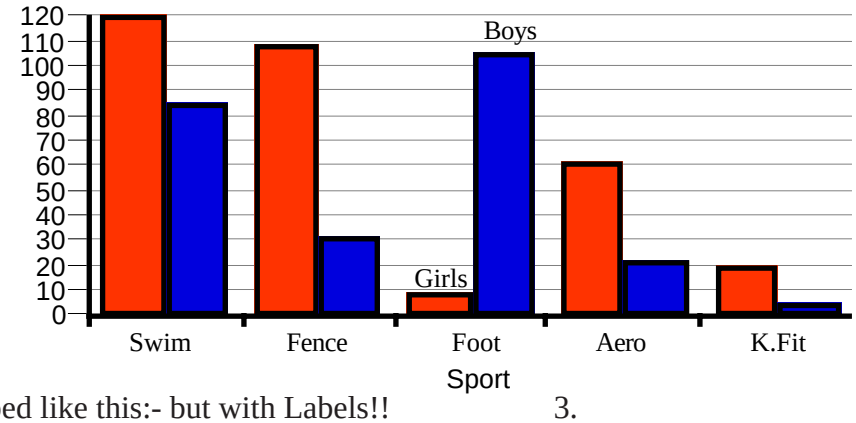
1. 14 17 21 21 23 27 29 31 32 34 36 36 37
38 40 41 41 42 48 49 51 53 54 54 61 62 16 weeks

2. £187 £219 £225 £324 £337 £369 £413
£522 £533 £555 £630 £658 £745 £773

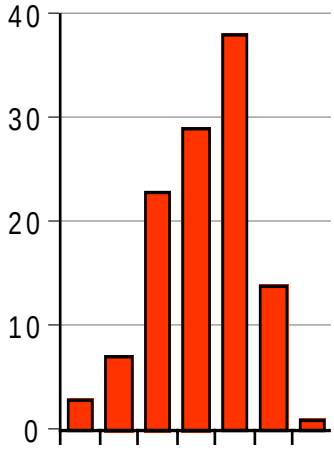
3. (a) i) 11 a.m. ii) 4 p.m. (b) 9

Ex 7

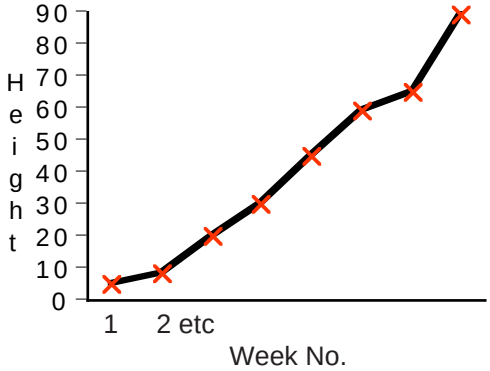
1.



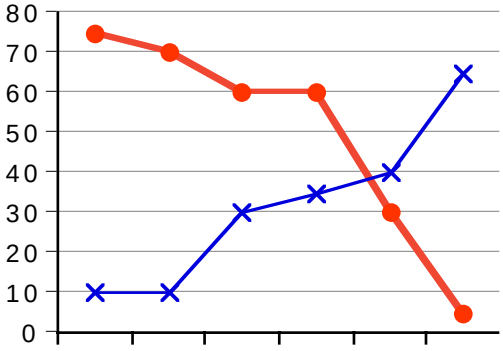
2. Shaped like this:- but with Labels!!



3.

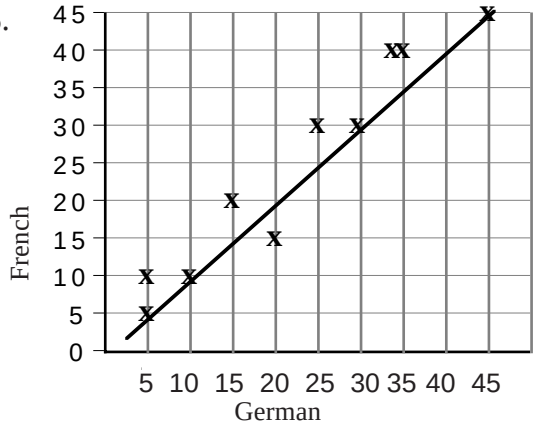


4



In Jan. due to bad weather, more go for hot school lunch.
As year goes on, number of school lunches fall while own food increases.
By June, many more bring own - not many in school.

