

## **Challenging topics**

### **Collecting and interpreting data**

#### **Session 4: Interpreting data**

## Tackling challenging topics

### Collecting and interpreting data

#### Session 4: Interpreting data

##### Introduction

Knowledge about the collection and interpretation of data is needed to support mathematical understanding in a range of vocational settings. Teachers\* can modify the examples in these sessions to suit their particular vocational area by introducing relevant data sets or charts.

We use 'teaching and learning' and 'teacher' as generic terms to include:

- teaching, training and learning
- teachers, tutors, trainers, lecturers and instructors in the further education (FE) system.

This is the fourth of a set of four sessions with a common theme. You can use each session individually or link them. Each session has a number of stages and activities, which can also be used separately or linked. Learners would benefit if these smaller units were delivered consecutively, with the teacher ensuring that the overall session coverage is achieved.

##### Learning objectives and outcomes

Taking part in this session will help learners to:

- interpret and analyse data
- be aware of the limitations of conclusions drawn from data analysis
- work co-operatively to build on prior knowledge and to explore and resolve misconceptions
- discuss mathematical problems, improving their ability to describe situations and concepts using appropriate mathematical language
- collaborate in solving problems, learn from each other and clarify their own understanding by engaging in activities that encourage discussion with their peers.

##### Resources required

For each small group of learners, you will need:

- **Sheet 1: Labels** (three pages)
- **Sheet 2: Male or female?** (three pages)
- **Card set A: Regional differences** (two pages)
- **Sheet 3: Clues**
- **Card set B: Questions** (two pages)

- **Sheet 4: True or false?** (two pages)
- large sheets of paper (A4 would be ideal)
- felt tip pens
- scissors (unless you have prepared the cards in advance)
- glue sticks.

### Starting points

Learners should have some previous experience of reading and interpreting graphs and charts.

### Planning learning in multiple environments

During discussion, draw on learners' own experience of charts. This may have been at school or college, in work experience, or in their current vocational course. Try, wherever possible, to relate the collection and interpretation of data to the wider vocational context by using vocationally relevant examples.

**Time needed for this session: 2 to 2.5 hours.**

### Suggested approach

#### Stage 1: Explaining what is represented in a chart

#### Working in groups

Arrange learners in groups of two or three and prepare them to work co-operatively. If learners are unfamiliar with this way of working, the handout from Session 1 (**Sheet 1 – Discussing Mathematics**) may be helpful.

Explain the purpose of the activity and the learning objectives.

Give a copy of **Sheet 1: Labels** (three pages) to each small group of learners. There are three graphs/charts. The labels for each are missing. Ask learners to cut out the words and stick them on to the appropriate part of each graph/chart.

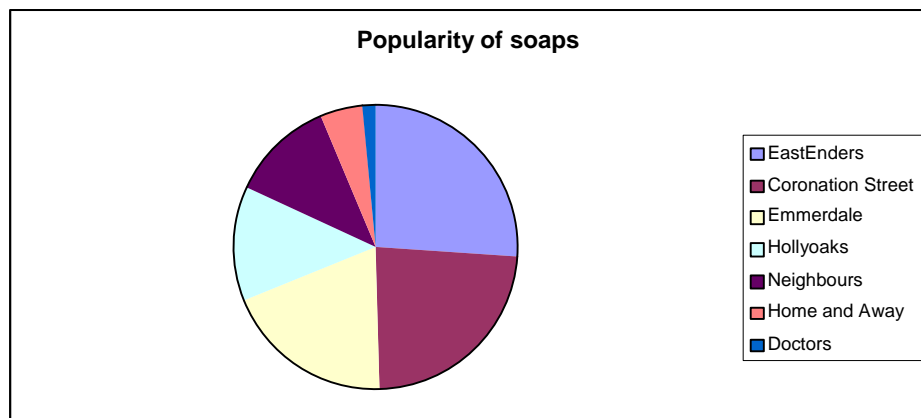
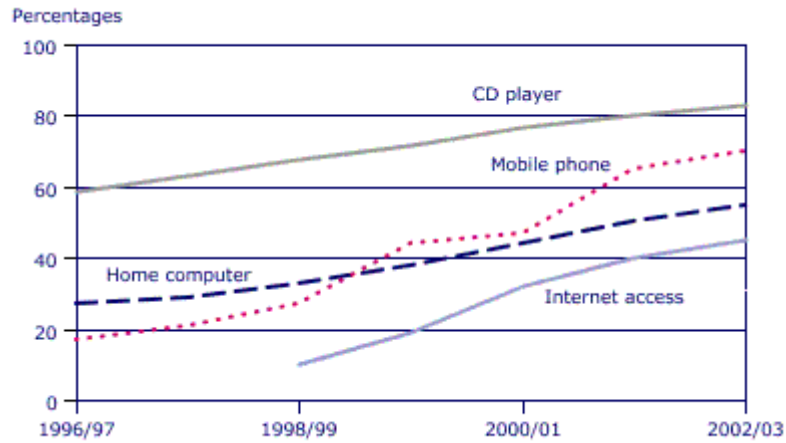
As a class, discuss any differences between what the groups have done and encourage learners to justify their decisions.

Ask learners how they think the graphs and charts will have changed if they were drawn in 2008.

