

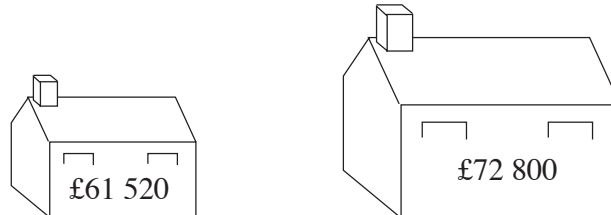
## (D) Misrepresentation of Data

The media (both the press and TV) often misrepresent data in order to unfairly emphasise a particular point. You will see some instances of this in the following examples.



### Worked Example 11

The following diagram shows how the average price of a house has increased in less than 2 years.



Explain why the diagram is misleading.

(SEG)



### Solution

The sizes (or volumes) of the houses are *not* in the ratio

$$61\,520 : 72\,800 \approx 1 : 1.18$$

The linear ratio is about 2 : 3, i.e. 1 : 1.5, so the area ratio is 1 : 2.25 and the volume ratio is 1 : 3.375, none of which is correct.



### Worked Example 12



- Explain why the slogan "BIGGER BOTTLES – smaller prices" on the advertisement could be misleading.
- Explain why this advertisement is correct.

(SEG)



### Solution

- It sounds as if the bigger bottle is actually cheaper than the smaller bottle.
- The cost per litre of the smaller bottle is

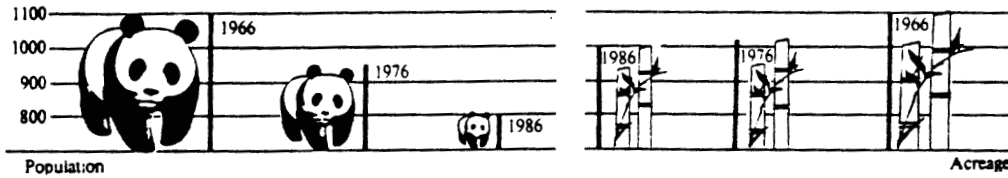
$$£6.65 \times \frac{100}{70} = £9.50$$

so, in fact, the bigger bottle has a smaller price for the equivalent volume.



### Worked Example 13

The unusual diagram below was produced by a nature conservation group.



- The panda population was smaller in 1986 than in 1966. Approximately how much smaller?
- Give *two* ways in which the panda diagram is misleading.
- Describe briefly the change in bamboo yield from 1966 to 1986.
- What has been omitted from the bamboo diagram?
- Name *one* unusual feature of the bamboo yield diagram.

(NEAB)



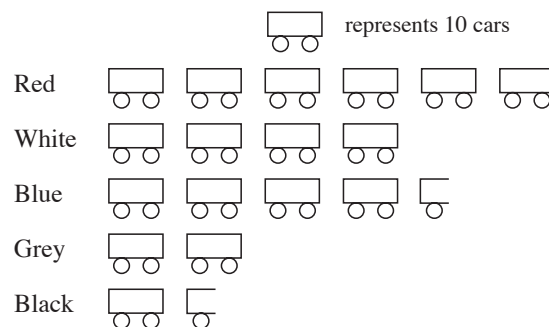
### Solution

- About 300 less.
- The vertical axis starts at 700, so the decrease looks larger than it really is; also, the sizes of the pandas are not in proportion to 1100 : 950 : 800.
- Significant decreases from 1966 to 1976, but little change from 1976 to 1986.
- Scale on vertical axis.
- The years on the horizontal axis increase in the 'negative' direction.



### Exercises

- The pictogram shows the number of cars of different colours sold by a large garage during a period of 20 weeks.



- How many white cars were sold?
- How many more blue cars than black cars were sold?
- Find the total number of cars sold.
- Calculate the mean number of cars sold per week.
- The profit made per car is £500. Calculate the total profit on the black cars.