5.



(c) French marks are higher (not by much)
Pen & Rab got same in both
If a student is good at German, he or she will be good at French.

(d) By eye

(e) Estimate 35

(f) Flo's German marks are higher

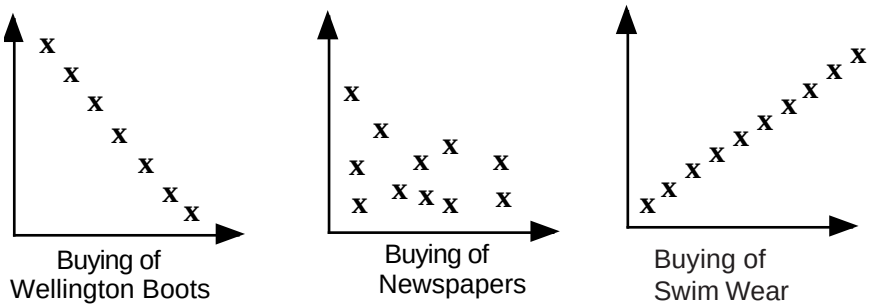
6. Draw Scatter Graph with correct axes and labels
(c) Estimate 17/18 mins.

7. Draw Scatter Graph with correct axes and labels
(c) i) 14cm^3 ii) 45cm^3

8. Draw Scatter Graph with correct axes and labels
(c) 16°C (d) 17mm

9. Draw Scatter Graph with correct axes and labels
(c) i) about 150 ii) about 550
(d) 42kg.

10.



11.

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

7 | 9 = 79

12.

Machine 1		Machine 2
	199	8 9
2 5 0 6 7	200	5 2 4 0 5 7 1 5 9 3
4 1 8 5 9 9 6 3 7 7 3 0 9 9 5 3 6 2 3 8 4 2	201	3 6 8 9 9 7 6 2 8 7 1 0 6 3 4 4
0 1 1 0 3 0 0 6 5 0 1 8	202	0 0 1 9 0 0 3 1 0 2
8	203	3 0

201 | 6 represents 2016

Machine 1 more bunched, gives more 201's. Machine 2 gives more of the lesser 200's but gives more 203's (not many!).

13. (a)

Class 1X		Class 1Y
7 5	0	8
9 7 4	1	0 1 3 5 7 8 8 8 9
9 9 8 7 7 7 7 6 6 6 5 4 4	2	0 2 3 3 4 5 5 6 6
9 8 6 3 1 1	3	
3	4	8 9
	5	0 0 0 0

2 | 3 represents 23

(b) More passed in 1X, but 1Y had the highest marks.

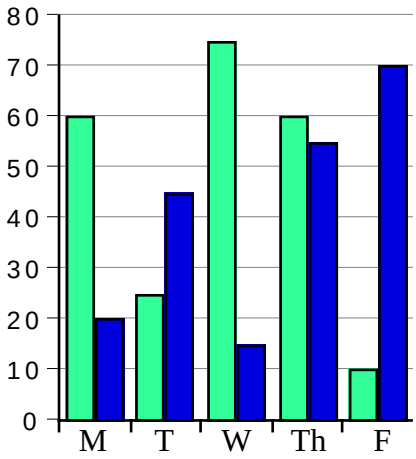
Exercise 8

1. (a) 16 (b) 34
2. Table with frequencies 4, 11, 9, 6, 5, 1 = 36
   (a) Fred (b) Alice (c) 3.
3. Table with:

