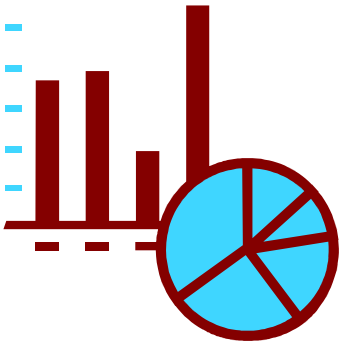


Enabling world-class education

30-4-10 Handling Data

Days: 1 and 2 **Topic:** Specify, Plan Collect and Record Data

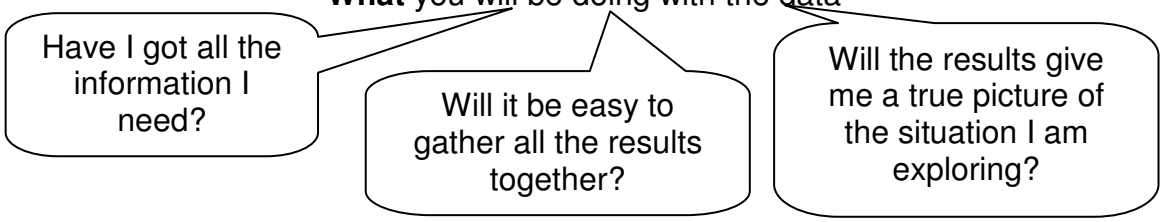
You need to be able to:

- recognise the difference between **primary** and **secondary** data
- design good ways to collect data such as experiments, survey or questionnaire
- understand the importance of the size of a set of data
- see possible sources of bias and plan to avoid them
- design 2-way tables
- distinguish between notation such as **>** 80 and **≥** 80

You will need to think about:

How you are going to collect data:

What you will be doing with the data



Always consider if what you are planning is fair

Remember:

The larger a survey is the more likely it is to be a good representation of the truth about its topic

Quick Questions

1. Complete this two-way table showing the results of a survey of 95 Y10 pupils and their lunch habits:

	School Lunch	Packed Lunch	Other	Totals
Female	21		18	52
Male		5		
Totals	45			95

2. Match each word to its definition:

Primary Data	Data which gives opinions or ideas, often recorded in words
Secondary Data	Data which is collected first hand, by the person presenting the project
Discrete Data	Data which is countable, such as number of pets
Qualitative data	Data which has been gathered from another source such as the government

3. In a survey about how often fizzy drinks are bought a questionnaire asks people to record purchases in this way:

a lot ☐ a few ☐

Write down a reason why this is not a good recoding method.
Suggest a better alternative.

4. Part of a survey includes a request for age indication as follows:

Below 20 20-30 30-40 40-50 More than 50

Suggest changes that need to be made to the middle categories.
Why are these changes necessary?

5. In a survey to see if more holidays are taken in the winter or the summer it was decided to ask 30 pupils from one year group the question 'do you take holidays in the winter or the summer?'
Make 2 suggestions in order to improve this plan.

Past Paper Questions

1. Some Year 11 pupils investigate the amount of time pupils in their school spend on homework.

They conduct a survey and ask 30 pupils the following question:

> **"How many minutes homework did you do last night?"**

Here are their results.

25	120	55	10	40
60	75	75	45	65
45	90	45	110	75
90	45	90	60	45
15	25	45	35	55
75	20	30	45	100

(a) Draw a frequency table, with equal class intervals, to show this information.

The first interval should be 'thirty minutes or less'.

(3)

(b) The pupils conducted this survey on a Thursday morning.

They asked each person in their Maths set how long they had spent on their homework the previous night.

Suggest three reasons why their sample may not have been typical.

.....

.....

(3)

(c) Describe two ways in which they could improve their sample.

.....

.....

(2)

2. (a) A headline in a newspaper this year stated;

> **Students skip Breakfast**
>
> *Our survey shows that few students are eating cereals, fruit, or bread for breakfast.*
> ***In fact they eat nothing at all!***

You are asked to conduct a survey to find out what students eat for breakfast.

Design an observation sheet to collect the data you need.

Invent the first 20 entries on your data sheet. (3)

(b) The newspaper made the following statement about the eating habits of teenagers.

> **Only one in a hundred teenagers eat fruit and vegetables each day. Over half eat no vegetables other than chips.**

You are asked to find out whether this statement is true in your area.

Give three questions you could ask teenagers to see if what the article says is true in your area.

.....

.....

(3)

3. (a) The table shows the age and gender of people taking part in a survey.

	Age group			
	Under 16	**16 to 21**	**22 to 64**	**65 and over**
Male	18	9	5	0
Female	7	3	4	0

Give **two** reasons why the data collected may not be representative of the whole population.

Reason 1

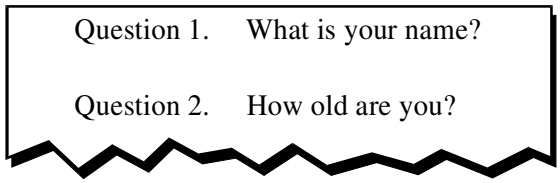
.....

Reason 2

.....

(2)

(b) People taking part in the survey were asked to complete a questionnaire. The first two questions are shown.



(i) What is wrong with asking question 1?

.....

(1)

(ii) What is wrong with asking question 2?

.....

(1)

(iii) Rewrite question 2 so that it would be more acceptable.

.....

(1)

4. Emma reads in a magazine that there is a link between the number of children and the number of pets in a family.

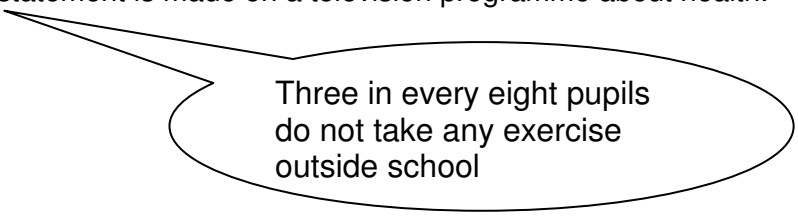
(a) Design a two-way table to record the number of pets and the number of children in a sample of families.

(3)

(b) Complete your two-way table by inventing data for eight families.

(1)

5. This statement is made on a television programme about health.



(a) Matthew decides to do a survey in his school about the benefits of exercise.
He decides to ask the girls' netball team for their opinions.
Give **two** reasons why this is **not** a suitable sample to take.

Reason 1:

.....

Reason 2:

.....

(2)

(b) This is part of Matthew's questionnaire.

Question	*Don't you agree that adults who were sportsmen when they were younger suffer more from injuries as they get older ?*
Response	*Tick one box*

☐ *Yes* ☐ *Usually* ☐ *Sometimes* ☐ *Occasionally*

(i) Write down one criticism of Matthew's question.

.....

(1)

(ii) Write down one criticism of Matthew's response section.

.....

(1)

6. A mobile phone company wants to build a transmitter mast on land belonging to a school.
The company offers the school £50 000 for the land.
The local paper receives 20 letters objecting to the proposal and 5 letters in favour.
One of the paper's reporters writes an article in which he claims

'Objectors outnumber those in favour by 4 to 1'

(a) Give **two** reasons why the newspaper reporter's claim may **not** be correct.

Reason 1

.....

Reason 2

.....

(2)

(b) The school decides to take a **stratified** sample of the views of local people about the proposal.

Give **two** factors that should be taken into account when selecting the sample.

Factor 1

.....

Factor 2

.....

(2)

7. Some pupils conduct a survey about mobile phones.

(i) This is Tony's question.

> Do you have a mobile phone and use it regularly?

Write down one criticism of Tony's question.

.....

.....

(1)

(ii) This is Cherie's question and response section.

> Question: How much do you spend each week using your mobile phone?
>
> Response: Less than £2 ☐ Less than £10 ☐ £10 or more ☐

Write down one criticism of Cherie's response section.

.....

.....

(1)

8. Chandni wants to survey pupils in her school about their reading habits.

Write a question that would help Chandni to investigate how often pupils in her school read for pleasure.

Include a response section.

.....

.....

.....

(2)

END OF QUESTIONS

Answers to Quick Questions

1.

	School Lunch	Packed Lunch	Other	Totals
Female	21	**13**	18	52
Male	**24**	5	**14**	**43**
Totals	45	**18**	**32**	95

2. Primary Data → Data which is collected first hand, by the person presenting the project

Secondary Data → Data which has been gathered from another source such as the government

Discrete Data → Data which is countable, such as number of pets

Qualitative data → Data which gives opinions or ideas, often recorded in words

3. The terms are not defined clearly so an amount might be considered *few* by some or *a lot* by others**.**

☐ one or less each week ☐ 2 – 5 a week ☐ 6 – 10 a week ☐ more than 10 each week

4. Below 20 20-29 30-39 40-50 More than 50

(Or equivalent)
The changes are necessary to enable an age of say, 30, to be recorded in one section only

5. Define summer /winter clearly using months of the year; Compare to total no. of holidays taken each year; Consider using a larger sample; Consider asking families with no school-aged children; etc

Answers to Past Paper Questions

1. (a)

Time (mins)	Frequency
30 mins or less	6
31 to 60	13
61 to 90	8
91 to 120	3

(b) Reasons that refer to:
Size of sample e.g. only one class asked
Characteristics of sample e.g. same set /ability group/year
Methodology e.g. only one night

(c) Focus on two **different** ways the results could reflect the whole school
e.g. *Ask people from every year or whole school*
Ask people from different (maths) sets
Ask over a number of days / each night / over a week
Choose people from each form
Use all subjects
Choose a random sample
Ask more people / everyone

2. (a)

Breakfast Item	Tally
Cereal	IIII
Fruit	III
Toast/bread	IIII
other	𝍸 IIII

(b) Questions that have can only have Y/N responses; e.g. do you eat fruit ....; do you eat vegetables..... do you eat chips ..... etc

3. (a) Two different reasons
e.g. *more males than females; no one over 64; more under 16 than over 16; sample size too small; unequal age groups*

(b) (i) Reason e.g. data collected should be anonymous; not relevant; names not needed

(ii) Reason e.g. personal; people prefer not to give their age

(iii) Have at least 3 age groups which don't overlap

4. (a) (b) *for example:*

No. children	**No. of pets**		
	0	**1-2**	**3 +**
1	2		
2		3	
3+		2	

5. (a) Two valid reasons e.g. sport team members already choose exercise; only girls; similar aged pupils; etc

(b) (i) e.g Leading question / do not begin with 'don't you agree'

(ii) e.g. No space for no/ options need to be more specific/ boxes overlap

6. (a) Any two valid reasons, e.g. only people with a vested interest write to a paper; the £50 000 will affect people's views; 25 is not representative

(b) Any two valid factors ensuring getting a representative sample e.g. *ask the neighbours so you get all views and not just parents and teachers; ask various age-group; make sure you ask the same numbers of men and women*

7. (a) (i) e.g. Regularly is not the same to different people; use can vary from week to week; no reference to not having a mobile

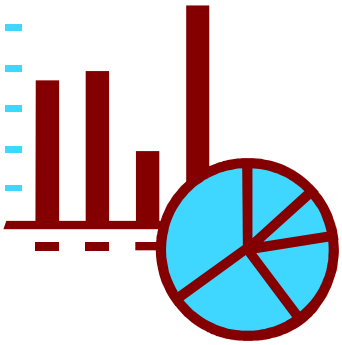
(ii) e.g. overlapping boxes; no box for NONE; spending can vary

8. e.g. How <u>often</u> do you read <u>for pleasure</u>?

Response section eg.

Daily (frequently)/Every 2 or 3 days (often)/Weekly (sometimes)/ monthly (rarely)/ never

END OF ANSWERS



Enabling world-class education

30-4-10 Handling Data

Days: 3 and 4 **Topic:** Analysing data

You need to be able to:

- Calculate the mean, range and median of small data sets with discrete then continuous data
- Identify the modal class for grouped data
- Find the median for large data sets and calculate an estimate of the mean for large data sets with grouped data
- Use relevant statistical functions on a calculator or spreadsheet
- Compare distributions and make inferences, using the shapes of distributions and measures of average and range.

You will need to think about:

The difference between **discrete** and **continuous** data.

Discrete data – can only take exact values eg shoe sizes

Continuous data – can take any value within a given range eg temperature

The **range** is a measure of the spread of a set of data.
The **range** is the highest value minus the lowest value

The **mean**, **median** and **mode** are measures of average.
The **mean** of a set of data is the total of all the values divided by the number of values The **median** is the middle value when the data is arranged in order.
The **mode** is the value that occurs the most often.

Calculating the mean, median, mode and range from a **frequency table**
The ages of 15 people are shown in the table

Age	Frequency
30	4
31	6
32	2
33	3

6 people were aged 31

Mean = $\frac{(4\times30)+(6\times31)+(2\times32)+(3\times33)}{15}$

= 31.3 years

Median = 31 (the 8th person's age)
Mode = 31
Range = 33-30 = 3

Estimating the mean, median and mode for **grouped data**
The times taken for 20 people to run a marathon are shown in the table

More than 3 hours but less than or equal to 6

Time (hrs)	Frequency
0<h≤3	**3**
3<h≤6	**14**
6<h≤9	**2**
9<h≤12	**1**

Estimated mean = $\frac{(3x1.5)+(14x4.5)+(2x7.5)+(1x10.5)}{20}$

= 4.65 hours

Take the mid-value of each group

The median is given by the times of the 10th and 11th runners, which are within the class interval 3<h≤6

Modal class = 3<h≤6

Quick questions

1. The following temperatures were recorded in London during one week
22℃ 19℃ 18℃ 21℃ 21℃ 22℃ 22℃
Calculate
(a) the median temperature
(b) the range in temperature
(c) the mean temperature
(d) the modal temperature

2. The table shows the numbers of texts sent by 20 people in 1 hour

Number of texts	Frequency
1	0
2	2
3	1
4	6
5	8
6	3

Calculate the
(a) mean (b) mode (c) median (d) range

3. The table shows the distances travelled to work by 50 people living in a town.

Distance travelled, *d* (km)	**Frequency**	**Mid-value**	**Mid-value x Frequency**
$0 < d \leq 2$	12		
$2 < d \leq 4$	19		
$4 < d \leq 6$	9		
$6 < d \leq 8$	7		
$8 < d \leq 10$	3		

(a) Complete the table and find an estimate of the mean distance travelled to work
(b) What is the modal distance?
(c) What is the median distance?