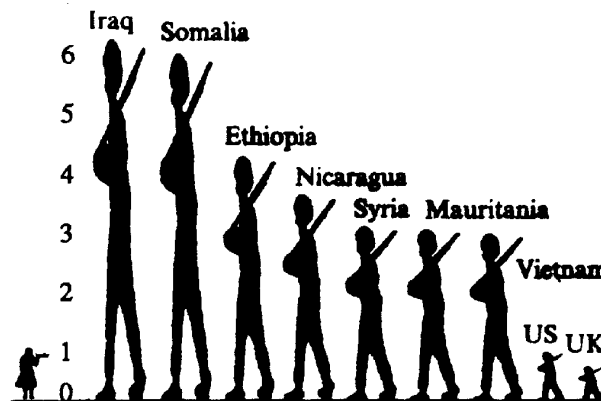
(NEAB)

2. The diagram shows the amount of energy needed by each kilogram of body weight each day between birth and the age of 18 years.



- (a) A boy is 15 years old. How much energy in kilojoules does he need each day for each kilogram of his body weight?
- (b) A girl is 16 years old. She weighs 50 kg. How much energy in kilojoules does she need each day?
- (c) What happens to the energy needs of the body as people grow older? (SEG)

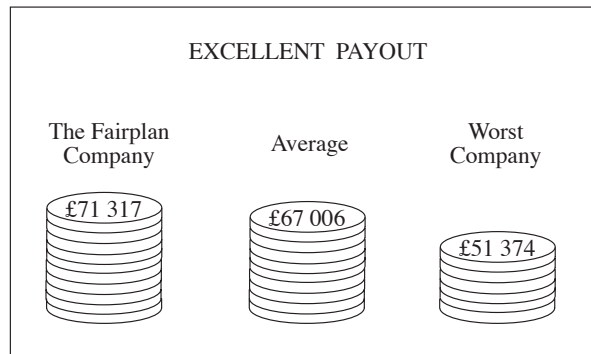
3. The diagram below shows the soldier-teacher ratios for some Third World countries together with the United States and the United Kingdom.



- (a) In Syria there are 600 000 teachers. How many soldiers are there?
- (b) In which countries are there more teachers than soldiers?
- (c) In Nicaragua there are 700 000 soldiers. How many teachers are there?
- (d) There are the same number of soldiers in Somalia as in Vietnam. What can you say about the number of teachers in Somalia and Vietnam? (NEAB)



6.

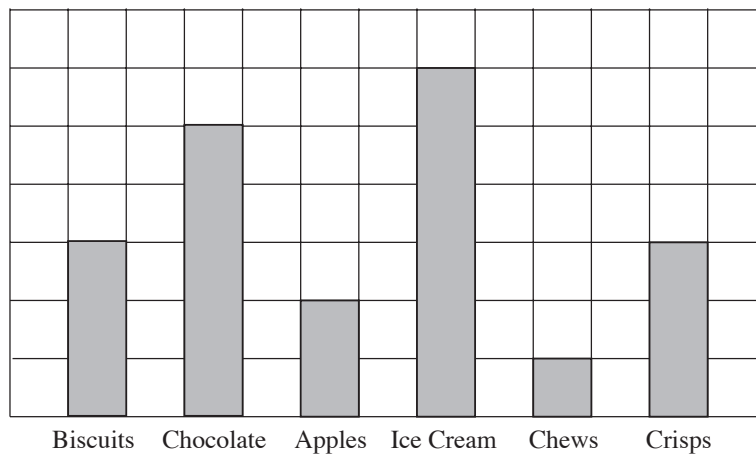


The pictogram shows the amount of pension given to people when they retire.

- (a) Calculate the amount of money that each disc represents for the Worst Company. Give your answers to the nearest £.
- (b) Why could it be misleading to compare The Fairplan Company with the Worst Company using this pictogram?

(SEG)

7. The bar chart shows the number of children buying different types of food from the canteen on a particular day.



Chocolate was bought by 30 children.

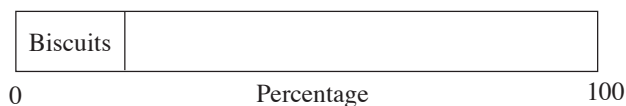
- (a) Work out the number of children who bought chews.
- (b) Find the number of children who bought ice cream.

Each child buys only one type of food.

- (c) Calculate the total number of children buying food on that day.