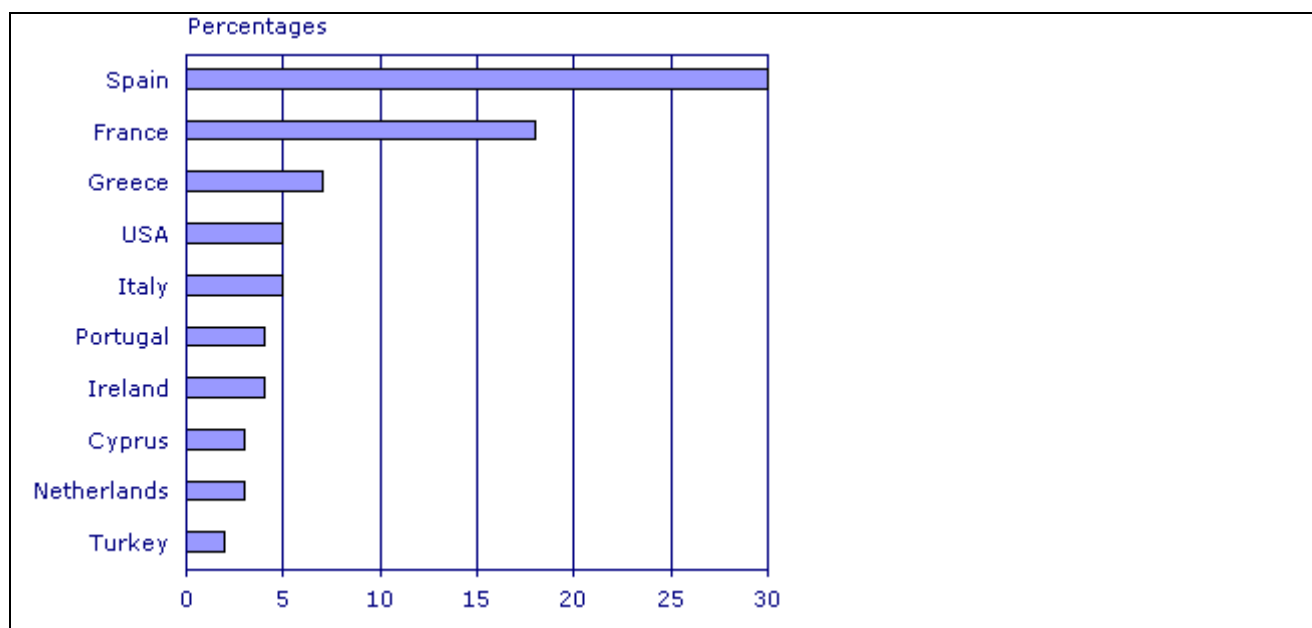
#### Comment

The correct responses are shown below. However, if learners do not get them right, but can justify their decision, they have succeeded in the task.

The aim is to encourage learners to look closely at graphs and charts and begin to interpret them without realising that they are doing this.



**Learning Mathematics in context**



## Stage 2: Using knowledge of differences to interpret charts

### Working in groups

Give a copy of **Sheet 2: Male or female?** (three pages) to each group of learners. Learners have to decide which pie chart, which line graph, or which set of bars represents males and which represents females. They have to justify their decision.

### Class discussion

A whole class discussion in which learners share their decisions and justifications will help them to make statements about the interpretation of graphs and charts.

#### Comment

The aim of this activity is to encourage learners to look closely at charts and graphs and think about what the sections, lines or bars represent. It is not about getting the right answer. It may be that either way round can be justified.

However, the correct answers are as follows.

- The first pie chart in **Occupation by gender** refers to males, the second to females.
- The upper line graph in **Life expectancy** is female.
- The line graph that starts below and ends above in **Examination successes** is female.
- The black bars represent females in **Senior citizens**.
- The black bars represent males in **% of population under 16**.
- The black bars represent males in **Portions of fruit and vegetables**.
- The black bars represent females in **Time spent on leisure activities**.

## Stage 3: Matching statements to charts

### Working in groups

Give each small group of learners a copy of **Card set A: Regional differences** (two pages). Ask learners to cut out the charts on the first page and stick them onto a large sheet of paper, evenly spaced. They should then cut out the cards on page 2 and stick each one next to the bar chart for which the interpretation is true.

When learners have placed all their cards, they should compare their decisions with those of another group. Any differences should be resolved by discussion. It may be that a group decides to change the position of a card as a result of discussion or it may be that the groups agree that a particular interpretation can go in more than one place and both are correct.

This can be repeated using a range of charts from different vocational areas.

## **Stage 4: Drawing a chart from clues**

### **Working in groups**

Give out a copy of **Sheet 3: Clues** to each small group of learners. They have to use the clues (which are really statements of interpretation) to construct the charts that the clues relate to.

**Note:** The clues are written in such a way that there is not enough information to decide on a single correct interpretation.

When learners have constructed their charts, they should compare them with that of another group. If there are any differences, they should discuss them until they reach a consensus about whether the differences are due to misinterpretation of the clues or whether there is not enough information in the clues and the differences are valid. If the latter is the case, they should make up some more clues so that no differences arise. These extra clues can be shared as part of the class discussion following the activity.

## **Stage 5: Designing questions to go with a chart**

### **Working in groups**

Give one chart or graph from **Card set B: Questions** (two pages) to each small group of learners. Ask them to write down, underneath the chart/graph, three questions that can be answered using that chart/graph.

Ask learners to pass their chart/graph and questions to another group of learners who should then answer the questions. Preferably, learners should receive a different type of chart/graph from the one they have been working on.

Learners answer the questions and then give their work back to the group that set them for marking. Any difficulties or problems with the questions or the answers should be resolved by discussion between the groups.

If learners are becoming more confident about interpreting charts and graphs, they could be asked to write one easy question and two hard ones. Alternatively, they could be given a second chart or graph and asked to write two hard questions about it.

This activity can be continued using graphs and charts relating to particular vocational areas.

**Stage 6: Reviewing learning: True or false?****Working in groups or class discussion**

Ask learners to look at the charts and interpretations on **Sheet 4: True or False?** (two pages). They must decide which statements are true and which are false and give their reasons. In some cases, it is legitimate for learners to say they are not sure. However, this is a 'last resort' response and learners must give a full explanation.

You may wish to add questions that are relevant to particular vocational areas.

This activity can be done in groups, with decisions being shared and discussed as a class, or it can be done as a whole class discussion.



### Comment

These are just a few examples of possible responses.

The South East has twice the percentage of households with central heating as Yorkshire and Humberside.

- False. Although one bar looks twice as high as the other the bars do not start at zero.

The difference in the proportion of households with central heating in the South East and London is 5%.

- True.

More than three quarters of houses in the West Midlands have central heating.

- True – the bar goes beyond 75%.

The safest drivers are those aged 80 and over.

- Probably False – they do have fewer accidents but there are not many drivers aged 80 or more so they may well have more accidents per driver.

17-19 year olds are safer drivers than those aged 20 to 59.

- Almost certainly False – there are far fewer 17-19 year olds on the roads than 20-59 year olds. The number of accidents per person will be higher than in any other age group.