4. The table shows the heights (cm) of some boys and girls in a class

Boys	145 185 170 172 175 168 155 168 160 158 162 168 176
Girls	140 150 152 155 160 162 170 175 178 165 162 158 155

By calculating the mean, median and range, compare each set of data

Past paper questions

1. (a) The table shows the results of throwing a dice 50 times.

Score	Frequency
1	6
2	8
3	8
4	9
5	7
6	12

(i) Calculate the mean score.

.....

.....

.....

Answer .....

(3)

2. Jane records the times taken by 30 pupils to complete a number puzzle.

Time, t (minutes)	Number of pupils
$2 < t \leq 4$	3
$4 < t \leq 6$	6
$6 < t \leq 8$	7
$8 < t \leq 10$	8
$10 < t \leq 12$	5
$12 < t \leq 14$	1

Calculate an estimate of the mean time taken to complete the puzzle.

.....
.

.....
.

.....
.

Answer ..... minutes **(4)**

3. A police officer records the speeds of 60 cars on a dual carriageway.

Speed (mph)	Frequency	Midpoint	
40 to less than 50	9		
50 to less than 60	27		
60 to less than 70	21		
70 to less than 80	3		

(a) Write down the modal class.

Answer ..... mph

(1)

(b) Use the class midpoints to calculate an estimate of the mean speed of these cars.

.....

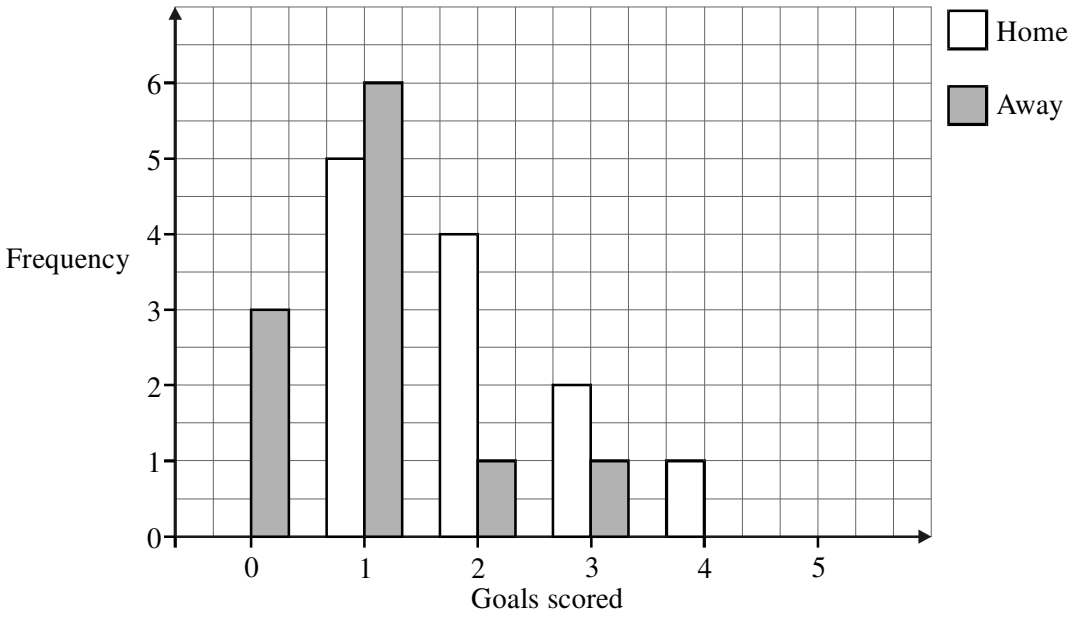
.....

Answer ..... mph

(3)

(Total 4 marks)

4. The graph shows the distribution of goals scored by a football team in home and away matches.



(a) What is the range of the number of goals scored at home matches?

Answer .....

(1)

(b) Calculate the mean number of goals per match for home matches.

.....

.....

.....

Answer .....

(3)

(c) A supporter says "The average number of goals per match is the same for both away matches and home matches".

Which average is being used?

.....

.....

Answer .....

(1)

5. 50 children take part in a sponsored spell to raise money for 'Comic Relief'.
They are given 40 words to learn and are then tested on them.
The results are shown in the table below.

Correct spellings	Frequency
1 to 10	1
11 to 20	7
21 to 30	26
31 to 40	16

(a) Calculate the estimate of the mean number of spellings each child got correct.

.....

.....

.....

(3)

(b) For each word a child spells correctly they receive 5p from their sponsor.
Altogether £592 was raised by this sponsored spell.
No person sponsored more than one child.

Use your answer to (a) to estimate the total number of people who sponsored the children.

.....

.....

..... (2)

6. The stem and leaf diagram shows the ages, in years, of 15 members of a badminton club.

Key:	**2**	7	means an age of 27 years

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

(a) What is the median age of the members?

.....

Answer ..... years

(1)

(b) What is the range of the ages?

.....

Answer ..... years

(1)

7. One afternoon a survey was taken of 100 customers at a supermarket.
The time they spent queuing at the checkout was recorded.
The results are shown below.

Time t minutes	Number of customers
$0 < t < 5$	18
$5 < t < 10$	42
$10 < t < 15$	30
$15 < t < 20$	8
$20 < t < 25$	2

(a) Calculate an estimate of the mean time these customers had to queue.

.....

.....

.....

(4)

(b) On another occasion this mean time was 12.5 minutes.
Give a reason why the mean time might have changed.

.....

.....

.....

(1)

END OF QUESTIONS

Answers

Quick Questions

1. (a) 18 19 21 21 22 22 22 median = 21℃

(b) Range = 22 – 18 = 4

(c) Mean = 145 ÷ 7 = 20.7℃

(d) Mode = 22℃

2. (a) 2 x 2 + 1 x 3 + 6 x 4 + 8 x 5 + 3 x 6 = 89

Mean 89 ÷ 20 = 4.45

(b) Mode = 5

(c) Median = 5

(d) Range = 6 – 1 = 5

3. (a)

Distance travelled, d (km)	Frequency	Mid-value	Mid-value x Frequency
$0 < d \leq 2$	12	1	12
$2 < d \leq 4$	19	3	57
$4 < d \leq 6$	9	5	45
$6 < d \leq 8$	7	7	49
$8 < d \leq 10$	3	9	27

Mean = 190 ÷ 50 = 3.8

(b) Mode = $2 < d \leq 4$

(c) Median = $2 < d \leq 4$

4. Boys Range = 185 – 145 = 40 Girls Range = 178 – 140 = 38

Mean = 166.3 Mean = 160.2

Median = 168 Median = 160

The range shows that the boys' heights were slightly more spread out than the girls' heights.

The mean and median show the boys in the class are on average taller than the girls.

Past Paper Questions

1. (a) i) 1 × 6 + 2 × 8 + 3 x 8 + 4 x 9 + 5 x 7 + 6 x 12 = 189

189 ÷ 50 = 3.78 or 3.8

2. 3 x 3 + 5 x 6 + 7 x 7 + 9 x 8 + 11 x 5 + 13 x 1 = 228
228 ÷ 30 = 7.6 (minutes)

3. (a) 50 to less than 60

(b) (45 × 9) + (55 × 27) + (65 × 21) + (75 × 3)

3480 ÷ 60 = 58mph

4. (a) 4 – 1 = 3

(b) 1 × 5 + 2 × 4 + 3 x 2 + 4 x 1 = 23
23 ÷ 12 = 1.9

(c)Mode

5. (a) 1 × 5.5 + 7 × 15.5 + 26 × 25.5 + 16 × 35.5

1345 ÷ 50 = 26.9

(b) £592 = 592 00p

592 00 ÷ (26.9 x 5) = 440 people

6. (a) The median is 42 (the age of the 8 th person)

(b) The range = 62 – 27 = 35

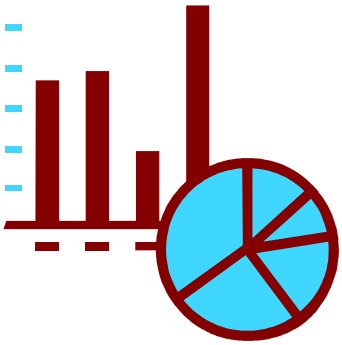
7. (a) 18 × 2.5 + 42 × 7.5 + 30 × 12.5 + 8 × 17.5 + 2 × 22.5 = 920

920 ÷ 100 = 9.2

(b)

Either	There may be a different number of checkouts
or	There may be a different number of customers.
or	The customers may be buying different quantities of goods.
or	There may be trainee persons on some checkouts.
or	It may be a different time of the day

END OF ANSWERS



Enabling world-class education

30-4-10 Handling Data

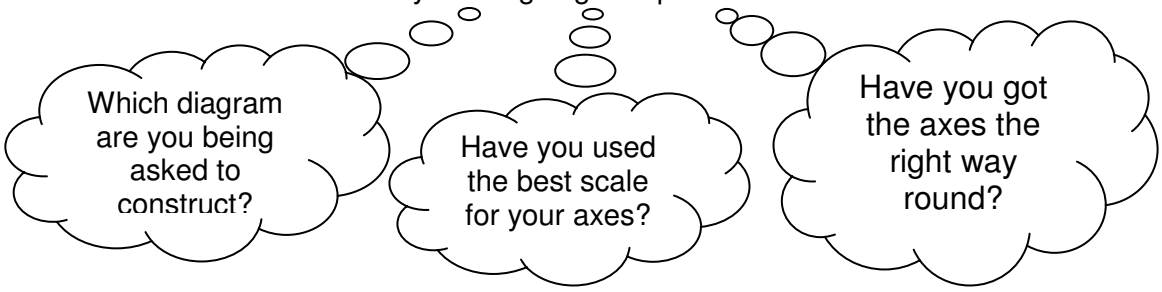
Days: 5 and 6 **Topic:** Representing Data

You need to be able to:

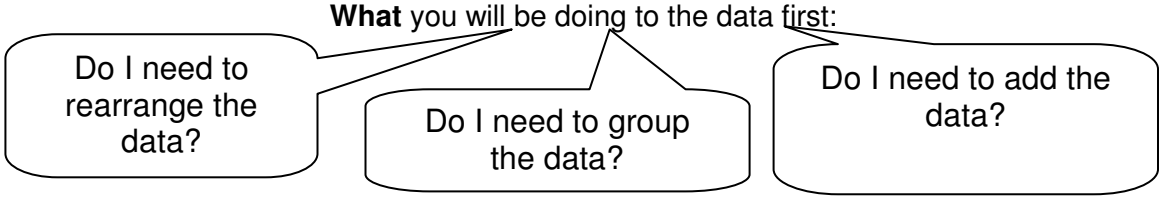
- Construct pie charts
- Construct pictograms and bar charts
- Construct line graphs
- Construct scatter diagrams and understand correlation
- Construct stem and leaf diagrams
- Construct box and whisker diagrams

You will need to think about:

How you are going to represent data:



What you will be doing to the data first:



Always make sure you have labels and a title – *easy marks!*

Remember:

Use a sharp pencil to make your diagram as accurate as possible.

Quick Questions

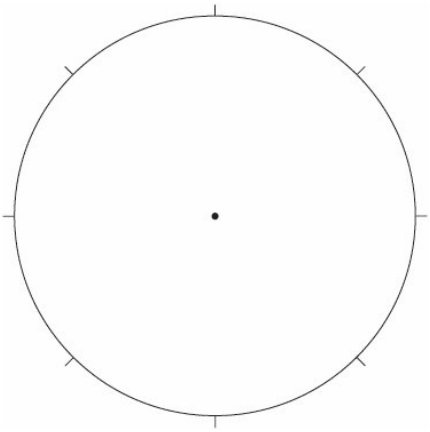
1. (a) Look at this information.

In 2002, a man earned £400 each week.

The table shows how he spent his money.

Rent	£200
Food	£100
Entertainment	£50
Other	£50

Complete the pie chart below to show how the man spent his money.
Remember to **label** each sector of the pie chart.

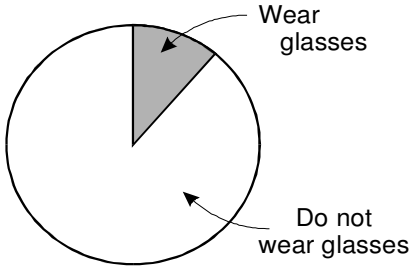


2. Ten out of thirty-six people said they ate toast for breakfast.
What angle should represent this on a pie chart?

3. Twenty-one out of thirty-six pupils said they watched Top of the Pops.
What angle would show this on a pie chart?

4. There are **60 pupils** in a school. **6** of these pupils wear glasses.

The pie chart is not drawn accurately. What should the angles be?



…… ° and …… °

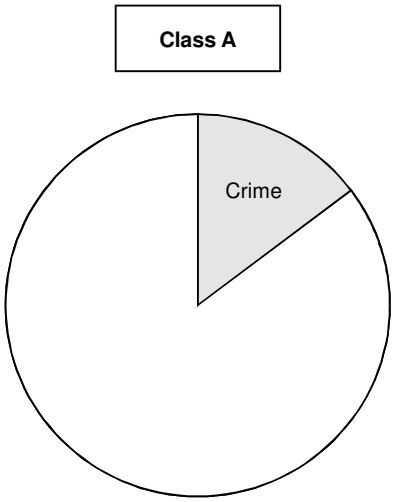
5. A teacher asked two different classes:

'What type of book is your favourite?'