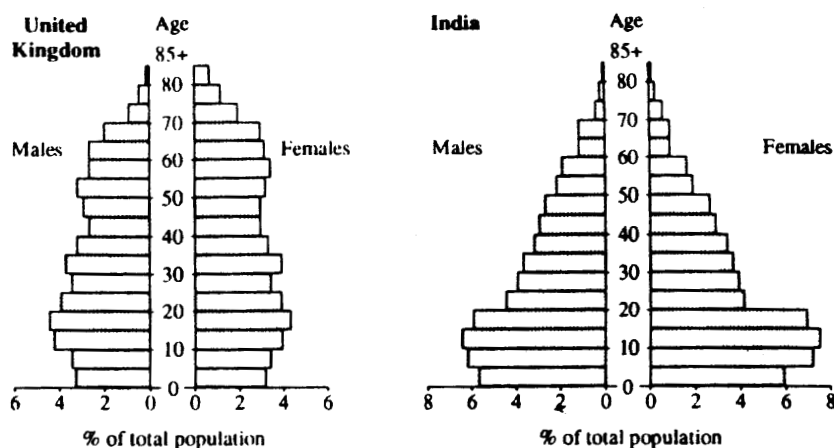
Another form of presentation was proposed.

- (d) Keeping the foods in the same order as on the bar chart complete a percentage bar chart in a copy of the one below.



(SEG)

8. The population pyramids for India and the United Kingdom show the percentage of males and females within each age group.

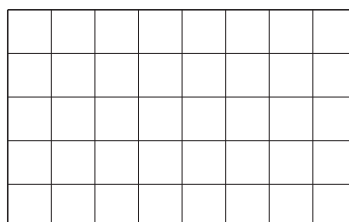


- (a) Which age group of males made up 2% of the population in the United Kingdom?
- (b) (i) Which age group in India accounted for the highest percentage of the population?  
(ii) Estimate what percentage of this age group were males.
- (c) Estimate the percentage of females in the United Kingdom who were less than 10 years old at the time the information was collected.
- (d) Give *two* comments on the population structure in these countries for people over 70 years of age.
9. The number of pupils in each unit area of a playground is shown below.

2	3	4	8	9	7	8	4
3	4	8	10	12	14	10	7
3	7	9	8	13	15	12	8
0	1	4	7	8	10	6	3
0	0	3	2	4	2	1	0

- (a) Complete a copy of the choropleth map using the given key.

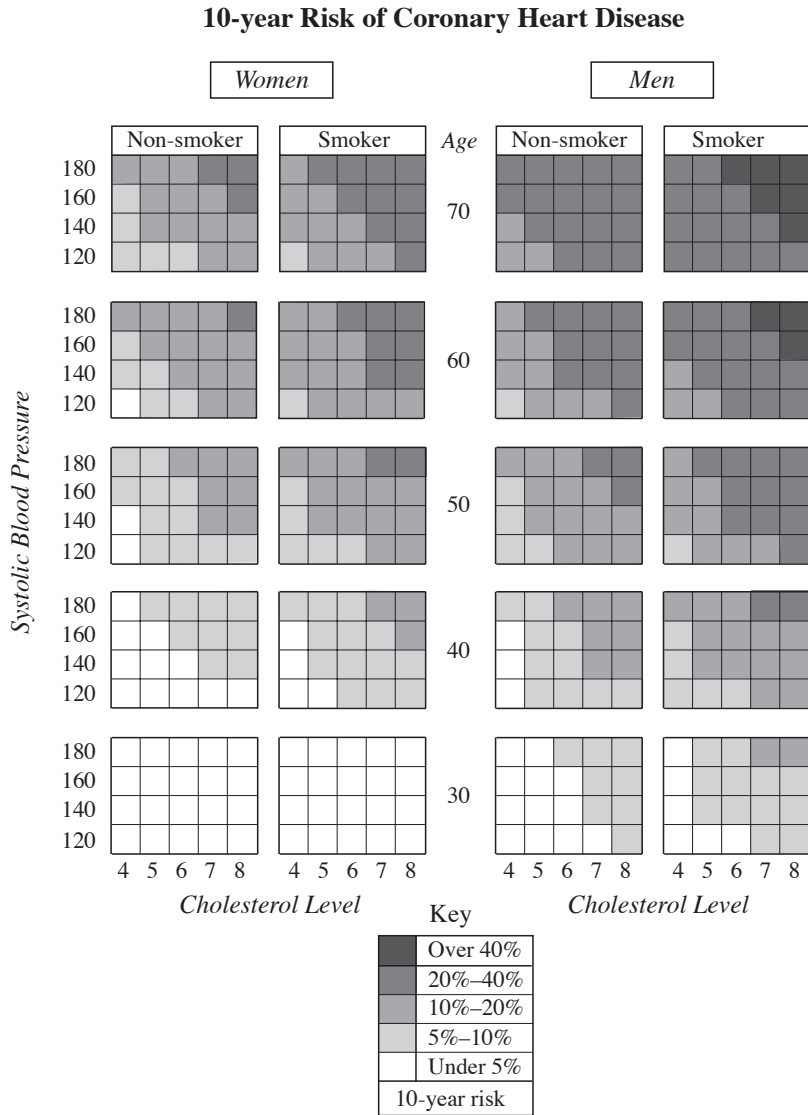
Number of pupils	
0 – 5	
6 – 10	•••••
11 – 15	■