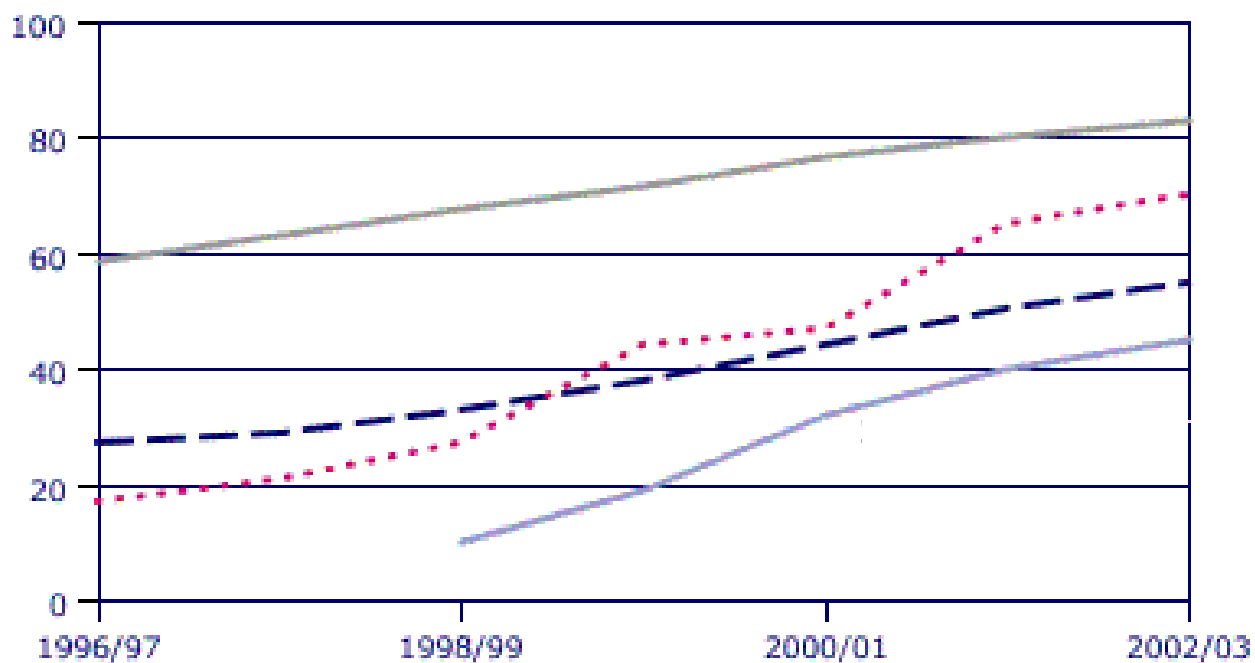
The 60-79 age group accounts for approximately 15% of all accidents.

- True – just over 30 out of a total of around 220 is approximately 15%.

If learners need more practice, you can use charts and graphs that relate to the learners' vocational area.

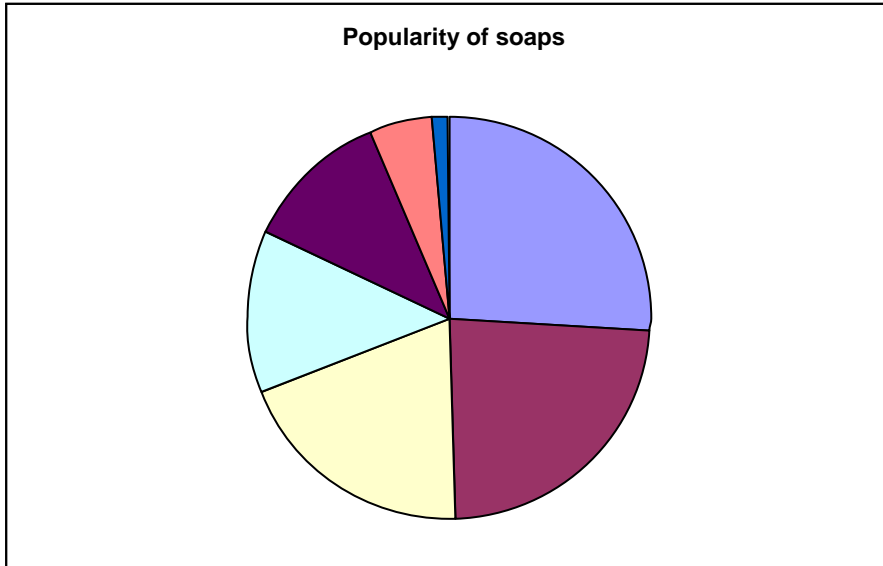
**Sheet 1: Labels (page 1 of 3)**

Percentages



Internet access	CD player	Mobile phone
Digital television service	Home computer	DVD player

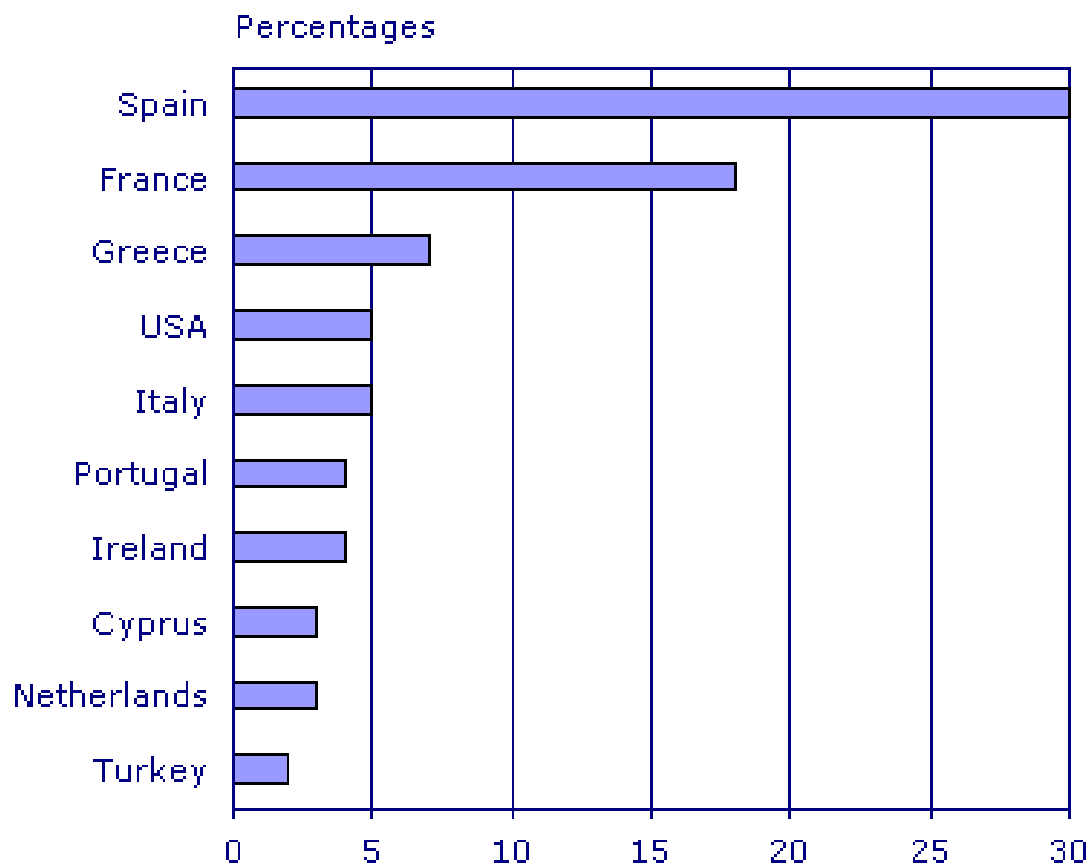
**Sheet 1: Labels (page 2 of 3)**



<b>Neighbours</b>	<b>Doctors</b>	<b>Hollyoaks</b>
<b>Home and Away</b>	<b>East Enders</b>	<b>Emmerdale</b>
<b>Coronation Street</b>		

