

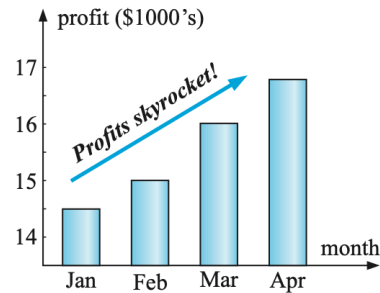
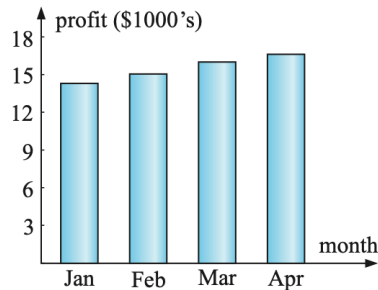
MISLEADING GRAPHS

Graphs can also be **misleading** and there are two ways this is usually done.

- Using a 'cut-off' scale on the vertical axis.

For example, consider the graph shown:

A close look at the graph reveals that the vertical scale does not start at zero and so has exaggerated the increase in profits.

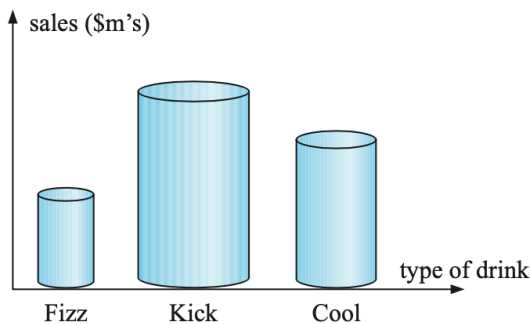


The graph should look like this:

This graph shows the true picture of the profit increases and probably should be labelled '*A modest but steady increase in profits*'.

- Giving the 'bars' on a bar chart (or column graph) a larger appearance by adding area or the appearance of volume where the height of the bar is the relevant dimension representing frequency.

For example, consider the graph comparing sales of different types of soft drink.

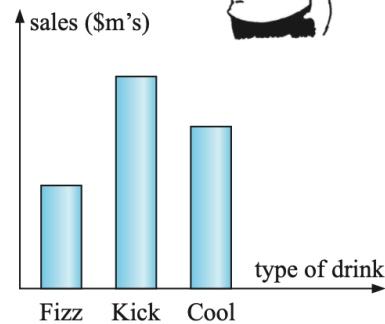


By giving the 'bars' the appearance of volume the sales of 'Kick' drinks look to be about eight times the sales of 'Fizz' drink.



On a bar chart, frequency (sales in this case) is proportional to the height of the bar only and so the graph should look like this:

It can be seen from the bar chart that the sales of Kick are just over twice the sales of Fizz.



EXERCISE 10L

- 1 A school has 820 students and an investigation concerning the school uniform is being conducted.
 - a 40 students from the school are randomly selected to complete the survey on their school uniform.

In this situation:

 - i what is the population size
 - ii what is the size of the sample?
 - b Explain why data collected in the following situations would not produce a sample that is representative of the population.
 - i The surveyor's ten best friends are asked to complete the survey.
 - ii All the students in one class are surveyed.
 - iii Volunteers are asked to complete the survey.
- 2 A research company is canvassing peoples' opinions on whether smoking should be banned in all public places.

They canvass people standing outside buildings in the city during office hours. Explain why the data collected is likely to be biased.
- 3 A television station is conducting a telephone poll on the question *Should New Zealand change to a republic?* How is the data biased if it is supposed to represent the views of all New Zealanders?

- 4 A polling agency is employed to survey the voting intention of residents of a particular electorate in the coming election. From the data collected they are to predict the election result in that electorate.

Explain why each of the following situations would produce a biased sample:

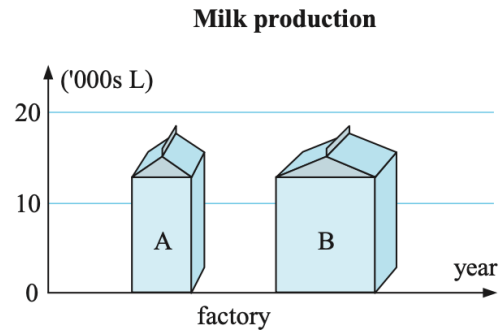
- a A random selection of people in the local large shopping complex is surveyed between 1 pm and 3 pm on a weekday.
- b All the members of the local golf club are surveyed.
- c A random sample of people on the local train station between 7am and 9am are surveyed.
- d A doorknock is undertaken, surveying every voter in a particular street.