(a) Results from **class A** (total 20 pupils):

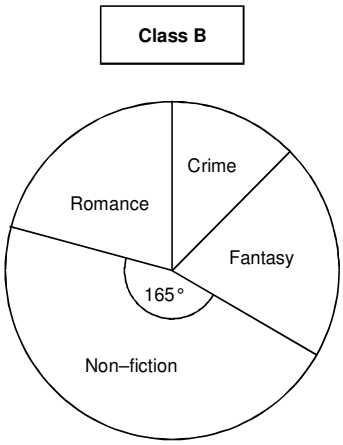
Type of book	Frequency
Crime	3
Non–fiction	13
Fantasy	4

Complete the pie chart to show this information. Show your working and draw your angles accurately.



(b) The pie chart below shows the results from all of **class B.**

Each pupil had only one vote.



The sector for **Non-fiction** represents **11 pupils**. How many pupils are in class B?

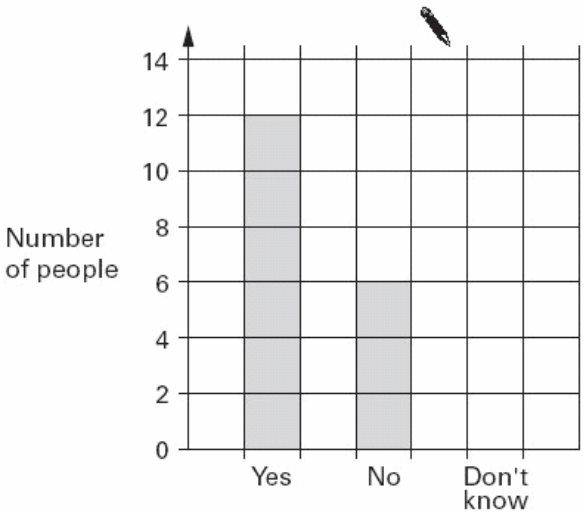
…… pupils

6. (a) Jackie asked **27** people:

'Do you like school dinners?'

The bar chart shows her results for 'Yes.' and 'No'.

Complete the bar chart to show her result for 'Don't know'.



(b) This pictogram also shows her results for 'Yes' and 'No'.

Complete the pictogram to show her result for 'Don't know'.

Yes	○ ○ ○ ○
No	○ ○
Don't know	

7. There are **seven different ways** to make **8p** with coins.

Complete the table to show the seven ways to make 8p.

Two have been done for you.

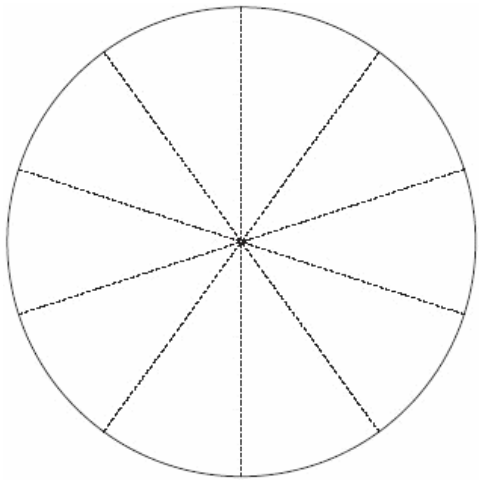
Number of **5p** coins	Number of **2p** coins	Number of **1p** coins
0	0	8
0	1	6

8. The table shows information about which primary school pupils went to.

Name of primary school	Ash	Burgate	Grange	Park
Percentage of pupils who went to that school	10%	40%	25%	25%

Complete the pie chart below to show the information in the table.

Label your pie chart with the **names** of the schools.



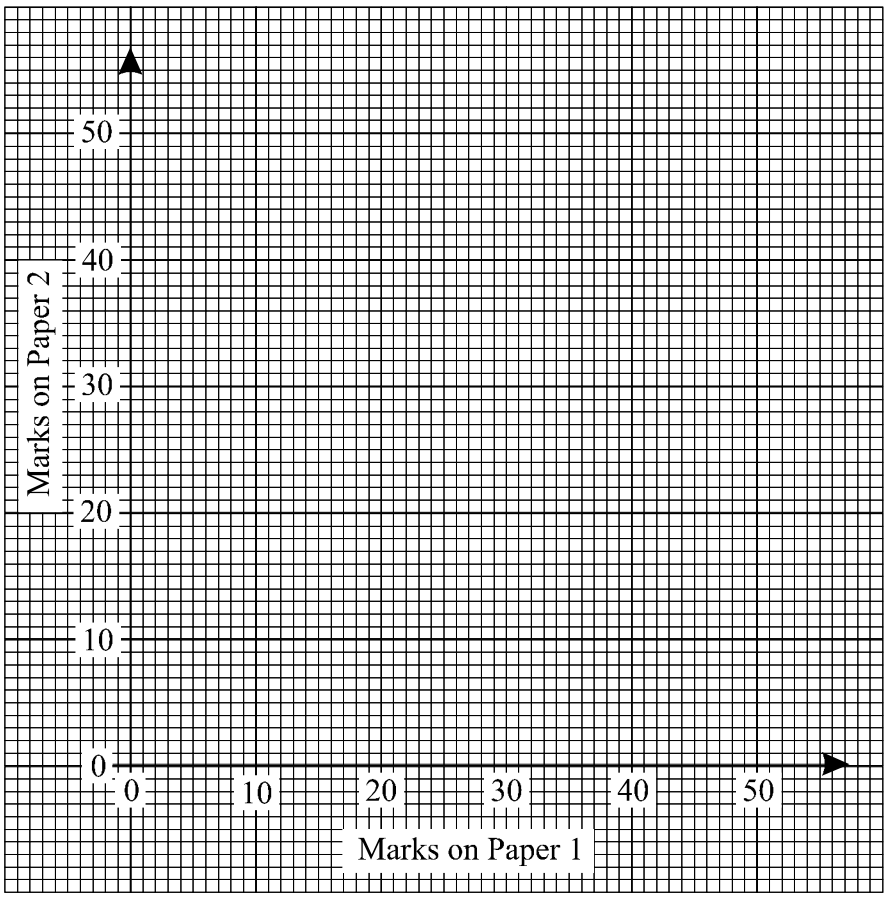
Past Paper Questions

1. Ten pupils took two examination papers in Mathematics.

Their marks out of 50 were as follows.

Paper 1	44	24	40	48	30	25	10	37	38	34
Paper 2	43	28	38	42	32	30	25	35	40	37

(a) On the grid below draw a scatter diagram of these marks.



(2)

(b) Draw a line of best fit for the points you have plotted.

(1)

(c) Omar was absent for Paper 2. He scored 32 marks on Paper 1.

(i) What mark do you think it fair to give him for Paper 2?

.....

(ii) State how you got your answer.

.....

.....

.....

(2)

(d) These pupils also took an examination paper in Art and one in Chemistry.
A scatter diagram of these marks is drawn.
How might it be different from the one drawn for the two Mathematics papers?

.....

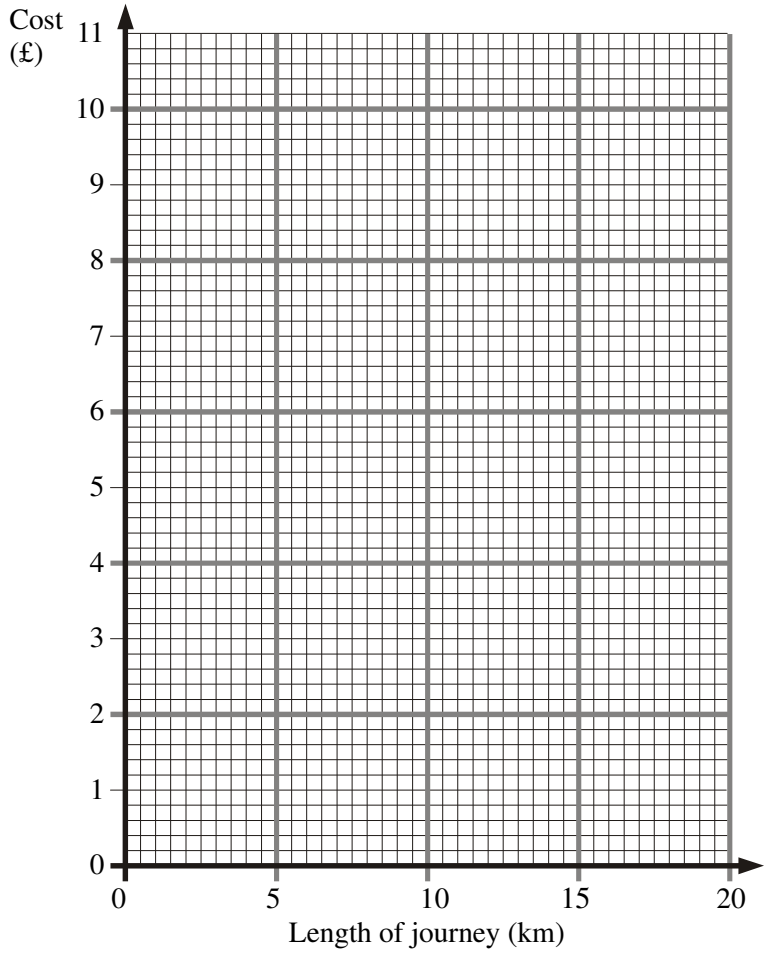
.....

(1)

2. These are the prices charged for different journeys by taxi.

Length of journey (km)	1	2	3	5	8	13	14	18
Cost (£)	1.80	2.30	2.50	2.80	5.40	7.50	8.40	10.30

(a) (i) On the grid below, draw a scatter diagram to show this information.



(2)

(ii) What does this diagram tell you about the relationship between the length of a journey and its cost?

.....

.....

(1)

(iii) Draw a line of best fit.

(1)

(b) (i) Estimate the cost of a taxi journey of 16 km.

.....

.....

(1)

(ii) I was charged £6.20 for a taxi journey.
Estimate the length of the journey.

.....

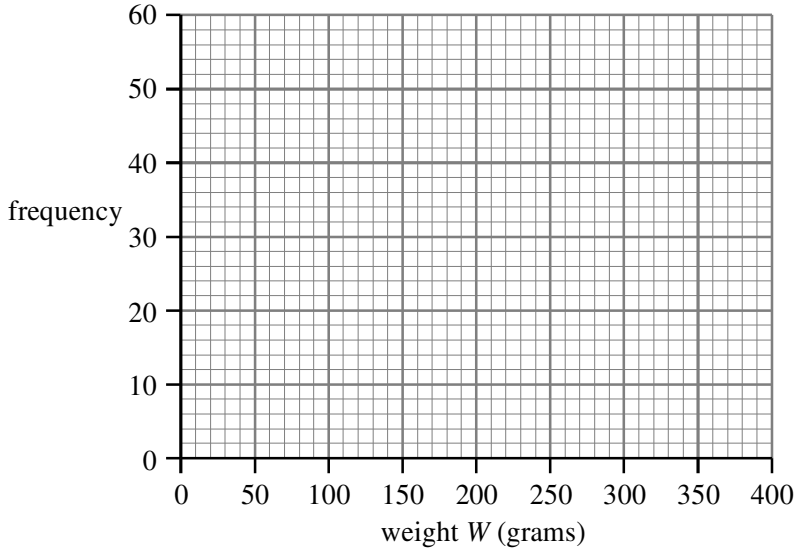
.....

(1)

3. A gardener tests a fertiliser.
He grows some tomatoes with the fertiliser and some without.
He records the weights of all the tomatoes grown.

weight (grams)	frequency with fertiliser	frequency without fertiliser
$50 < W \leq 100$	10	2
$100 < W \leq 150$	15	42
$150 < W \leq 200$	55	46
$200 < W \leq 250$	53	41
$250 < W \leq 300$	17	34
$300 < W \leq 350$	8	1

(a) Draw a frequency polygon for each distribution on the grid below, clearly indicating which is **with fertiliser**, and which is **without fertiliser**. **(4)**



(b) Use the frequency polygons to compare the effects of the fertiliser.

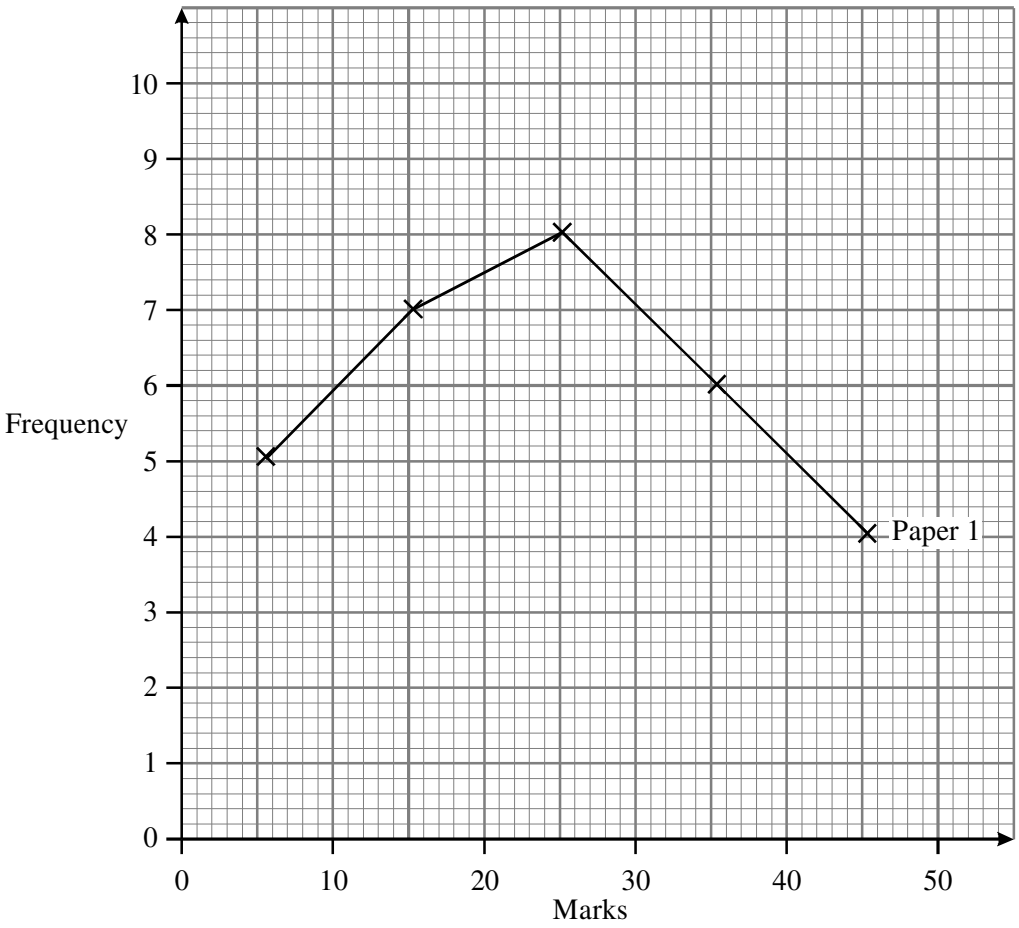
.....