Sheet 1: Labels (page 3 of 3)

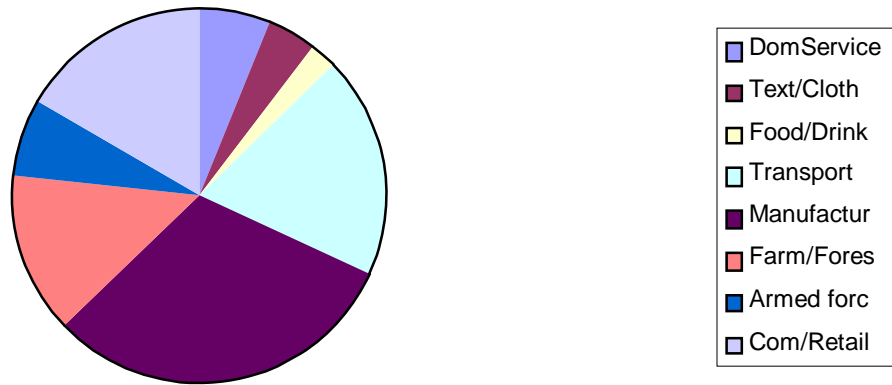
Popularity of holiday destinations



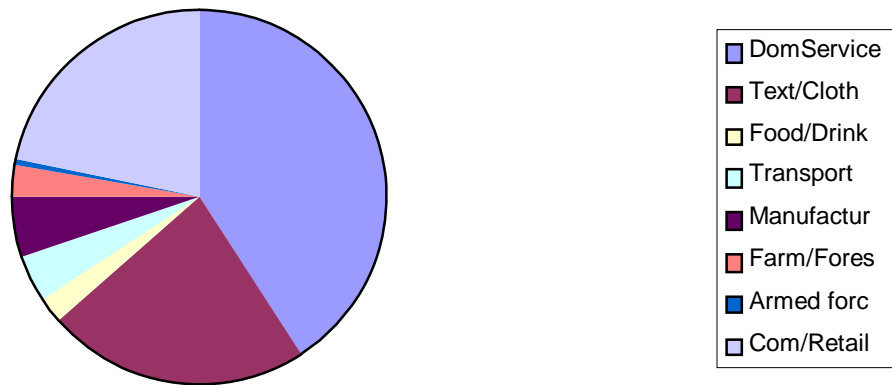
<b>Turkey</b>	<b>Portugal</b>	<b>France</b>
<b>USA</b>	<b>Netherlands</b>	<b>Italy</b>
<b>Ireland</b>	<b>Spain</b>	<b>Cyprus</b>
<b>Greece</b>		

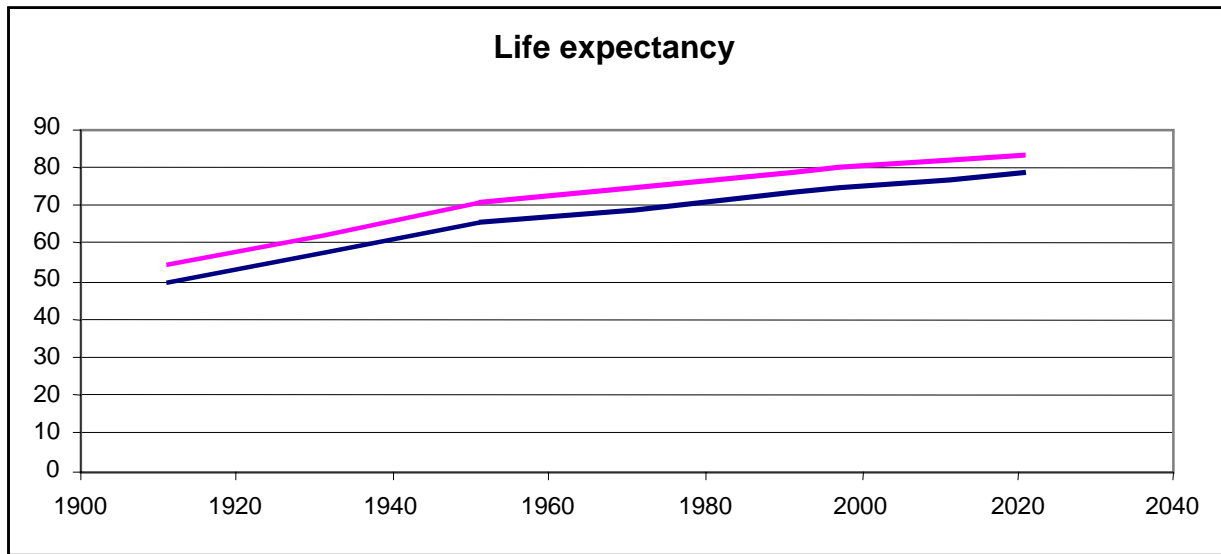
**Sheet 2: Male or female? (page 1 of 3)**