- (b) There is a teacher in the playground. Where do you think the teacher is?  
Explain your answer.

(AQA)

10. The diagram below is taken from an article about risks of coronary heart disease. The article was published in a journal of the Royal Statistical Society in 2003.



The diagram shows the risk of coronary heart disease for women and men.

The diagram shows that a woman with a systolic blood pressure of 120 and a cholesterol level of 4 has a 10-year risk of heart disease between 5% and 10% if she is 50 years old and a smoker.

- (a) What is the risk if
  - (i) the age of the woman is 50 and she is a non-smoker,
  - (ii) the age of the woman is 60 and she is a smoker?
- (b) Is the 10-year risk greater for men or for women? Give a reason for your answer.
- (c) Write down two things that the diagram shows about the effects of age and smoking on the risk of coronary heart disease.

*(Edexcel)*

11. A class of 25 students obtained the following marks in a Mathematics test.

26	18	37	42	29
49	21	52	31	32
15	28	24	35	36
51	31	24	46	41
38	40	16	22	57

- (a) Construct a stem and leaf diagram. Place the figures on the leaves in order of size.
- (b) Using your stem and leaf diagram, or otherwise, find
- (i) the range,
  - (ii) the median.

*(NEAB)*

12. The ages of drivers involved in fatal accidents in England during one week are given below.

17	82	40	48	21	35	23	24	18	57	62	45
20	21	33	27	24	37	58	69	65	19	15	21
28	71	43	31	73	26	18	21	34	35	51	63
23	65	22	45	23	27	18	19	32	25	61	36

Illustrate the data using

- (a) a stem and leaf plot,
- (b) a histogram,
- (c) a pie chart.

Which do you think is the most informative way of representing the data?

13. The lengths, in seconds, of the tracks on a double album are:

<i>Volume 1</i>	203	288	249	215	254	283	266
	202	237	221	262	240	253	266
	246	273	203				
<i>Volume 2</i>	170	185	240	195	202	174	179
	182	195	263	190	210	183	201
	179						

- (a) Collect these data on a back-to-back stem and leaf diagram as started below. Use a second diagram to reorder the data.



<i>Volume 1</i>		<i>Volume 2</i>
	17	0
	18	5
	19	
3	20	
5	21	
	22	
	23	
9	24	
4	25	
	26	
	27	
3	8	28

- (b) Use your back-to-back stem and leaf diagram to compare the length of tracks on volume 1 and volume 2.

*(SEG)*

14. During the season 1966-67 the average attendance at Football League matches was 672 000 per week. This was distributed among the four divisions as follows:

<i>Division</i>	<i>Average attendance per week (thousands)</i>
1	338
2	173
3	96
4	65
TOTAL	672