.....

.....

(2)

4. 30 pupils take a test.
The results for Paper 1 are shown as a frequency polygon.



(a) Here are the results for Paper 2.

Marks	Frequency
1–10	10
11–20	9
21–30	6
31–40	3
41–50	2

On the grid above, draw a frequency polygon to show these results.

(2)

(b) On which paper did the pupils generally perform better?
Give a reason for your answer.

.....

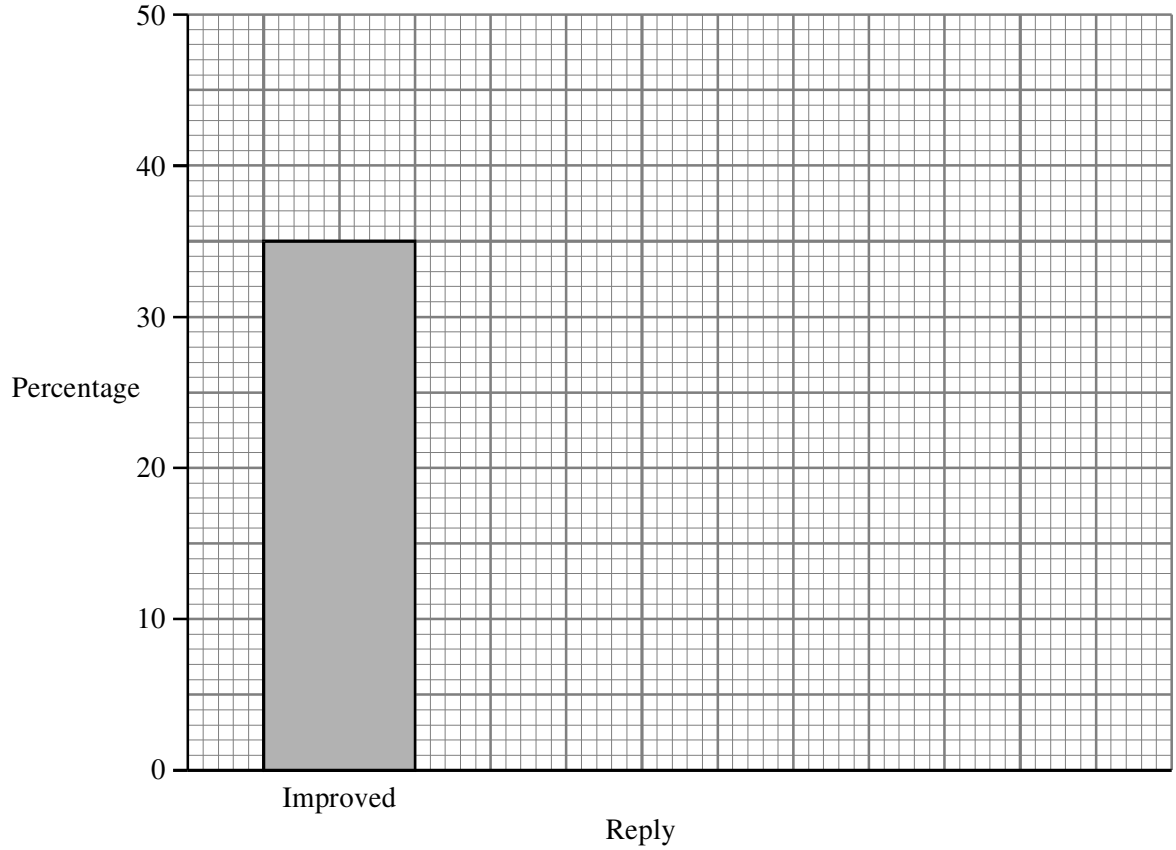
.....

(1)

5. A rail company asks some of its passengers if their service has improved.
Here are the results.

Reply	Percentage
Improved	35%
Same	26%
Not as good	31%
Don't know	8%

(a) Complete the bar chart to show these results.



(2)

(b) The rail company asked 200 people in the survey.
How many people answered "Not as good"?

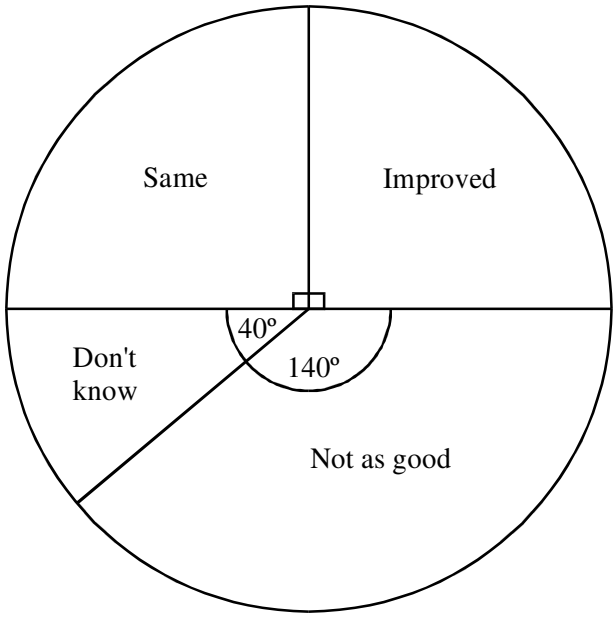
.....

.....

.....

(2)

(c) 180 other people are asked the same question.
The results of this survey are shown on the pie chart.



(i) How many people answered "Improved"?

.....

.....

.....

(2)

(ii) What is the probability that a person picked at random from this second survey answered "Don't know"?

Give your answer as a fraction in its simplest form.

.....

.....

(2)

6. Karen did a survey to find the most popular cereal.

(a) The results for the adults are shown in the table.

Cereal	Muesli	Weeta Bites	Cornflakes	Other cereals
Number of adults	20	15	30	25

The results for the adults are shown in the table.

Draw a clearly labelled pie chart to illustrate this information.

Draw a clearly labelled pie chart to illustrate this information.

.....

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.....

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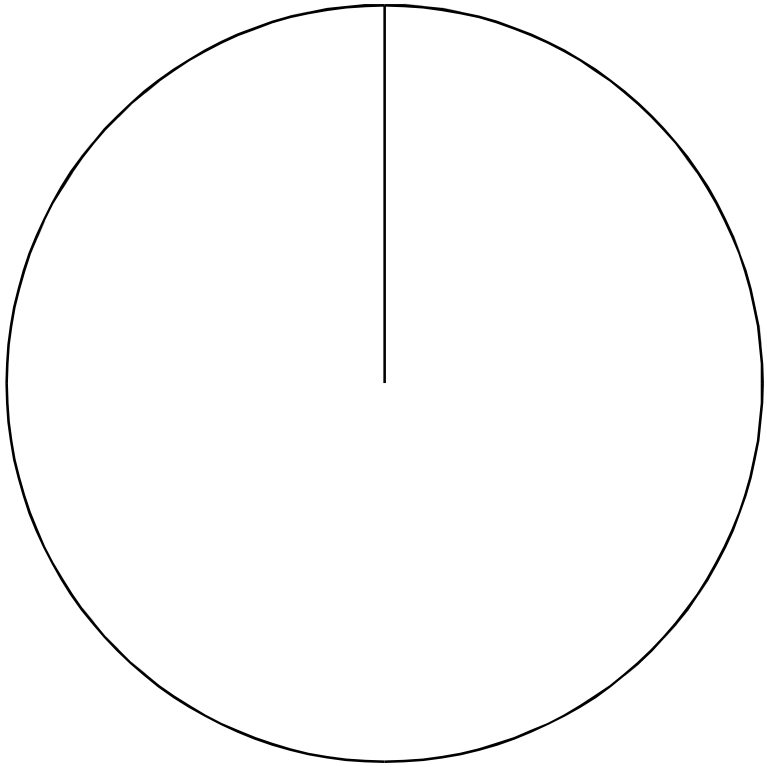
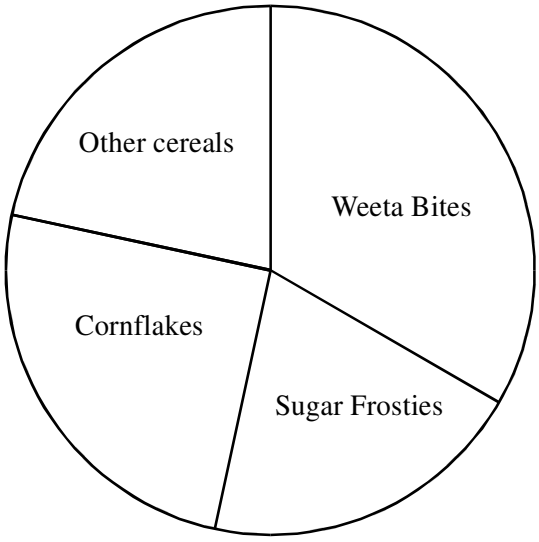


(4)

(b) The results for the children are shown in this pie chart.



A third of the children eat Weeta Bites.
A quarter of the children eat cornflakes.
Weeta Bites are eaten by 40 children.

How many children eat cornflakes?

.....

.....

.....

Answer .....

(3)

7. The number of complaints made about different parts of the Health Service last year is shown in the table.

Type	Number of complaints
Hospitals	400
Doctors	200
Dentists	80
Other	120

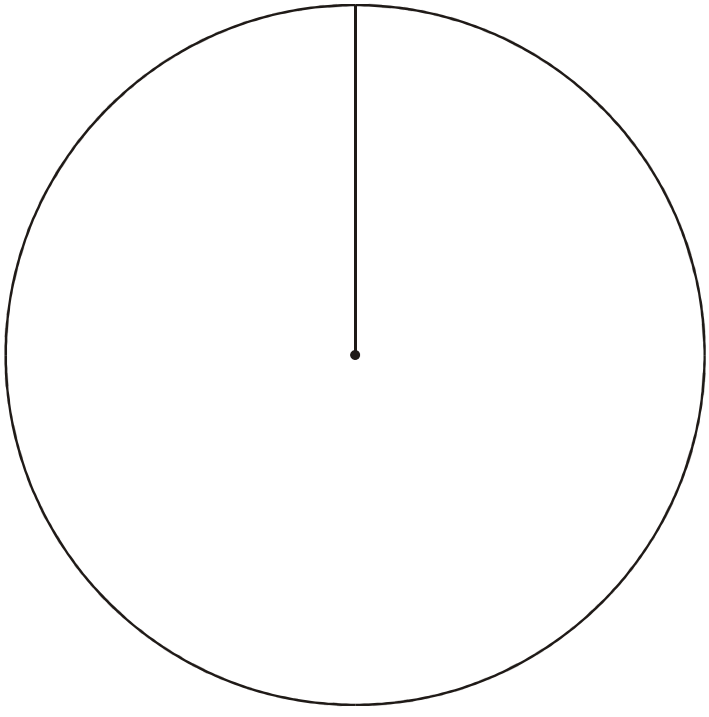
Draw and label a pie chart to represent these data.

.....

.....

....

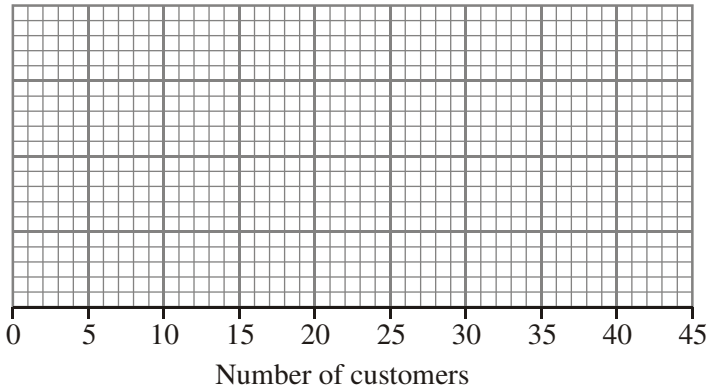
(Total 4 marks)



8. A manager recorded the number of customers that entered his supermarket each hour over five days in June.
The table shows a summary of his results.

	Number of Customers
Minimum	8
Lower quartile	23
Median	25
Upper quartile	33
Maximum	42

Draw a box plot to show these results.