**Occupation by gender in 1951**

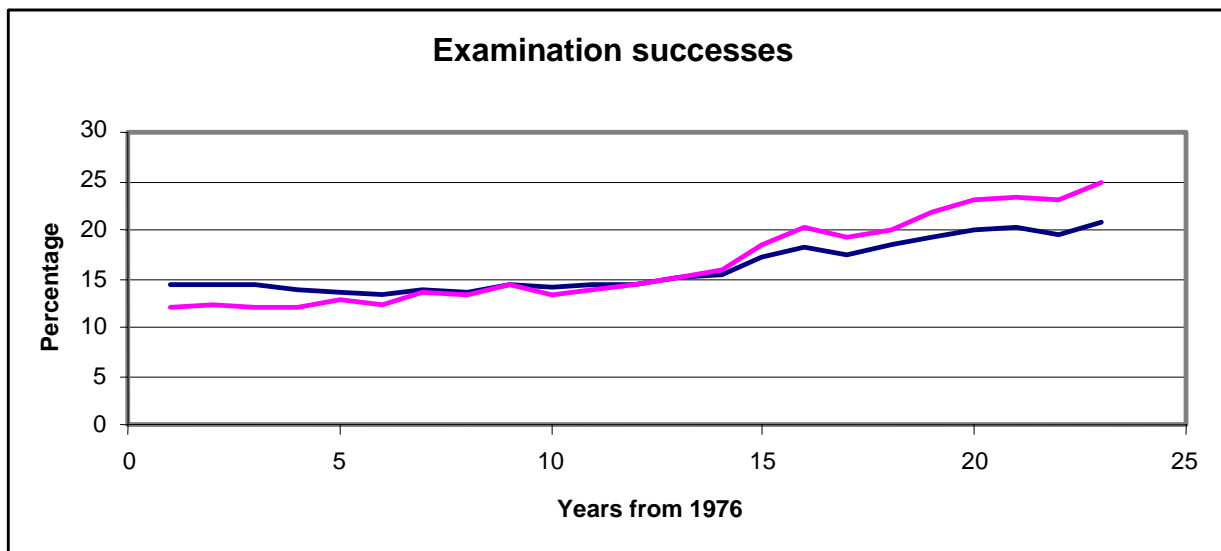


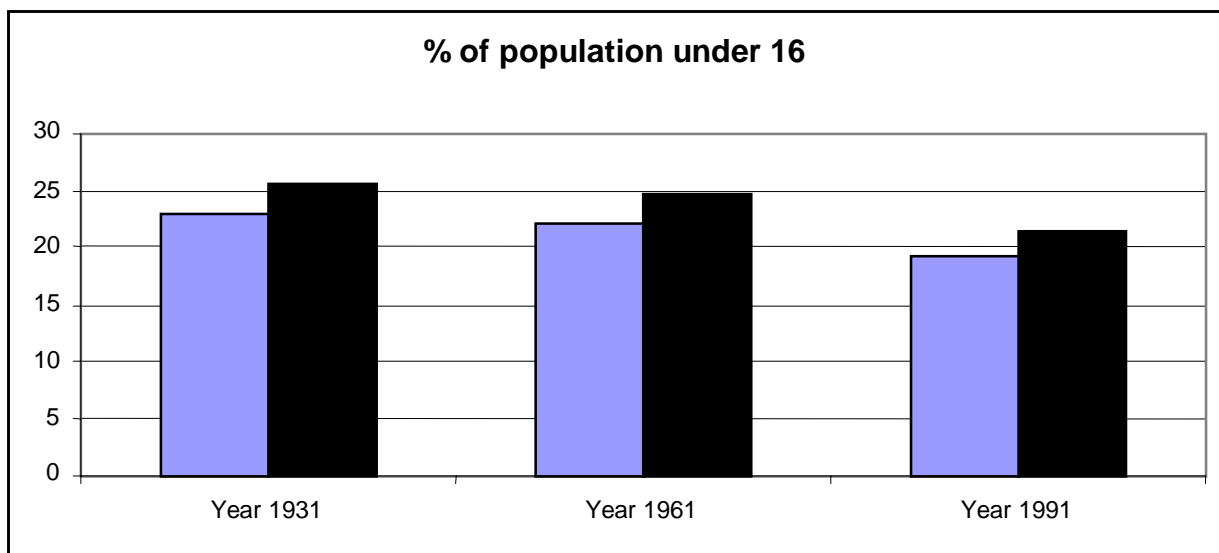
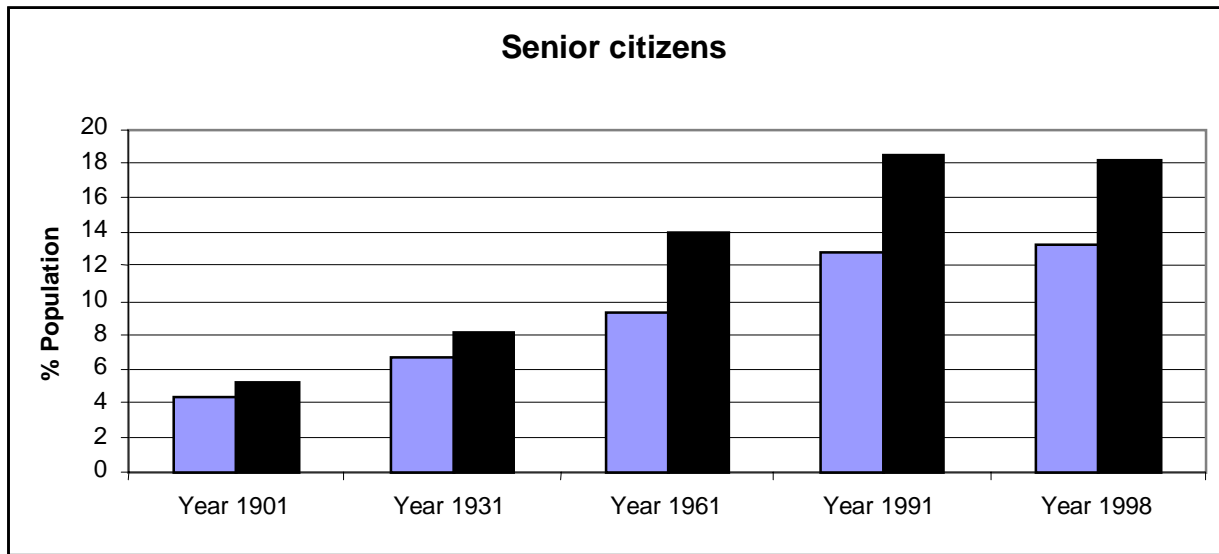
**Occupation by gender in 1951**