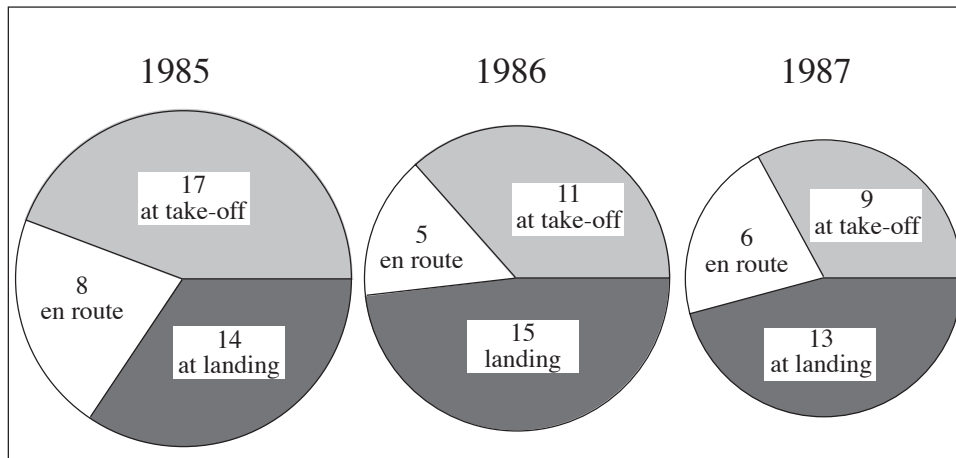
- (a) Calculate the angles of the sectors in a pie chart that would represent these data, giving your answers to the nearest degree.

By the season 1984-85, the average attendance had dropped to 416 000 per week.

- (b) If a pie chart depicting the 1966-67 average attendance had a radius of 4 cm, what radius should a pie chart for the 1984-85 season have, if it is to reflect accurately the fall in average weekly attendance?
- (c) The angles of the four sectors on the 1984-85 diagram should be  $201^\circ$ ,  $83^\circ$ ,  $50^\circ$  and  $26^\circ$  respectively. Using the radii in (b), draw the two pie charts.
- (d) State *two* conclusions that can be drawn from comparing the two pie charts.

*(NEAB)*

15. The diagram below illustrate the numbers of fatal accidents in international air passenger flights in 1985, 1986 and 1987.



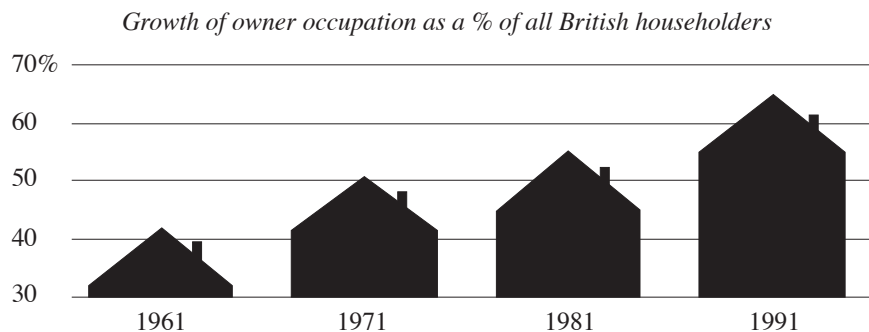
Source: *Flight International*

The figure in each sector is the number of fatal accidents corresponding to that particular stage of flight.

- How many fatal accidents were there altogether in the three years?
- What proportion of all fatal accidents took place at the take-off stage?
- The radius of the pie chart depicting the 1985 data is 24 mm. Explain how the radius for the 1986 pie chart would have been calculated.
- Draw a multiple bar chart to illustrate the data.
- Describe the main features of the data.
- Which of the two types of diagram do you prefer for this data set? Why?

(NEAB)

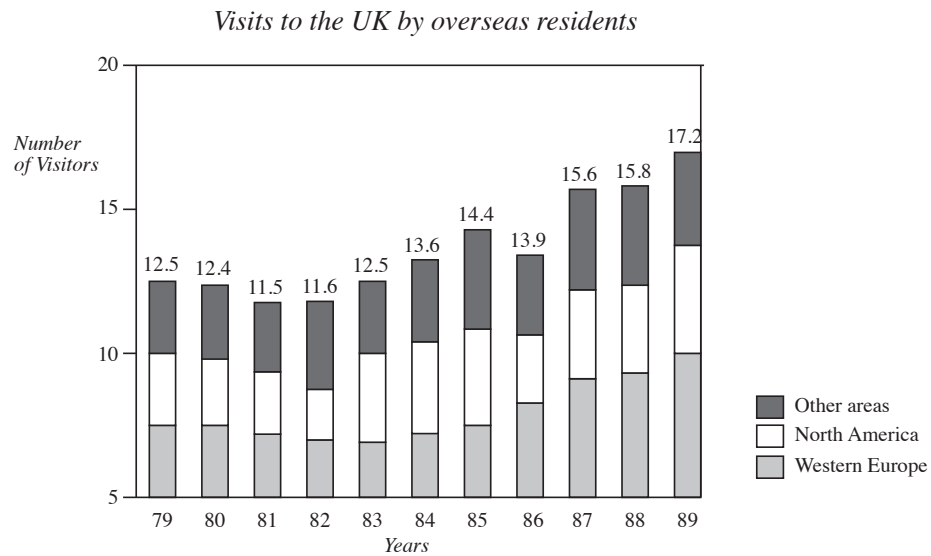
16. The diagram below shows the percentage of British people who own their own house.