Goals	0	1	2	3	4	5	6	7	8	9	10
Teams	5	10	6	2	5	2	1	2	1	1	1

Checkup Exercise 1

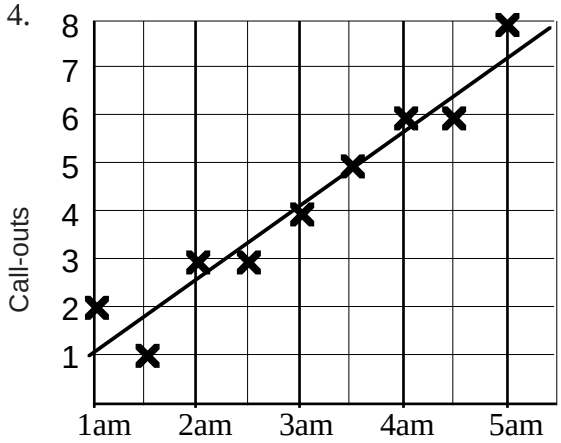
1



2. (a) i) 0 – 1000 ii) 41 – 42 thousand
   (b) 18000 approx.
   (c) 1992 - 1996
   (d) Rising slowly, then fast!

3. (a) i) 50% ii) 25% iii) 10%
   (b) i) 60 ii) 30 iii) 150
   (c) 150

4.



(b) Rising - later it gets - more call-outs

5.

0	4 6 3 1 8 2 4 9
2	3 5 9 8 7 8 5 2
3	5 6 8 9 97
4	7 5 5 7 2 4 4 7 6 1 8 4 4
5	0 0

3 | 8 represents 38

6. (a) Table with: B = 21, C = 10, Ch = 14, CN = 10, V = 2, H = 6, U = 2.
   (b) 2
   (c) Beefburger
   (d) 4 (e) 65

Answers to Use of Simple Statistics

Exercise 1

1. (a) 10 (b) 74 (c) 7·6
2. (a) 5·9 (b) 7·1 (c) £14·43
3. (a) 5 (b) £17 (c) 25·5kg
4. (a) 4 (b) 5 (c) 251
5. (a) 18 (b) 19·6 (c) 20·5 (d) 26
6. (a) 19 cm (b) 170 cm (c) 172 cm
7. (a) 12 m (b) 10·2 m (c) 10 m (d) 10 m
8.

	Range	Mean	Mode	Median	Best
(a)	145	36	20	20	Med/Mode
(b)	51	43	34	36	Mode
(c)	11	60	56	59	Mean / Median

9. (a) 30 mins (b) Med = 21 mins Mode = 10 mins
   (c) Med. Mean is put out by 110 mins. Mode...only 2 at 10 mins..not enough to justify
10. (a) Jim - 15 less (b) i) 11 ii) 18 (c) Before = 46·1 After = 37·2
    (d) At end...wider range and mean lower (e) Above both times.
11. (a) R 8 M 75·5 (b) R 4 M 74·5 (c) i) Mary ii) Mary (d) Beth
12. (a) List Marks in order (b) 15 (c) Mean = 20·9 Mode = 18 Median = 20·5
    (d) 20 or 21 Mean & median close to each other and small range
13. (a) 50·7 (b) 52 (c) No! (d) Mode
14. (a) 36 (b) 3 15. 24 16. 6

Exercise 2

1. (a) Complete table (b) 3·6 (c) 6 (d) i) 4 ii) 4
2. (a) B = 3·4 D = 3 (b) B = 3 D = 3 (c) B = 3 D = 5
   (d) i) The Groupies ii) neither iii) The Magpies.
3. (a) 8 years (b) 4 (c) 5·3 (d) 5
4. (a) 21 (b) 5 cm (c) i) 15·8 cm ii) 17 cm iii) 17 cm
   (d) Not great! too low.
5. (a) Check table (b) 5 (c) i) 20·5 ii) 20 iii) 19
   (d) Median