**Sheet 2: Male or female? (page 2 of 3)**

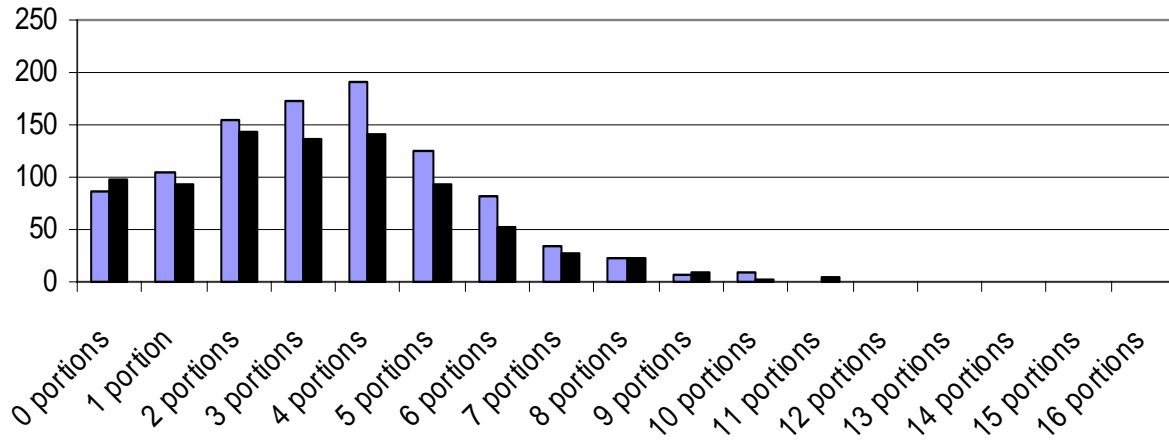




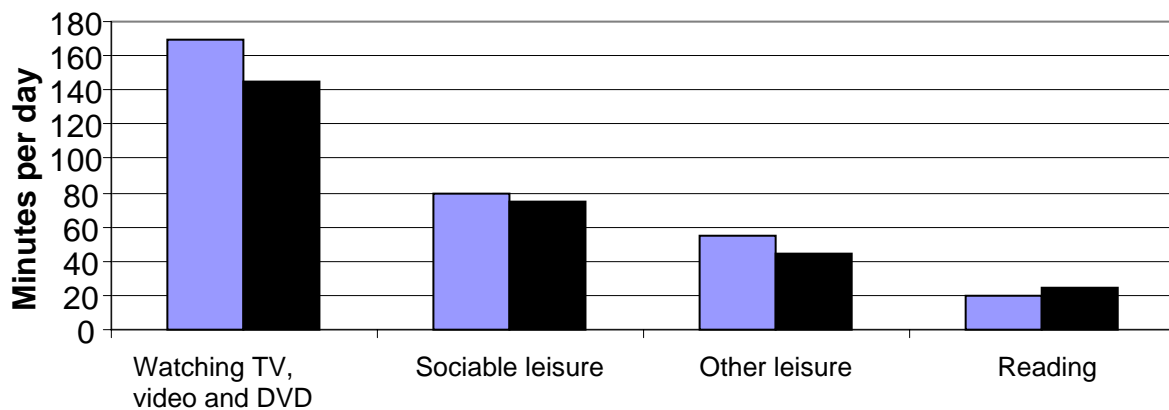


**Sheet 2: Male or female? (page 3 of 3)**

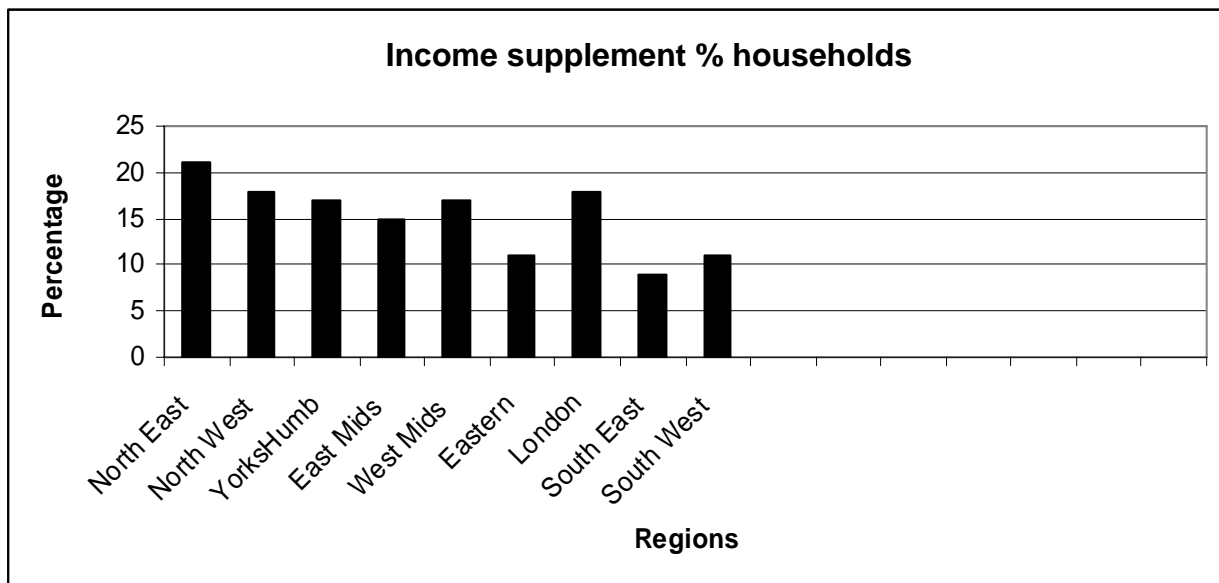
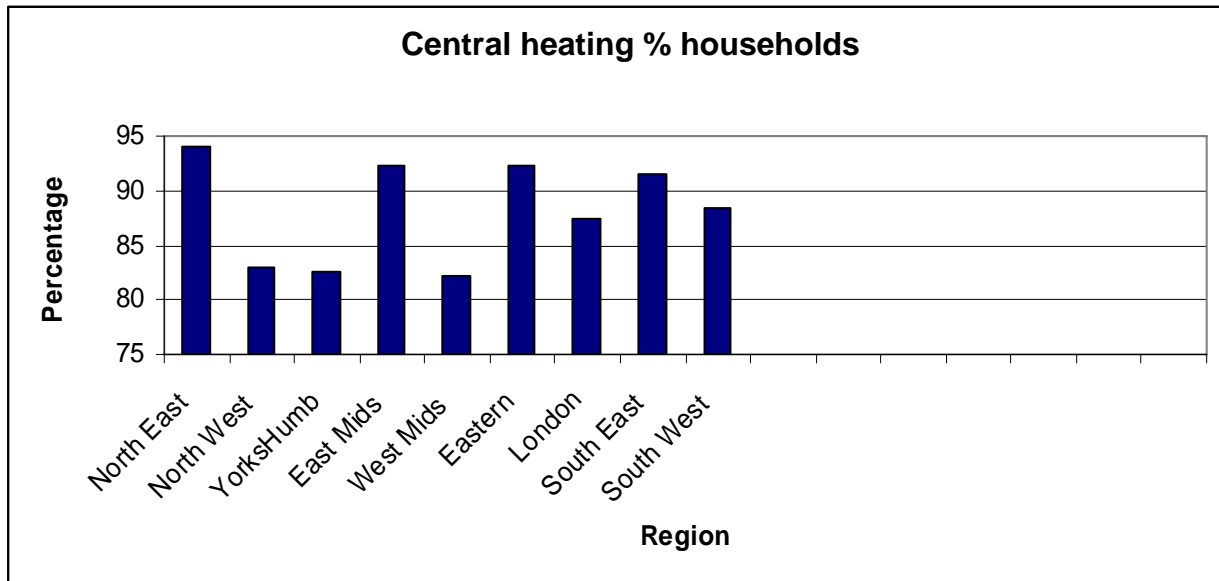
**Portions of fruit and vegetables consumed in previous 24 hours**