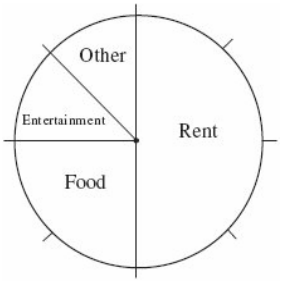


(Total 3 marks)

Answers to Quick Questions

1. (a) £ 4 **[1]**

(b) Completes the pie chart correctly **[2]**
eg



2. 100°
[1]

3. 210°
[1]

4. Both values correct, **36**° and **324**°, in either order.
[2]

5. (a) Pie chart completed with angles of: Non-fiction: 234° (± 1°) and Fantasy: 72° (± 1°)
[2]

(b) $\frac{360}{165} \times 11 \approx 24$ **[2]**

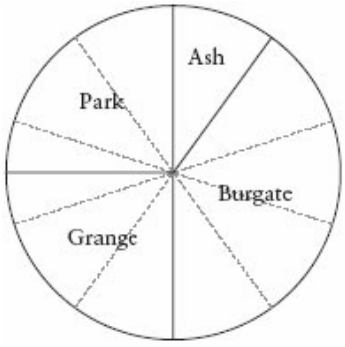
6. (a) Draws a correct bar, with ruler and pencil for Don't know that indicates 9 people
[1]

(b) Indicates 3 circles for Don't know
[1]

7. Shows all five correct ways, with none incorrect or duplicated
[3]
eg

0	2	4
0	3	2
0	4	0
1	0	3
1	1	1

8. Completes the pie chart correctly
[2]



eg

Answers to Past Paper Questions

1. (a) All ten points accurately plotted.
B2
[Allow **B1** if one or two points are inaccurate.]

(b) For a good attempt at drawing the line of best fit.
B1
A line of best fit passing through the origin scores zero, as does a zig zag line or a curve.

(c) (i) Accurate reading from candidates line of best fit at 32 mark.
A1

(ii) For saying, or showing on the graph, that the line of best fit was used.
M1

(d) No correlation, or points would be scattered all over the graph.
B1

[6]

2. (a) (i) points plotted (<1mm out)
B2

(ii) the longer the journey, the more it costs
B1

(iii) straight, ruled, long enough; MUST f.t. from their line of best fit
B1

(b) (i) £9.20 B1

(ii) 10 km B1

[6]

3. (a) plotting correct points with mid points accurately (< 1 mm)
B2
straight, ruled lines
B1
clearly labelling at least one
B1

(b) More of the same size
B1
not as many big ones
B1

[6]

4. (a) All 5 points plotted correctly and polygon (ruled)
B2

(b) Paper 1 and a valid reason
B1

[3]

5. (a) 3 bars drawn with correct height and width
B1
Fully labelled with gaps between bars
B1

(b) $\frac{31}{100} \times 200$ or equivalent M1
62
A1

(c) (i) $\frac{90}{360} \times 180$ or equivalent M1
45
A1

(ii) $\frac{40}{360}$
M1
$\frac{1}{9}$
A1
Accept: 0.11(…)

[8]

6. (a) Pie chart:
Accuracy ±2° and labelled
Angles: 80°, 60°, 120°, 100°
or % 22%, 17%, 33%, 28% B4

(b) 3 × 40 or 120 children M1

$\frac{(\text{their}\,120)}{4}$ M1 dep
or $\frac{(\textit{their}\,90°)}{(\textit{their}\,120°)} \times 40$ o.e.

30 A1

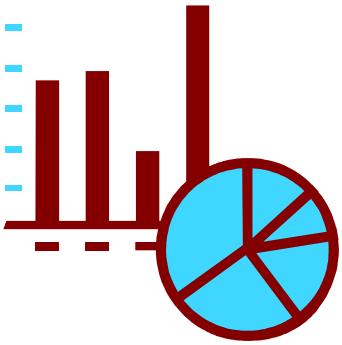
[7]

7. Any correct method
eg $\frac{400}{"800"} \times 360°$ M1
All 4 angles correct; 180°, 90°, 36° and 54° A1
4 sectors drawn accurately and correct ±2° B1
Correct labelling, in correct proportions
Exactly 4 sectors B1

[4]

8. Median at 25 B1
Quartiles at 23 and 33 and box B1
Whiskers to 8 and 42 B1

[3]



Enabling world-class education

30-4-10 Handling Data

Days: 7 and 8 **Topic:** Interpreting Data

You need to be able to:

- relate summarised data to the initial questions
- interpret a wide range of graphs and diagrams and draw conclusions; **identify seasonality and trends in time series**
- look at data to find patterns and exceptions
- compare distributions and make inferences, using the shapes of distributions and measures of average and **spread**, **including median and quartiles**
- consider and check results and modify their approaches if necessary
- appreciate that correlation is a measure of the strength of the association between two variables; distinguish between **positive, negative and zero correlation using lines of best fit; appreciate that zero correlation does not necessarily imply 'no relationship' but merely 'no linear relationship'**

You will need to think about:

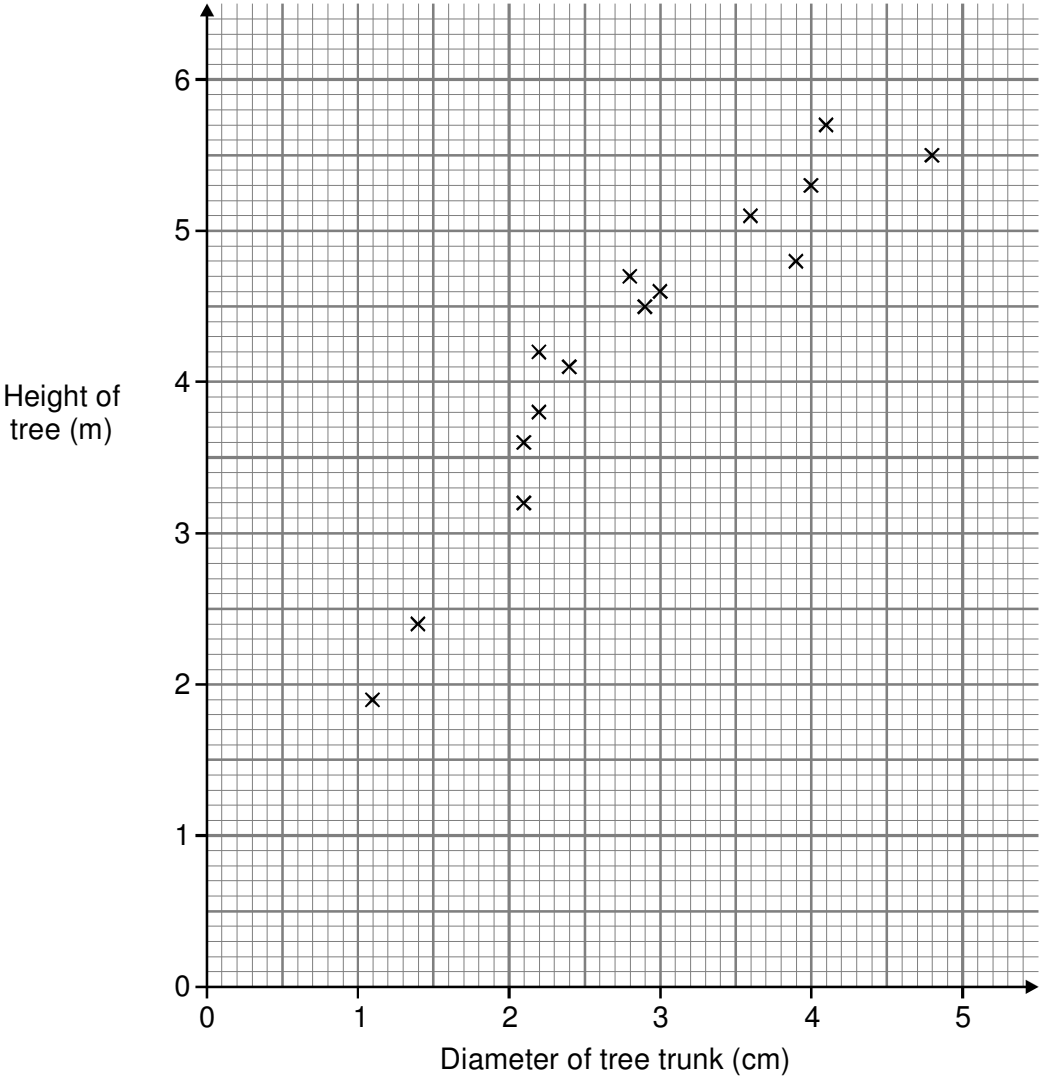
How the data is represented

What the representation indicates

Remember: Make sure your explanation refers to the data or diagram or your calculations

Quick Questions

1. The scatter graph shows information about trees called poplars.



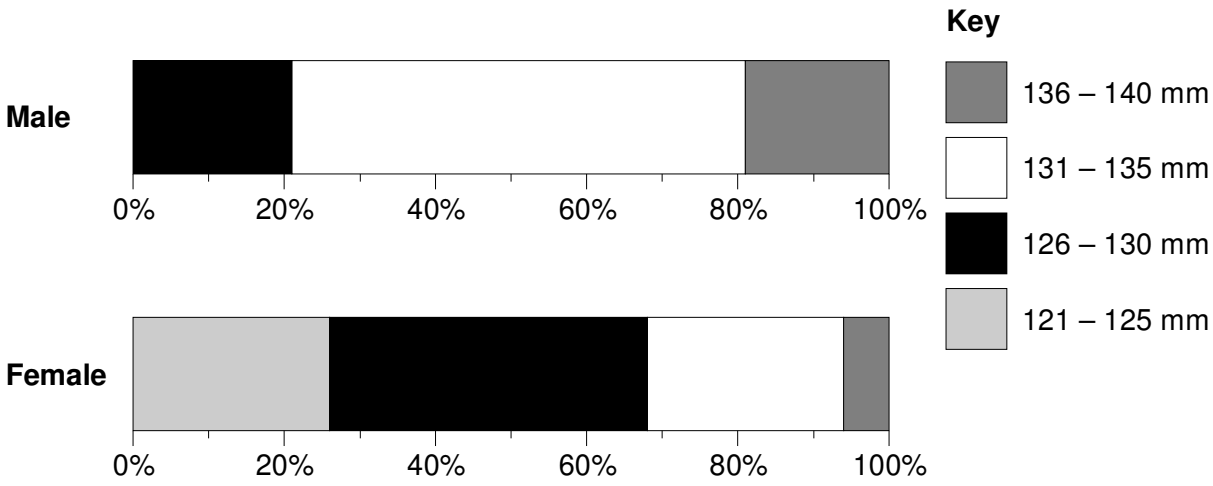
(a) What does the scatter graph show about the **relationship** between the diameter of the tree trunk and the height of the tree?

(b) The height of a different tree is 3 m. The diameter of its trunk is 5 cm. Use the graph to explain why this tree is **not** likely to be a poplar.

(c) Another tree **is** a poplar. The diameter of its trunk is 3.2 cm. Estimate the height of this tree.

2. Blackbirds

The percentage charts show information about the wing length of adult blackbirds, measured to the nearest millimetre.



(a) Use the data to decide whether these statements are true or false, or whether there is not enough information to tell.

The smallest male's wing length is larger than the smallest female's wing length.

☐ True ☐ False ☐ Not enough information

Explain your answer.

The biggest male's wing length is larger than the biggest female's wing length.

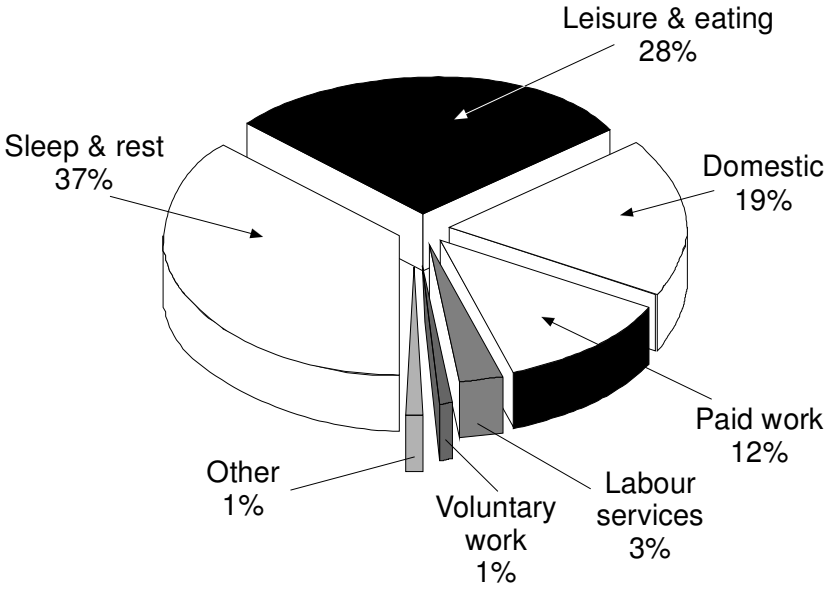
☐ True ☐ False ☐ Not enough information

Explain your answer.

3. Time

The pie chart shows how much time **each day**, on average, we spend doing different things.

"How Britons use their time (1995 data)"



Data from 'Economic Trends', Office for National Statistics, © Crown Copyright 1998

(a) The sum of the percentages is not 100%.

Does this mean there must be a mistake in the pie chart?
Explain your answer.

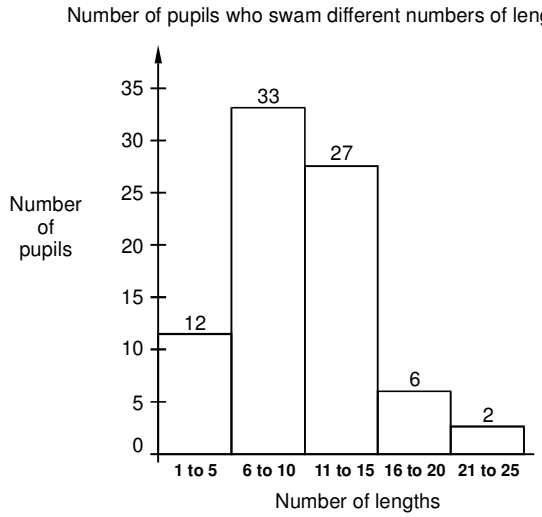
(b) Calculate how much time in one day (24 hours) we spend on average on **paid work**.
Show your working and give your answer in hours and minutes.

(c) Most days of paid work are at least 7 hours long.
Give one reason why the average amount is **less** than this.

