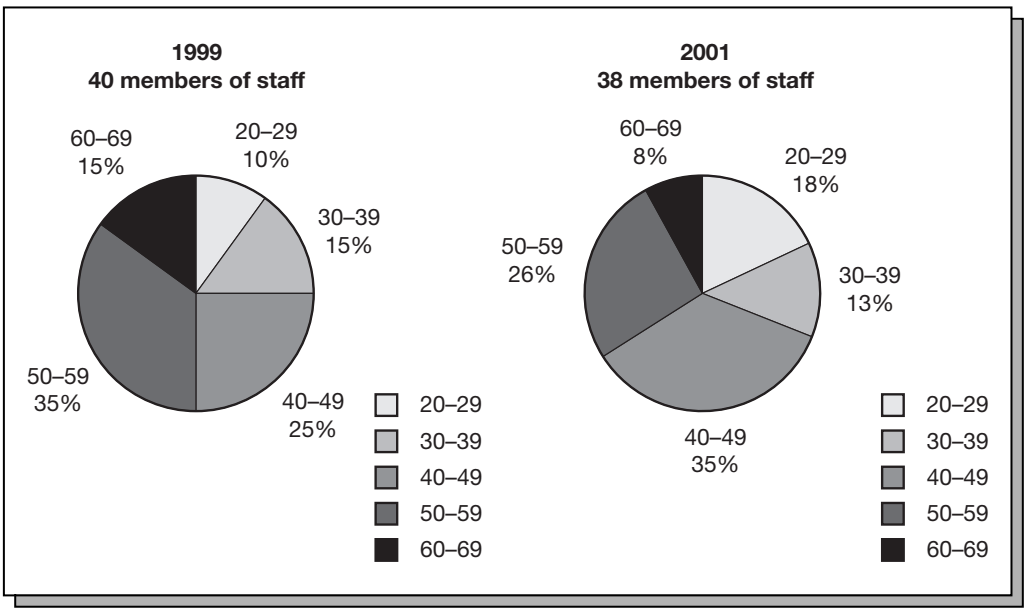
Check-Up

43

Interpreting pie charts

A governing body aimed over a two-year period to take the opportunity presented by some early retirements to adjust the age profile of the staff of a school more in favour of younger teachers. The data presented in the pie charts puts the teachers in the school into age groups of 20–29, 30–39, and so on, based on the age in years at the beginning of the school year. Was the aim of the governing body achieved?



Answers to check-up 43

Yes, it was achieved. The proportions of teachers in the 60–69 and 50–59 sectors reduced; the proportion of 20–29s increased. In 1999 the 50–69 bracket was half the staff; in 2001 it was only about a third. There was, however, a marked increase in the proportion of staff in their forties.

Discussion and explanation of check-up 43

A pie chart is a useful way of presenting a set of frequency data where the 'population' to be represented is clearly divided into a fairly small number of discrete, non-overlapping subsets. Each member of the population must belong to one and only one of these subsets. The whole pie then represents the whole population and the sizes of the sectors (slices) represent what proportions of the whole population are in the various subsets. In this example, for the pie chart on the left, the 'population' is the staff of the school in 1999. The whole pie represents all 40 teachers. The subsets are the teachers in their twenties at the start of the school year, those in their thirties, and so on. There are only five of these subsets, making this data ideal for presentation in a pie chart.

At a glance we can see the proportions in the various groups. The 40–49s are clearly one quarter of the staff. This is confirmed by the percentage written alongside, 25%. The vertical line down the middle of the pie conveniently slices it into two equal halves. This allows us to see at a glance that half of the staff is in the 50–59 and 60–69 categories and half is under 50.

It is important to remember that the pie represents the whole population and the slices represent *proportions* of the population, not actual numbers or frequencies. So, we can compare at a glance proportions across the two years, but we cannot compare frequencies. For example: which was greater, the number of 50–59s in 2001 or the number of 40–49s in 1999? The slice of pie is larger for the 50–59s in 2001. But this actually represents 26% of 38 = 10 teachers. The smaller slice for the 40–49s in 1999 represents 25% of 40 teachers, which is also 10. So, pie charts are really useful when we are interested in proportions rather than actual numbers.

The pie charts used here were produced using an Excel worksheet. The availability of computer software to do this job means that we no longer have to work out for ourselves what should be the angles for the various slices of the

pie. But remember that the total angle at the centre is 360º, half the pie uses 180º, and a quarter has an angle of 90º, also known as a right angle. Half of that, a slice of 45º, represents an eighth of the population. These are useful at-a-glance reference points when looking at a pie chart. Look out also for thirds (120º) and sixths (60º).

Summary of key ideas

- The whole pie in a pie chart represents the whole population for which data is provided.
- Each slice represents a discrete subset of the population.
- The size of the slice represents the proportion of the population within that subset.
- A pie chart should be used for discrete data with a fairly small number of subsets.

Further practice

43.1 Which of these might sensibly be represented in a pie chart?

a) The proportions of pupils in a primary school gaining level 4 or above in Key Stage 2 tests over a period of five years.

b) Information about the proportions of pupils in a school with various ethnic origins.

c) The distribution of 1300 pupils across the 52 classes of a secondary school.

43.2 The pie chart below shows how the 240 pupils in a primary school travelled to school one morning in the summer term. Fill in the missing words.

a) About a _____ of the pupils came by car.

b) The proportion of pupils who came by bike or walked was nearly a _____.

c) More pupils came by _____ than came by car.

d) A total of 48 pupils came by _____.