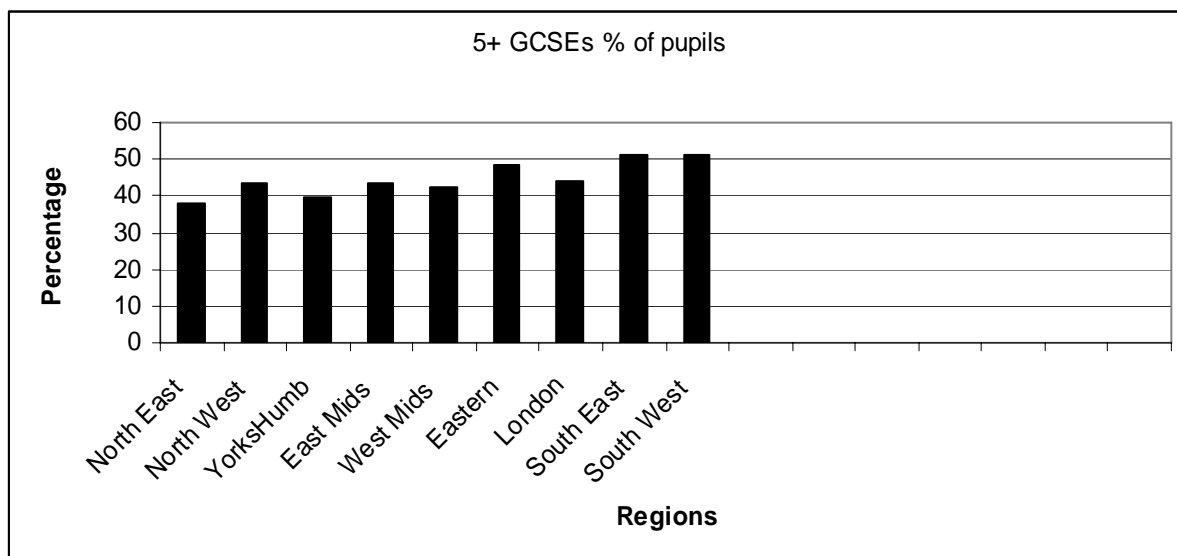
**Time spent on leisure activities**



**Card set A: Regional differences (page 1 of 2)**



**5+ GCSEs % pupils**



**Card set A: Regional differences (page 2 of 2)**

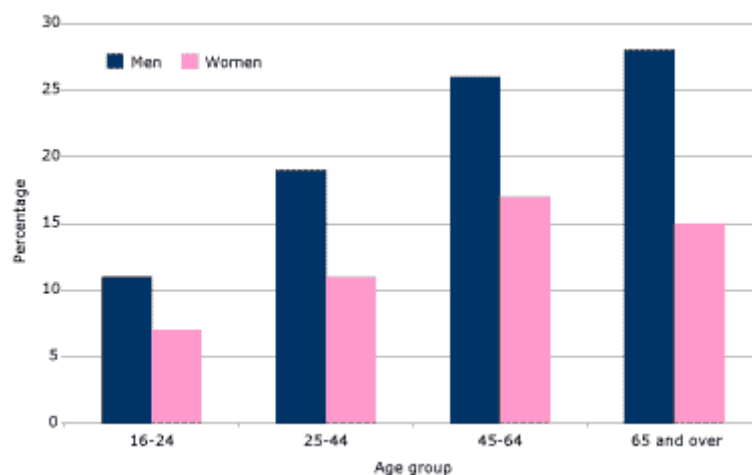
There was a higher percentage in the North West than in the North East.	The highest percentage was in the North East.
There are 10% more in the North East than in the Eastern region.	The lowest percentage is in the South East.
The South East had 9%.	The South West had 51%.
There are 10% more in the East Midlands than in the West Midlands.	Yorkshire and Humberside had 83%.
The North East had the highest percentage, followed by the East Midlands and the Eastern regions.	The West Midlands had the lowest percentage.
London had a slightly higher percentage than the West Midlands.	The North East managed 38%.
Yorkshire and Humberside had a much lower percentage than the North East.	London had a lower percentage than the South East.
The West Midlands was 2% more than the East Midlands.	The North East and Yorkshire and Humberside both had a lower percentage than the North West.

**Sheet 3: Clues**

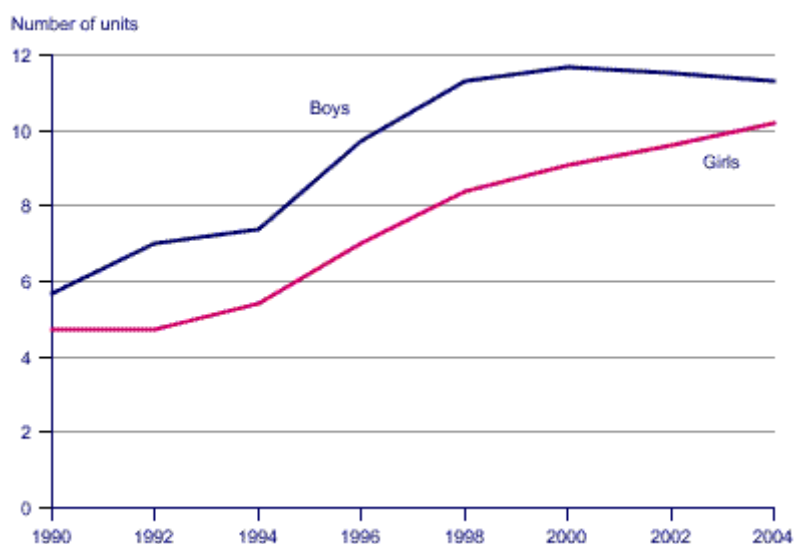
1. Comedy was the most popular type of DVD with 33% of the rentals being in this category.
2. Science fiction was the least popular with only 4% of the rentals.
3. Children's programmes and Horror were only slightly more popular than Science Fiction.
4. Horror had 3% more than Science Fiction.
5. The Thriller and Adventure categories were second to Comedy but were a long way behind.
6. Drama accounted for 7% more of the rentals than Horror but 8% less than Thriller.