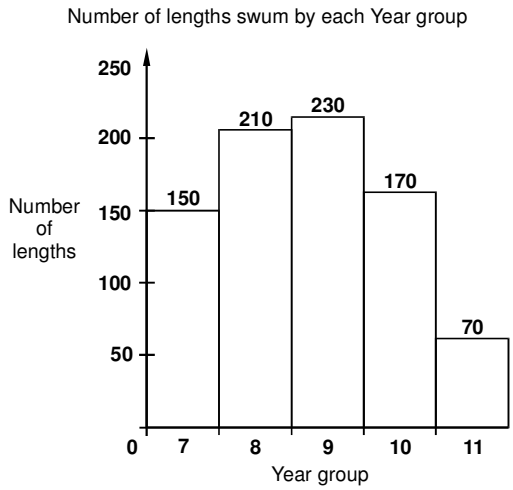
4. Swim

A school has 5 Year groups.
80 pupils from the school took part in a sponsored swim.
Lara and Jack drew these graphs.

Lara's graph:



Jack's graph:



(a) Look at **Lara's** graph.

Did **Year 10** have **fewer** pupils taking part in the swim than **Year 7?**

Tick the correct box.

☐ Yes ☐ No ☐ Cannot tell

Explain your answer.

(b) Use **Lara's graph** to work out the mean number of lengths swum by each of the 80 pupils.

Show your working.

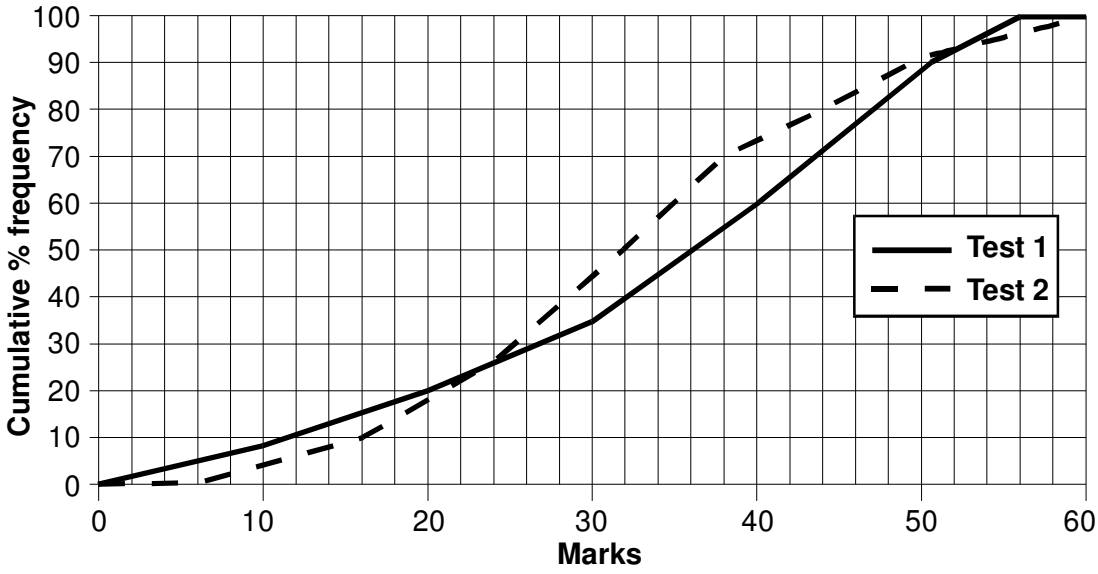
(c) Use **Jack's graph** to work out the mean number of lengths swum by each of the 80 pupils.

(d) Explain why the means calculated from Lara's graph and Jack's graph are different.

5 200 pupils in Year 9 at Oakdene School took two mathematics tests in January.

Each test had a maximum of 60 marks.

The graph shows the pupils' results.



(a) Put a ✓next to each statement that is true.
Put a ✗next to each statement that is **not** true.

For Test 1

A The majority of pupils obtained fewer than 30 marks.

B The top mark obtained was 60.

C 20 pupils obtained 12 marks or fewer.

(b) Put a ✓ next to each statement that is true.
Put a ✗next to each statement that is **not** true

For Test 2

A No pupil obtained fewer than 5 marks.

B The majority of pupils obtained more than 40 marks.

C 55 pupils obtained 34 marks or fewer.

(c) What was the median number of marks obtained on **Test 1**?

(d) What was the lowest mark obtained by a pupil in the top 20% of **Test 2**?

(e) Anita came top in both tests.
What was her total number of marks?

Past Paper Questions

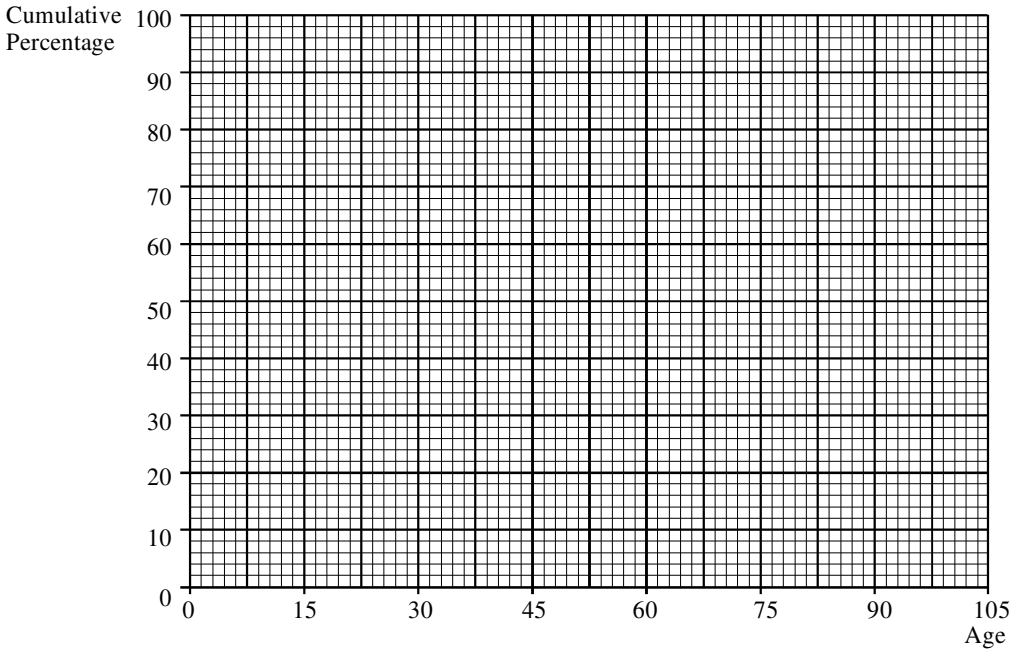
1. The countries of the world are divided into 'developed' and 'under-developed' countries.

The frequency table shows the distribution of ages for the population in the developed countries.

The figures are percentages and were estimated for the year 1985.

Age (y years)	Percentage of population	Cumulative Percentage
$0 < y \leq 15$	19	
$15 < y \leq 30$	22	
$30 < y \leq 45$	20	
$45 < y \leq 60$	17	
$60 < y \leq 75$	11	
$75 < y \leq 90$	9	
$90 < y \leq 105$	2	

(a) Construct a cumulative frequency diagram to show this information.



(3)

(b) (i) What was the median age for the population in developed countries in 1985?

(ii) The median age for the population in the under-developed countries in 1985 was 21.

What do the medians tell you about the difference between the population in the developed countries and the population in the underdeveloped countries? **(2)**

2. One afternoon a survey was taken of 100 customers at a supermarket.
The time they spent queuing at the checkout was recorded.
The results are shown below.

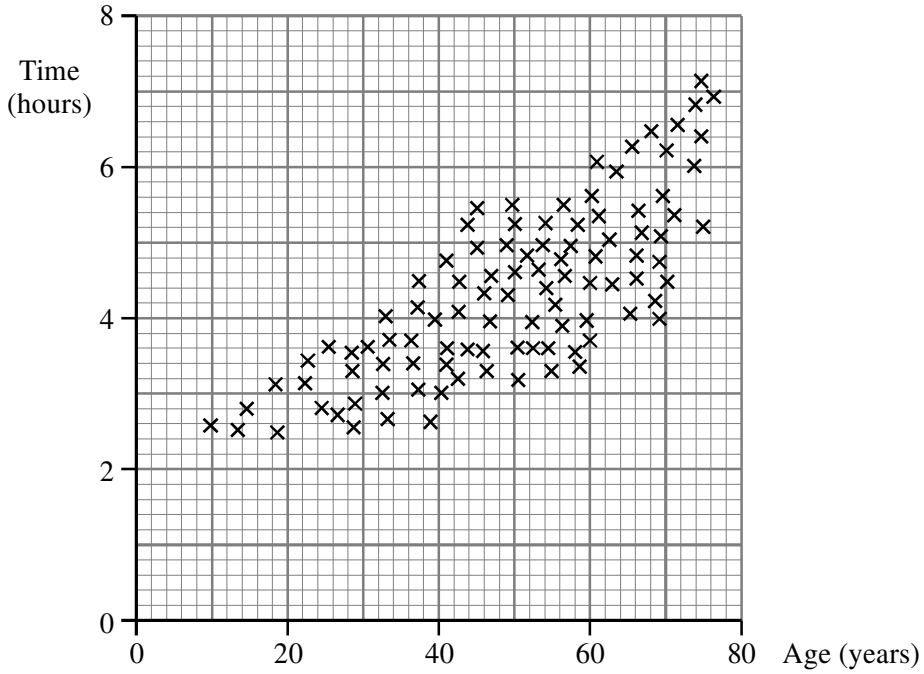
Time t minutes	Number of customers
$0 < t < 5$	18
$5 < t < 10$	42
$10 < t < 15$	30
$15 < t < 20$	8
$20 < t < 25$	2

(a) Calculate an estimate of the mean time these customers had to queue. **(4)**

(b) On another occasion this mean time was 12.5 minutes.
Give a reason why the mean time might have changed. **(1)**

3. A marathon is held in London every year.

(a) One year, 100 people were running for a charity.
The scatter diagram shows the ages of these 100 runners and the times they took.



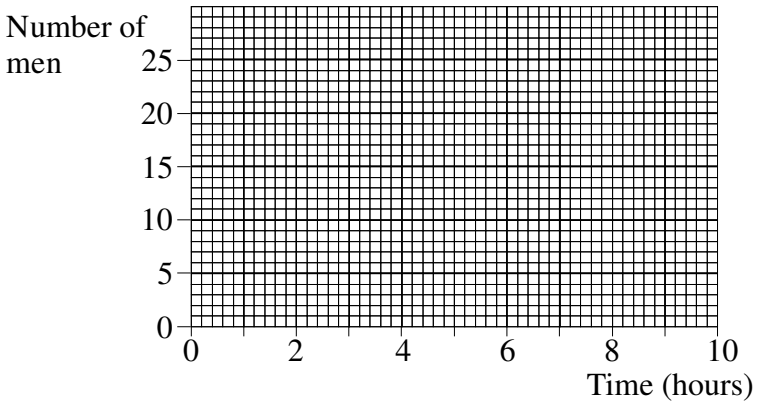
What does this scatter diagram tell you?

(1)

(b) This table shows the time taken by 50 men and 50 women.

Time taken (t hours)	Men	Women
$2 < t \leq 3$	9	3
$3 < t \leq 4$	18	7
$4 < t \leq 5$	12	16
$5 < t \leq 6$	6	18
$6 < t \leq 7$	4	4
$7 < t \leq 8$	1	2

On the axes below, draw a frequency polygon to show the distribution of times taken by these **50 men** in the marathon.



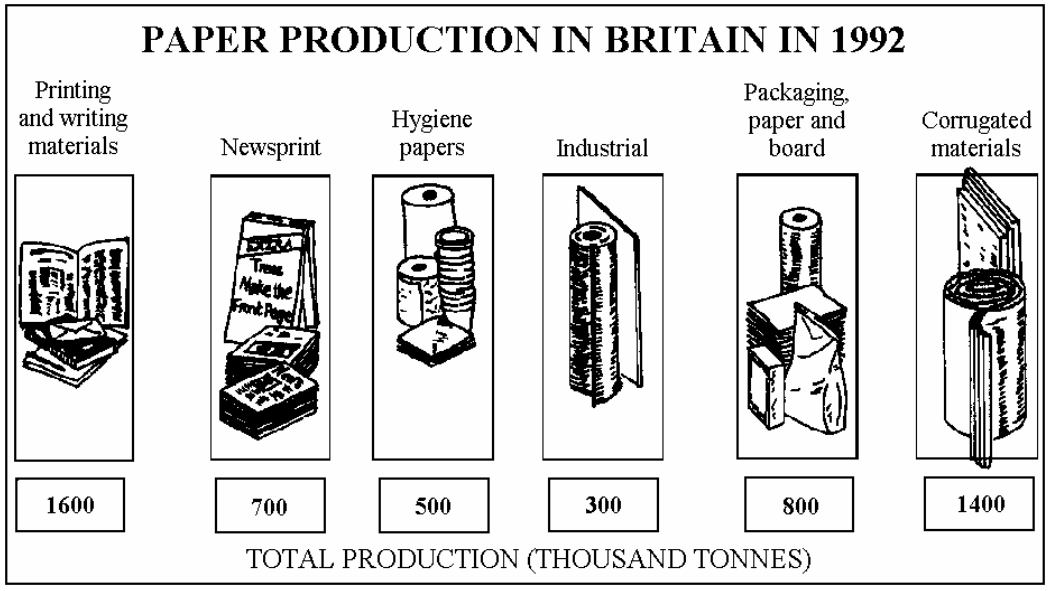
(3)

(c) The frequency polygon for the women's times is different from that for the men's times. Describe how they differ.
(You do not have to draw the frequency polygon for women). **(1)**

(d) The median time and the modal time for men are both in the range 3 to 4 hours.
Write down the range that contains

(i) the median women's time;
(ii) the modal women's time. **(2)**

4. The diagram shows the amount of paper produced in Britain in 1992.



(a) Calculate the total of paper, in tonnes, produced in Britain in 1992. **(1)**

(b) As well as the paper produced in Britain, 5.8 million tonnes had to be imported from other countries in 1992.
This was done to meet the needs of the 57 million people who lived in Britain.
Is the following statement true or false?

