

REPRESENTING DATA

- 1) The managers of a new shopping centre carried out a survey of shoppers to gather information about what method of travel (if any) they had used to get there and how far away from the shopping centre they lived. The results of the survey are summarised in the tables below.

Method of travel	On foot/bicycle	By car	Using public transport
Number of shoppers	9	147	50

Table 1

Distance from home (km)	0 - 5	5 - 10	10 - 20	20 - 30	30 - 50
Number of shoppers	10	44	81	53	18

Table 2

- i) State one suitable diagrammatic way in which the data in Table 1 could be represented.
- ii) Represent the data in Table 2 by means of an accurately drawn histogram.
- iii) Use the figures in Table 2 to calculate an estimate of the mean distance travelled.
- iv) The survey was carried out on a Saturday afternoon, a few days after the centre first opened. Give one possible reason why the survey results should be treated with caution.
- 2) Data collected from a survey of the annual incomes, £ x , of a sample of people living in a certain neighbourhood who were in full-time employment is summarised in the table below.

Annual income (£)	Number of people
$5000 < x \leq 10000$	122
$10000 < x \leq 15000$	290
$15000 < x \leq 20000$	201
$20000 < x \leq 30000$	86
$30000 < x \leq 50000$	27
$50000 < x \leq 100000$	14

- i) Illustrate the data by means of a cumulative frequency graph, and use your graph to estimate the median income and the interquartile range.
- ii) Calculations, using the above data, produced estimates of the mean and standard deviation of the incomes of £16 670 and £10 640 respectively, correct to 4 significant figures. Subsequently it was revealed that the highest income amongst the 14 people earning between £50 000 and £100 000 was, in fact, £65 000. State, without further calculation, what effect (if any) there would be on the values of the median, interquartile range, mean and standard deviation of the incomes.

- 3) The following table shows data taken from the *Annual Abstract of Statistics, 1993*. The first row shows the numbers, in thousands, of colour television licences in force in the United Kingdom on the 31st March in each of ten successive years. The second row shows the numbers, in thousands, of all licences in force (i.e. those for colour and those for black and white).

Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Colour licences ('000)	14699	15370	15819	16025	16539	17134	17469	17964	18111	18426
All licences ('000)	18494	18632	18716	18705	18953	19354	19396	19645	19546	19631

- i) State briefly what general trends are shown by the figures in the table.
- ii) Describe how the information in the table could be illustrated in one diagram.
- iii) Comment fully on the accuracy of all numerical aspects of the following newspaper report.

“The number of black and white licences decreased by over 68% during the 10-year period. This is a mean annual reduction of 6.8% and by 1992 there were only about 1200 black and white licences in force.”

- 4) Data collected from a survey of the cost of 4320 houses in a town are summarised in the table below.

Cost (£)	Number of houses
20 001 - 50 000	540
50 001 - 60 000	1150
60 001 - 70 000	1320
70 001 - 100 000	860
100 001 - 150 000	450

On graph paper, illustrate the data by means of a cumulative frequency graph and use your graph to find the median cost and the interquartile range.

- 5) For an enquiry into motorway journeys, each driver in a random sample of 200 drivers leaving the motorway was asked to indicate the distance just travelled on the motorway by ticking one box on the following form.

Length of journey on motorway:	
not more than 20 miles	<input type="checkbox"/>
more than 20 miles but not more than 40 miles	<input type="checkbox"/>
more than 40 miles but not more than 70 miles	<input type="checkbox"/>
more than 70 miles but not more than 100 miles	<input type="checkbox"/>
more than 100 miles	<input type="checkbox"/>

Table 1

- i) For the sample of 200 drivers, it was discovered that no driver had travelled no more than 200 miles. The lengths of the journeys of these drivers are summarised in Table 2.

Journey length (x miles)	$x \leq 20$	$20 < x \leq 40$	$40 < x \leq 70$	$70 < x \leq 100$	$100 < x \leq 200$
Number of drivers	38	69	51	25	17

Table 2

On graph paper, illustrate these results by means of a cumulative frequency graph and use your graph to estimate the median and the interquartile range of the lengths of the motorway journeys in this sample.

- ii) State one possible advantage of requesting the information in the form shown in Table 1.

iii) State one possible disadvantage of requesting the information in the form shown in table 1.

ANSWERS.

- 1)
 - i) Could use a pie chart.
 - ii) Frequency densities: 2, 8.8, 8.1, 5.3, 0.9.
 - iii) {Use midpoints etc.} Mean = 17.549 (3 decimal places).
 - iv) The survey could be 'skewed' since the centre might have attracted a lot of visitors from far away who would not normally travel this far simply because it has just opened etc.

- 2)
 - i) Cumulative frequencies: 122, 412, 613, 699, 726, 740.
Median \approx £14000, lower quartile \approx £11000, upper quartile \approx £19000.
I.Q.R. \approx £8000.
 - ii) Median and I.Q.R. would be unaffected. Mean and standard deviation would both be lowered.

- 3)
 - i) The number of licences is on the increase.
 - ii) By using a bar-chart with '*double bars*'.
 - iii) The 68% is based upon the figures for 1983 and 1992 and does not depend upon those for the in-between years in any way. Thus the claim of a mean annual reduction of 6.8% is unjustified & depends upon actual comparisons of 1983-1984, 1984-1985 ... etc.
In 1992 there were about 1200000 black and white licences, not 1200.

- 4) Cumulative frequencies: 540, 1690, 3010, 3870, 4320.
{Choose a good scale!} Median \cong £64 000.
LQ \cong £55000, UQ \cong £78000, IQR \cong £23000.

- 5)
 - i) Cumulative frequencies: 38, 107, 158, 183 200.
Median \cong 38 miles.
LQ \cong 23 miles, UQ \cong 65 miles, IQR \cong 42 miles.
 - ii) Quick and easy for motorists to complete.
 - iii) Information recorded is not very precise.