**Card set B: Questions (page 1 of 2)**

**Percentage of males and females who had drunk alcohol on five days or more in the week prior to interview**

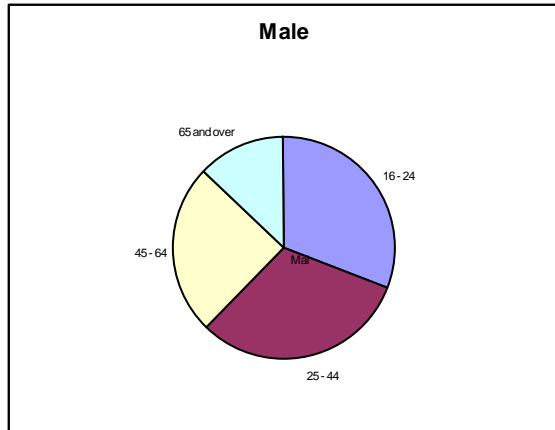
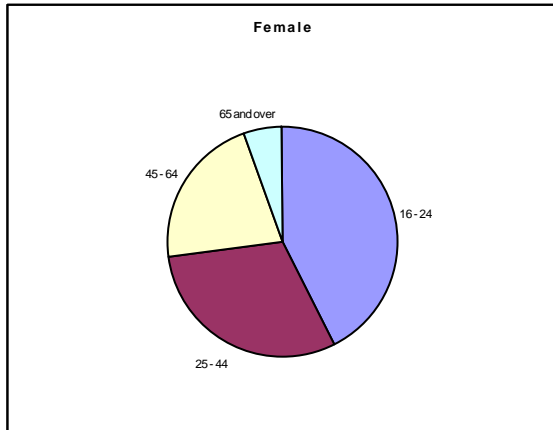


**Mean consumption of alcohol by children aged 11-15 who drank in the last week**

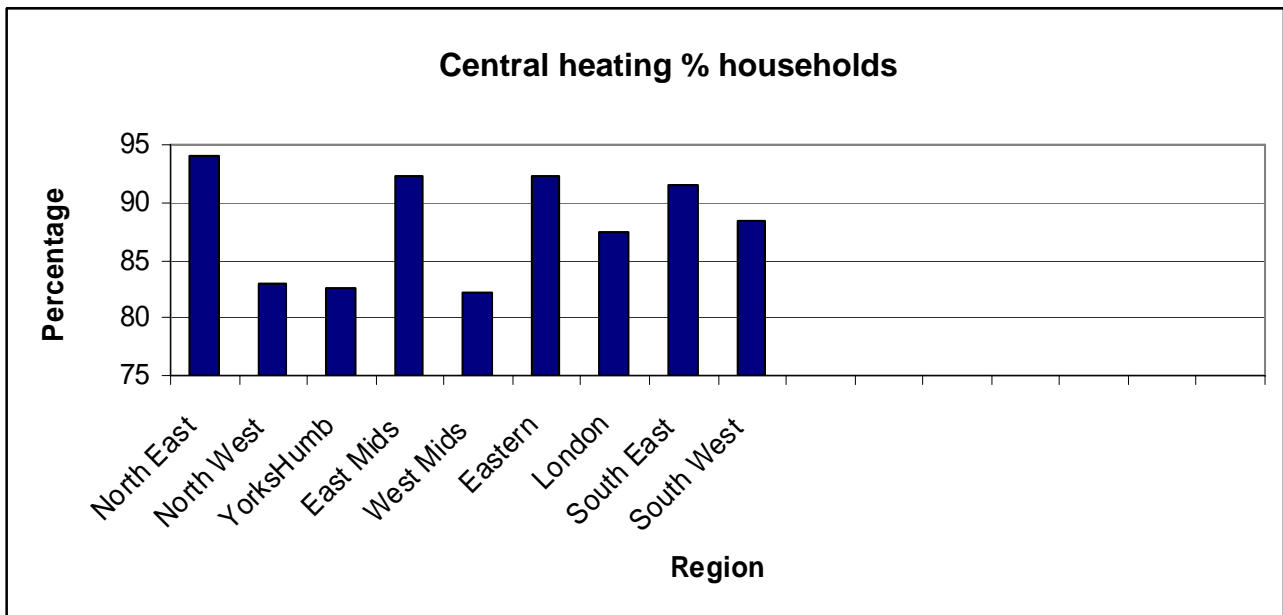


**Card set B: Questions (page 2 of 2)**

**Percentage of adults drinking more than the recommended guidelines on at least one day in the last week**



**Sheet 4: True or false? (page 1 of 2)**



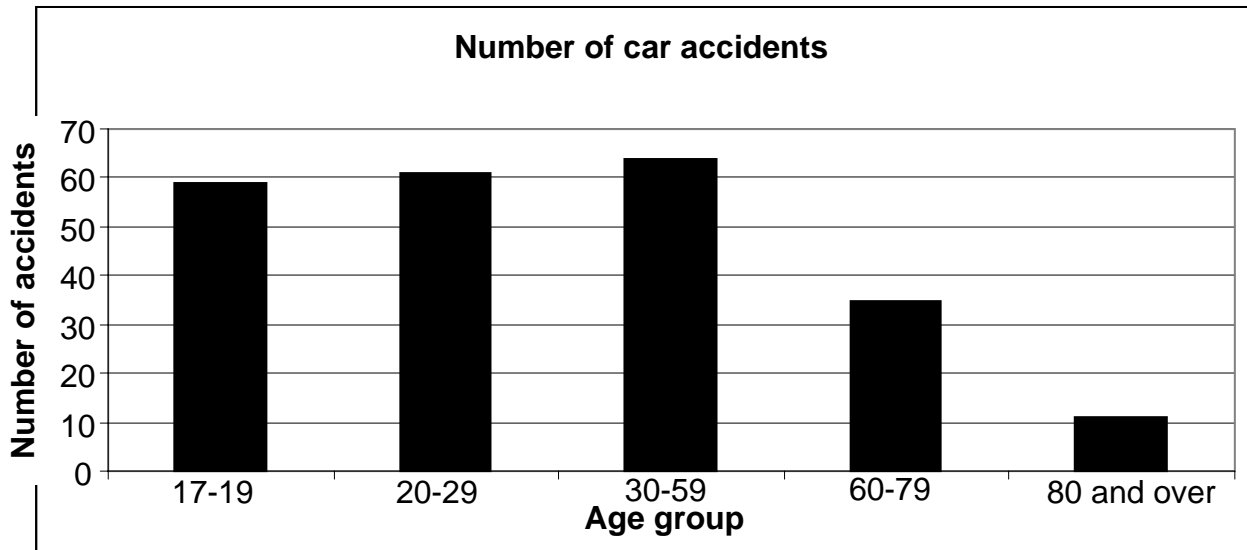
The percentage of households with central heating in the South East is twice that in Yorkshire and Humberside.

The difference between the South East and London is 5%.

More than three quarters of houses in the West Midlands have central heating.



**Sheet 4: True or false? (page 2 of 2)**



The safest drivers are those aged 80 and over.

17-19 year olds are safer drivers than those aged 20 to 59.

The 60-79 age group accounts for approximately 15% of all accidents.

30-59 year olds are the most dangerous drivers.