In 1992, each person in Britain used on average 200 kg of paper.

Give clear reasons for your answer and show all your working. **(3)**

5. The table shows the number of bunches of flowers bought by the customers of a florist's shop on the day before Mother's Day.

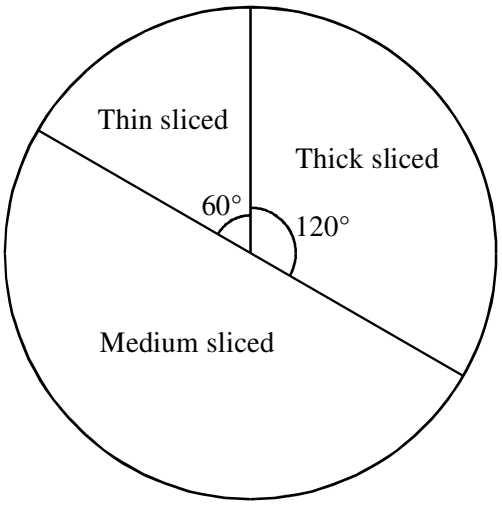
Number of bunches of flowers bought	Number of customers
1	24
2	10
3	5

(a) Calculate the total number of bunches of flowers bought from the shop that day. **(2)**

(b) Explain why the total number of bunches of flowers bought from the shop that day may not be representative of the normal daily sales.

(1)

6. The pie chart shows information about the loaves of sliced bread sold by a supermarket one day.



(a) The supermarket sold 150 medium sliced loaves.

How many thick sliced loaves were sold?
(3)

The supermarket sells both sliced bread and unsliced bread.

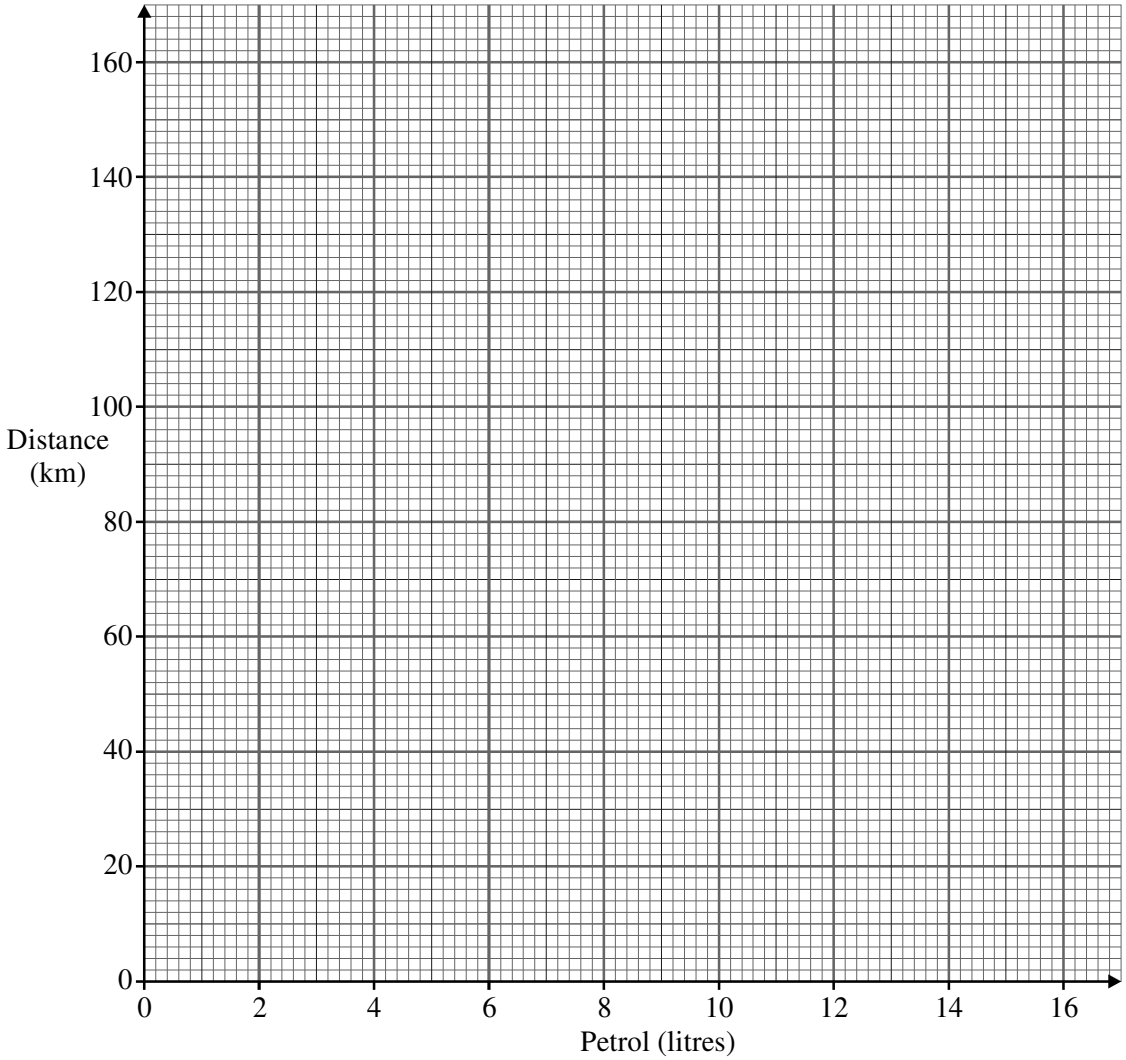
(b) Three quarters of the loaves of bread sold that day were sliced.

How many loaves of bread were sold altogether that day?
(3)

7. The table gives information about the petrol used for car journeys.

Petrol (litres)	3	5	6	8	4	11	10	9	2
Distance (km)	28	50	70	110	50	110	120	130	24

(a) Draw a scatter graph for this information.



(2)

(b) Draw a line of best fit. **(1)**

(c) Use your graph to estimate:

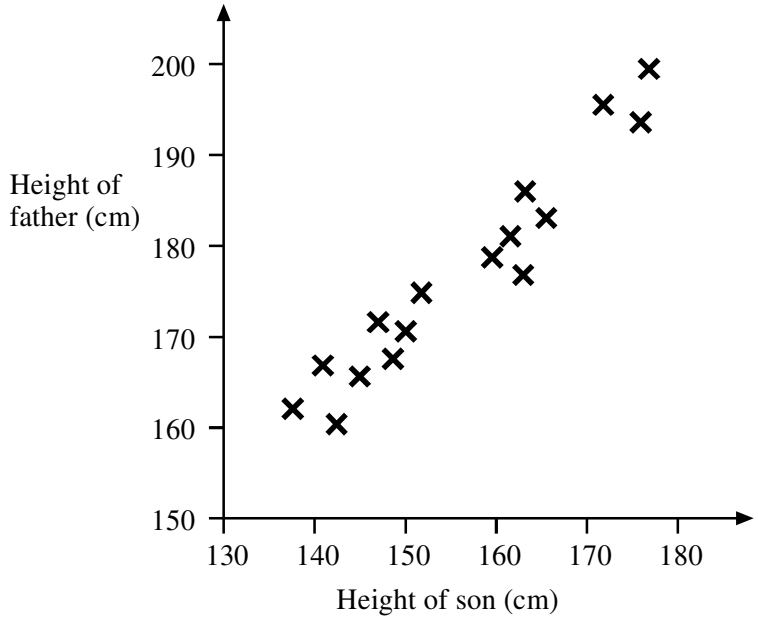
(i) the distance a car travels on 7 litres of petrol; **(1)**

(ii) the number of litres of petrol used by a car travelling a distance of 150 km. **(1)**

(d) Which of the estimates in (c) is likely to be more reliable?

Give a reason for your answer. **(1)**

8. The scatter diagram shows the heights of sixteen Year 9 boys and their fathers.

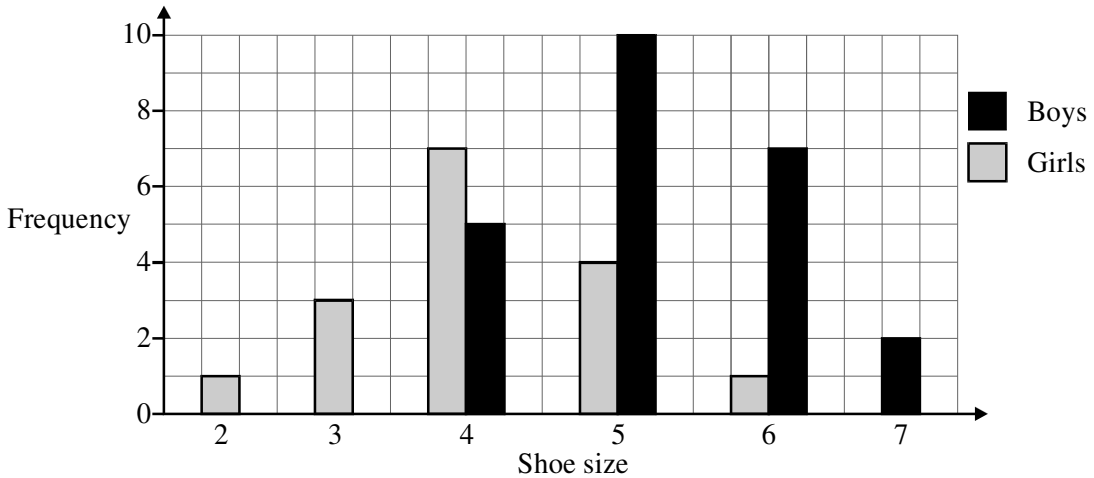


(a) What does the scatter diagram tell you about the relationship between the heights of these boys and their fathers? **(1)**

(b) Draw a line of best fit on the diagram. **(1)**

(c) Bill, another Year 9 boy, is 155 cm tall.
Use the diagram to estimate the height of Bill's father.
Explain clearly how you obtained your answer. **(2)**

9. The frequency diagram shows the distribution of shoe sizes for a class of 40 pupils.



(a) What is the ratio of girls to boys in the class?
Give your answer in its simplest form. **(2)**

(b) What percentage of the class have shoe size 6? **(3)**

(c) By working out the range and mode for the boys and for the girls, compare and comment on the shoe sizes for boys and girls. **(3)**

Answers to quick questions

1. No mark scheme available

2. **Blackbirds**

Indicates 'True' and gives a correct explanation

eg

- There are no males that are 121 – 125
- Males start at 126 – 130, females start at 121 – 125
- Some females are in the smallest category
- The smallest female wing length is not on the male chart

Accept minimally acceptable explanation, eg

- The grey bar does not appear on the male chart
- Accept End points of categories taken as exact
- No male is smaller than 126
- The smallest female might be 125 but the smallest a male could be is 126

! ***Explanation refers to a bird being at the end point of a category***

Indicates 'Not enough information' and gives a correct explanation

eg

- They are both within the same category so we need actual values
- Both could be 140, we don't know
- The exact lengths could be anything from 136 – 140
- Both have birds in 136 – 140
- All the males might be 136 but there might be a female that is 140

3. **Time**

(a) Explains the percentages may not be exact, eg:

- Rounding.
- Its only to a reasonable degree of accuracy.
- Some of them might have been above ½
- They should have given the percentages to more decimal places.

Accept responses stating the percentages are averages or based on estimates eg:

- 'The percentages are only averages.'
- 'All the percentages are averages.'
- 'The percentages are probably estimated.'
- 'We can't be sure what the percentages should be.'

Indications that there could be a mistake should be ignored if accompanied by an acceptable response, but should not be accepted on their own eg:

- 'It could be a mistake.'

Accept responses focusing on overlap between the categories shown eg:

- 'You can eat and rest at the same time.'
- 'Maybe some people do two things at once.'
- 'You do different things at the same time.'

(b) 2 hrs 52.8 minutes.

(c) Gives a valid explanation referring to:
Workers not working every day, eg:

- Some days you don't work.
- Holidays.
- Week-ends.
- Days you don't work lower the average.
  Also accept explanations that focus on breaks during the working day e.g.:
  - ♦ 'Lunch hours.'
  - ♦ 'Coffee breaks.'

  Accept responses that indicate children are included in the statistics e.g.:
  - ♦ 'Children don't get paid.'

or Not everyone working or working full time, eg:

- Unemployment.
- Some people dont work.
- Part-time workers.
- Some people only work for one or two hours.
- Lots do less but only a few do more.
- The average includes people who hardly do any as well as those who do lots.
- Voluntary work.

4. (a) Indicates the '**Cannot tell**' box
and
explains that there is no indication of the different numbers of lengths swum by individual pupils, eg:

- You don't know how many lengths each one swam.
- One pupil might swim lots of lengths.
- Older swimmers are stronger.
- Year 10 have some good swimmers.
- Year 7 didn't try as hard.
- You don't know how good at swimming they are.
- Year 10 might be fitter.

*Also accept **Cannot tell** indicated with explanation stating that the graph does not show the relevant information*

(b) between 10.3 and 10.4 inclusive

(c) between 10.0 and 10.1 inclusive.

(d) Explains, or implies, that Jack's mean is less accurate as he is using grouped data, e.g.:

- Jack used a range.
- Jack used classes.
- Jack uses mid-interval values.
- Jacks used an average.
- Lara's is exact, Jacks isn't.
- His are only estimates.
- In Jacks you have to guess how many lengths the people swam.
- In the first column the 12 pupils might only have swum one length.