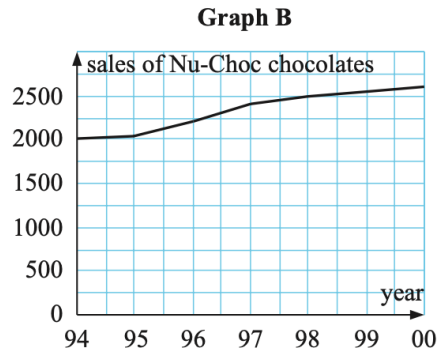
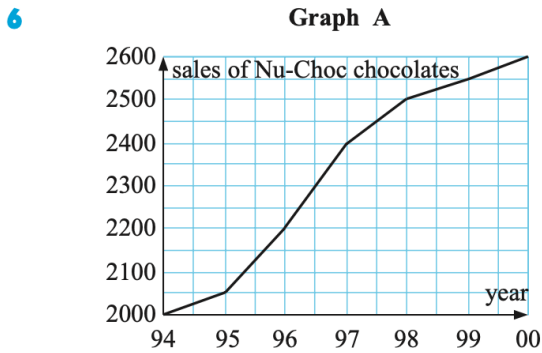
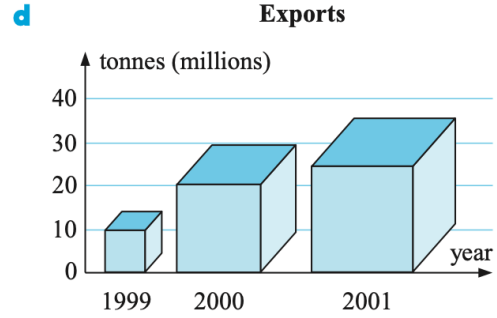
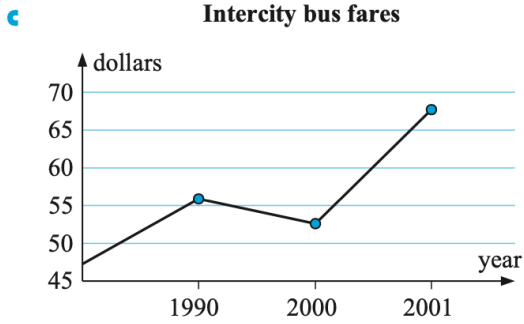
- 5 Describe the misleading or poor features of each of the following graphs:

a



b





- a** Which graph gives the impression of rapidly increasing sales?
- b** Have sales in fact rapidly increased over this 7 year period?
- c** According to graph A the sales for 1997 appear to be double those of 1996. Is this true?

EXERCISE 10L

1 a i 820 **ii** 40

- b i** The best friends of the surveyor would probably have opinions like his.
 - ii** The students in one class will not represent students of all ages within the school.
 - iii** People who would volunteer to fill in the survey would be likely to have strong opinions and so not represent the population.
- 2** Those standing outside the office building are more likely to be smokers since smoking is banned in the workplace.
- 3** Only those with telephones could respond.
- 4**
 - a** Only people who do not work between 1 pm and 3 pm would be selected.
 - b** People who play golf are not likely to be representative of the whole population.
 - c** These people are likely to be students or the employed, not the unemployed, senior citizens etc.
 - d** Only those people home at the time will be surveyed, and the people in that street may not have opinions indicative of the general population (street in a poor area, rich area etc.).
- 5**
 - a** The fish sold at Market 2 looks to be 4 times as much as at Market 1 whereas it is actually only double.
 - b** A and B produce the same quantity of milk, but B looks more because a bigger carton is shown.
 - c** Because the y -axis does not begin at zero, it looks as though the increases are far greater than they really are.
 - d** The width of the boxes is increased, not just the height, so the increase in exports looks greater than it really is.