State two ways in which the diagram is misleading.

(NEAB)

17. The diagram shows the number of visits (in millions) made to the United Kingdom by overseas residents for the years from 1979 to 1989.

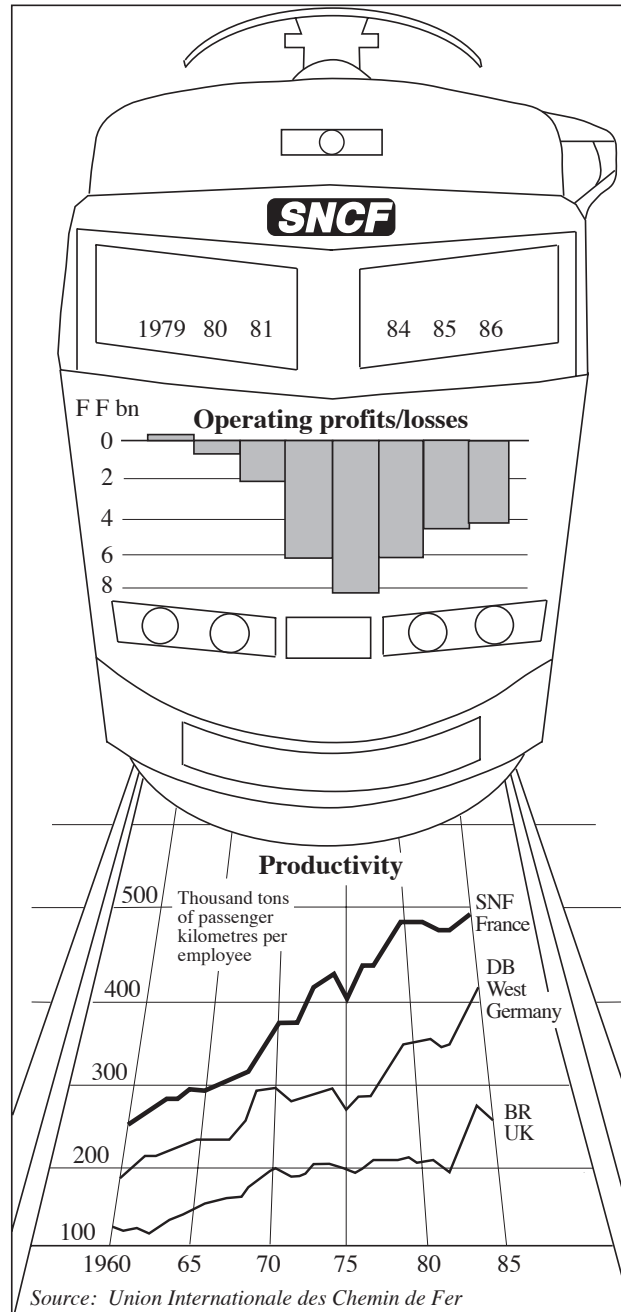


Source: *International Passenger Survey*

- Give two reasons why the diagram is misleading.
- In which year did the total number of visitors exceed 14 million for the first time?
- Estimate, to the nearest million, the number of visitors from Western Europe in 1983.
- In which year did the total number of visitors from Western Europe and North America exceed 13.6 million?

(NEAB)

18. The following diagram relates to the SNCF (French railway) and the railways in West Germany and the United Kingdom.



- In which year did the SNCF make its greatest operating loss?
- How much was the operating loss in 1982?
- Describe the change in productivity of the three railways between 1960 and 1985.
- Why is the graph of 'productivity' misleading?

(NEAB)