5. (a) Indicates correctly which statements are true and which are not true, eg:

✘

✘

• ✓

(b) Indicates correctly which statements are true and which are not true, eg:

✓

✘

• ✘

(c) States median number of marks between 36 and 38 inclusive,

(d) States 43

(e) States 116

Answers to Past Paper questions

1. (a) Idea of cf calculation (19, 41, 61, 78, 89, 98, 100)

Use of upper class boundary in plotting points(15, 30, 45 etc)

Correct curve or line(s) drawn

(b) (i) 36 – 38 (inclusive)

(ii) Valid explanation, referring to relative ages — *Accept: There are more older people in developed countries In underdeveloped countries people die at a younger age*

2. (a) For multiplying each frequency by the mid point of each class interval.
(18 × 2.5), (42 × 7.5), (30 × 12.5), (8 × 17.5), (2 × 22.5)

9.2

(b) Either There may be a different number of checkouts
or There may be a different number of customers.
or The customers may be buying different quantities of goods.
or There may be trainee persons on some checkouts.
or It may be a different time of the day

3. (a) The older people are the longer they take
(Explanations must refer to relationship between age and time taken)

(b) 6 points to plot:
(2.5, 9) (4.5, 12) (6.5, 4)
(3.5, 18) (5.5, 6) (7.5, 1)

Use of straight lines/curve to join points
No requirement to join to (1.5, 0) or (8.5, 0)

(c) Possible ambiguity in question.
Does 'they' refer to polygons or times?
Allow both interpretations
reference given to comparison of polygons or times

Accept	*Not Accept*
men were quicker than women	*women took 5 hours*
most women took about5 hours,	
most men 4 hours	
peak for women is further on, later	

(i) 4 to 5 (hours)
5 to 6 (hours)

4. (a) 5300 thousand or 5300000 (tonnes)

(b) Use of 11.1 or ÷ 57 or 57 × 200
Sight of 0.19(47) 190, 194, 195; 11.4

Statement is true because 195 kg is approx 200 kg
or 11.4 is approximately 11.1

5. (a) (1 × 24) + (2 × 10) + (3 × 5) = 59

(b) Sales of flowers near Mother's Day would be well above the average daily sales.

6. (a) 150 × $\frac{2}{3}$ or $\frac{120}{180}\times 150$ or 300 or 50 100

(b) $\frac{300}{3} \times 4$

7. (a) All points correct
points plotted within one small square

(b) Line of best fit through
(0,0) ± 4 small squares
and between (9, 120), (10, 110) *Line and points joined*

(c) (i) 76 to 92

(ii) 10.6 to 14

(d) (i) **and** reason
e.g. between given distances
e.g. more variation at greater distances

8. (a) Positive correlation (or equiv.)
As one increases so does the other

Accept (All, These. Most) fathers are taller than their sons

(b) Line,

Must be straight line drawn with ruler.
Approx same number of crosses on both sides of line.
Need not go through origin.

(c)

ft from any line (inc curve) if clearly shown where value taken from.

9. (a) 16 : 24 or 24 : 16 or 3 : 2

2 : 3 or 1 : 1.5

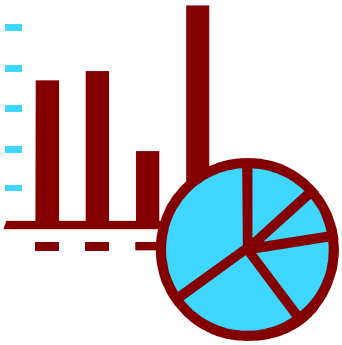
(b) $\frac{8}{40}$ or $\frac{1}{5}$ or 0.2

(c) Mode: Boys 5 Girls 4

Range: Boys 3 Girls 4

Comment:
Boys: smaller range, larger mode
or Girls: larger range, smaller mode
or valid statement

Completely valid statement referring to mode and/or range or general comment.



Enabling world-class education

30-4-10 Handling data

Days: 9, 10 and 11 **Topic:** Probability

You need to be able to:

- understand and use estimates or measures of probability from theoretical models (including equally likely outcomes)
- list all outcomes for single events, and for two successive events, in a systematic way
- identify different mutually exclusive outcomes and know that the sum of the probabilities of all these outcomes is 1
- understand and use estimates or measures of probability from experiments (relative frequency)
- understand that if you repeat an experiment, you may - and usually will - get different outcomes, and that increasing sample size generally leads to better estimates of probability and population characteristics
- use the vocabulary of probability to interpret results involving uncertainty and prediction

Tree diagrams are not included in this unit of work, but may be needed depending on the examination you are entered for.

You will need to think about:

The probability scale

Probabilities can only take values in the range 0 (impossible) to1 (certain)

Probabilities can be written as fractions, decimals or percentages but NOT in ratio or word form

The probability of an event = the number of ways the event can happen / the number of different outcomes

e.g when a dice is thrown once

P(score of six) = $\frac{1}{6}$

There are six **equally likely outomes**

1, 2, 3, 4, 5, 6

P(score of six) is a **shorthand** way of writing the probability of a six

If a dice is thrown once, each outcome is **mutually exclusive** because they cannot happen at the same time

P(not scoring a six) = $\frac{5}{6}$

The sum of the probabilities of mutually exclusive outcomes = 1

P(6) + P(not 6)

$= \frac{1}{6} + \frac{5}{6}$

Systematic ways of listing outcomes

e.g when a dice is thrown twice and the scores on each dice added together, the outcomes can be recorded in a table like the one below:

	1	**2**	**3**	**4**	**5**	**6**
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

There are 3 outcomes that lead to a score of 10

P(score of10) = $\frac{3}{36} = \frac{1}{12}$

There are 36 outcomes when two dice are thrown.

3/36 can be cancelled down to give the answer in its simplest form of 1/12

In an experiment:

relative frequency = $\frac{\text{the number of times the event occurred}}{\text{the total number of trials}}$

e.g when a coin was thrown 100 times, a head was obtained 60 times

The relative frequency or experimental probability of a throwing a head in this case

$= \frac{60}{100} = 0.6$

This can be compared to the **theoretical probability** of throwing a head which is 0.5

Quick questions

1. A box contains 10 red sweets and 5 green sweets. If you choose without looking, what is the probability of choosing a green sweet?
2. The probability it will rain today is 0.1. What is the probability it will not rain today?
3. Sarah throws a six sided dice and Paul throws an eight sided dice. Who is more likely to throw a six? Explain your answer.
4. Three coins are flipped.

   (a) Complete the list of all possible outcomes:

   HHH, HHT, HTH,

   (b) What is the probability of obtaining exactly two tails?
5. Two four sided dice are thrown and the scores added.
   **(include picture of dice)*
   (a) Copy and complete the table to show all possible outcomes.

	1	2	3	4
1	2	3		
2				
3			6	
4				

   (b) How many outcomes are there when two 4 sided dice are thrown?
   (c) What is the probability of obtaining a total score of 3?
   (d) What is the most likely score?

6. John throws a dice is 60 times. His results are shown below:

Score	**Frequency**
1	12
2	8
3	7
4	9
5	11
6	13

Sam says the dice is not a fair one as, if it was, all the frequencies would be the same. Do you agree? Explain your answer.

7. A survey of 100 people was carried out to estimate the probability a person will have a birthday in one of the first three months of the year.

(a) Complete the table to show the relative frequency of each month.

Month	Frequency	Relative frequency
January	29	
February	49	
March	22	

(b) Use the results in the table to predict the probability a person will be born in February.

(c) How could the accuracy of such a prediction be improved?

Past paper questions

1. The table shows information about a group of adults.

	Can drive	Cannot drive
Male	32	8
Female	38	12

(a) One of these adults is chosen at random.

What is the probability that the adult can drive?

.....

.....

Answer .....

(2)

(b) A man in the group is chosen at random.

What is the probability that he can drive?

.....

.....

Answer .....

(2)

(c) A woman in the group is chosen at random.
The probability that she can drive is 0.76.

What is the probability that she cannot drive?

.....

.....

Answer .....

(1)

(d) Does the information given support the statement

"More women can drive than men"?

Explain your answer.

.....

.....

.....

.....

.....(2)

2. Here are three statements about probability.
Tick a box to show whether you agree or disagree with each statement.
Give a reason for each answer.

(a) Graham says, "The probability that it will rain tomorrow is $\frac{6}{5}$".

☐ Agree ☐ Disagree

Reason .....

.....

(1)

(b) Mandy says, "In my box of chocolates there are 13 soft centres and 15 hard centres so the probability of my choosing a soft centre is $\frac{13}{28}$".

☐ Agree ☐ Disagree

Reason .....

.....

(1)

(c) Tom tosses a fair coin twice.
He gets a head both times.
He says, "The probability that I will get a head the next time I throw the coin is $\frac{1}{8}$".

☐ Agree ☐ Disagree

Reason .....

.....

(1)

3. At a school disco the drinks being sold were

Coke , Orange , Vimto.

Jake and Kirsty each bought one drink.

(a) Write down the different combinations of drinks that Jake and Kirsty could have bought.

.....

.....

(2)

(b) They both chose their drinks at random.

What is the probability of both drinks being the same?

.....

.....

(2)

4. (a) Three cards are numbered 1, 3 and 4.
Three discs are numbered 2, 4 and 5.

A game consists of picking one card at random and one disc at random.
The numbers on the card and disc are added together.

(i) Complete the table to show all the possible totals.

		Disc		
		2	**4**	**5**
Card	**1**	3		
	3			
	4			

(2)

(ii) What is the probability of getting a total which is an even number?

.....

.....

Answer .....

(2)

(b) In a different game the probability of getting a total which is an even number is $\frac{3}{5}$.
What is the probability of getting a total which is an odd number?

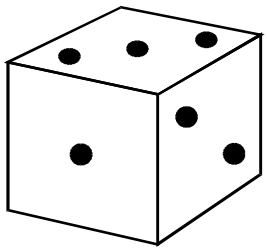
.....

.....

Answer .....

(1)
(Total 5 marks)

5. A dice is suspected of bias.
Here are the results of 20 throws.



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

(a) Use these results to calculate the relative frequency of each score.

.....

.....

.....

Score	1	2	3	4	5	6
Relative frequency						

(2)

(b) Use the relative frequency to calculate how many times you would expect to score 3 in 60 throws of this dice.

.....

.....

.....

Answer .....

(2)

(c) Compare your answer to part (b) with the number of times you would expect to score 3 in 60 throws of a **fair** dice.

.....

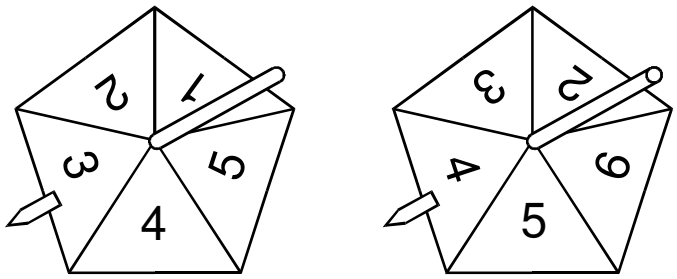
.....

.....

(1)

6. Two fair spinners are used for a game.
The scores from each spinner are added together.

For example: The total score from these two spinners is 4 + 5 = 9.



Tom played the game 500 times and kept a record of how many times he scored a total of 7.
He recorded his results in this table.

Number of spins	Total number of 7s	Relative frequency
first 50	13	0.26
first 100	23	0.23
first 150	27	
first 200	38	
first 500	105	

(a) Complete the table by calculating the relative frequencies for 150 spins, 200 spins and 500 spins.

(2)

(b) Which of these relative frequency results gives the best estimate of the probability of scoring a total of 7?

Give a reason for your answer.

……

……

(2)

Answers to quick questions

1) $\frac{5}{15} = \frac{1}{3}$

2) 0.9

3) Sarah is more likely to throw a six.

The probability of getting a six on a six sided dice is $\frac{1}{6}$ and the probability of getting a six on an eight sided dice is $\frac{1}{8}$.

$\frac{1}{6} > \frac{1}{8}$ so there is a higher probability of throwing a six

4) **(a)** HHH HHT HTH **THH HTT THT TTH TTT** **(b)** $\frac{3}{8}$

5) (a)

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

(b) 16 **(c)** $\frac{2}{16} = \frac{1}{8}$ **(d)** 5

6) Although, for a fair dice, the expected frequencies for each score would be 10 in theory, this will not always occur in practice. If the dice were thrown more times, better estimates of the relative frequencies would be obtained and, if the dice is fair, the relative frequencies should become more similar.

7) **(a)** 0.49

(b) accuracy could be improved by including more people in the survey.

Answers to past paper questions

1) (a) $\frac{70}{90} = \frac{7}{9}$ (b) $\frac{32}{40} = \frac{4}{5}$ (c) 0.24 (or $\frac{24}{100}$ or 24%)

2) (a) Disagree. The probability cannot be greater than one.

(b) Agree. There are 13 soft sweets out of a total of 28 sweets.

(c) Disagree. On the next throw, there are still only two outcomes,

Head or Tail, so the probability is still $\frac{1}{2}$

3) (a) CC OC VC

CO OO VO

CV OV VV

(b) $\frac{3}{9} = \frac{1}{3}$ (Note, there are **9** possible outcomes and **3** ways of both choosing the same drink)

4) (a)

Card \ Disc	**2**	**4**	**5**
1	3	**5**	**6**
3	**5**	**7**	**8**
4	**6**	**8**	**9**

(b) $\frac{4}{9}$ (there are 9 possible outcomes and 4 of them are even)

(c) In the new game P(odd score) = 1 – P(even score) = 1- $\frac{3}{5} = \frac{2}{5}$

5) (a)

Score	1	2	3	4	5	6
Relative frequency	$\frac{3}{20}$	$\frac{3}{20}$	$\frac{5}{20}$	$\frac{3}{20}$	$\frac{3}{20}$	$\frac{3}{20}$

(b) 15

(In 20 throws of this dice a three was scored 5 times, so in 60 throws, you would expect to score a three 15 times).

(c) This is more than expected on a fair dice. On a fair dice, the probability of scoring a 3 is $\frac{1}{6}$, so in 60 throws, the expected number of scores of 3 would be $\frac{1}{6}$ of 60 = 10.

6) (a) $\frac{27}{500} = 0.18$ $\frac{38}{500} = 0.19$ $\frac{105}{500} = 0.21$

(b) 0.21. The experiment with the greatest number of trials gives the best estimate.