Exercise 3

1. (a) $^3/_{18} = {}^1/_6$ (b) $^5/_6$
2. (a) $^1/_6$ (b) $^1/_2$ (c) $^1/_3$ (d) $^1/_2$
3. (a) $^8/_{24} = {}^1/_3$ (b) $^4/_{24} = {}^1/_6$ (c) $^2/_{24} = {}^1/_{12}$ (d) $^6/_{24} = {}^1/_4$ (e) $^4/_{24} = {}^1/_6$
4. (a) $^1/_{49}$ (b) $^{24}/_{49}$ (c) $^1/_7$ (d) $^1/_7$
5. 30% (or 3 out of 10)
6. (a) $^1/_{13}$ (b) $^1/_{52}$ (c) $^3/_{13}$ (d) $^1/_2$ (e) $^1/_4$
7. (a) $^1/_5$ (b) $^2/_5$
8. (a) $^7/_{20}$ (b) $^1/_{20}$ (c) $^8/_{20} = {}^2/_5$ (d) $^3/_5$
9. (a) 120 (b) $^1/_6$ (c) $^5/_{12}$ (d) $^3/_4$
10. (a) $^1/_8$ (b) $^5/_{16}$ (c) $^{11}/_{16}$
11. (a) $^7/_{25}$ (b) $^2/_5$ (c) $^{17}/_{25}$ (d) $^{17}/_{25}$ (e) 0
12. (a) $^{27}/_{124}$ (b) $^{39}/_{124}$ (c) $^9/_{124}$

Checkup Exercise 2

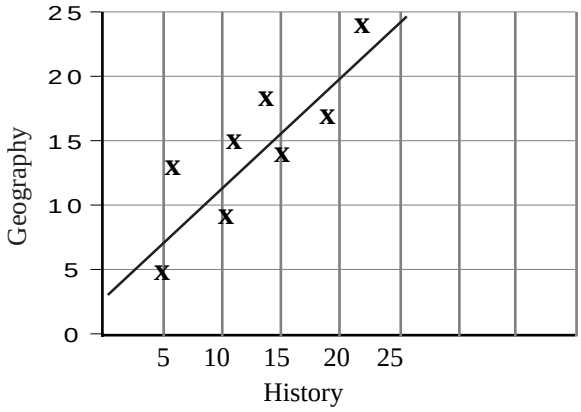
1.

	Range	Mean	Mode	Median
(a)	13	8	14	8
(b)	£13	£9·90	none	£10
(c)	4cm	3cm	3cm	3cm

2. (a) 5 (b) 53 (c) 53 (d) 53·2
3. Median = £6·26, Mean = £6·86 Yes. He was correct!
4. (a) 7·3 (b) 9 out of 10! (c) No, the teacher included herself, knocking the mean out
   (d) Median. Mean, without age 19, is 6.
5. (a) Mean 4·9 Mode 6 Median 5
   (b) Mode will tell him which size he sells most.
6. (a) i) 6 ii) 4 iii) 5 (b) Mean gives better mark.
7. (a) i) $^1/_5$ ii) $^2/_5$ iii) $^3/_5$ (b) i) 0 ii) 1
8. (a) $^1/_4$ (b) $^3/_{20}$ (c) $^2/_5$ (d) $^1/_{20}$ (e) $^1/_2$ (f) $^1/_2$

Specimen Assessment Questions for Graphs, Charts and Tables

1. (a) 1K (b) 3 (c) 15 (d) 110
2. (a) i) 250 ii) 125 iii) 50
   (b) 25
3.



(b) If student is good at History then he/she is good at Geography
(c) See graph
(d) Round about 20 also!

4. (a) Simple Freq. table (b) 50 sat 10 top mark (c) 7

Specimen Assessment Questions for Use of Simple Statistics

1. (a) 12 cm (b) 162 cm (c) 157 cm (d) 162·1 cm
2. (a) Mode (b) Good! 1 better than ‘average’. (mean = 75, median = 71)
3. (a) Freq. Table (b) 3·4 (c) i) 3 ii) 3
4. (a) $^3/_4$ (b) $^1/_4$ (c) 0 (d) 1