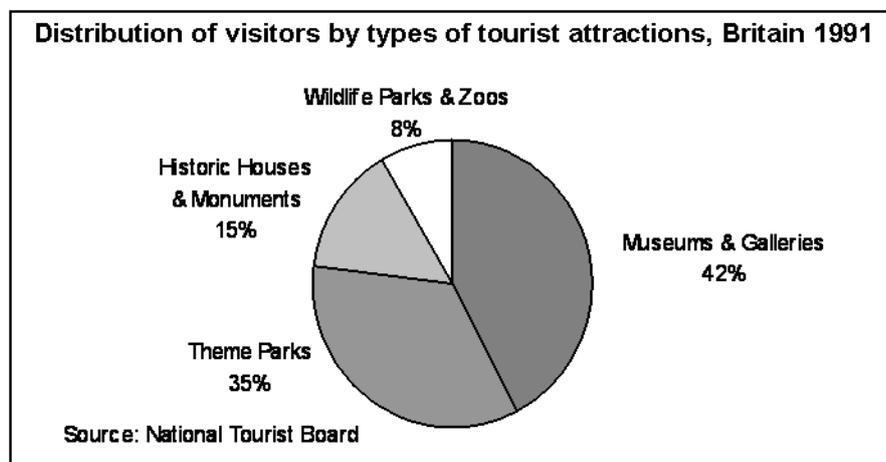# Pie charts

This guide explains what a pie chart is, outlines the types of data that can be presented using a pie chart and provides some design tips to ensure that when you use pie charts to present data they are clear and easy to interpret.

Other useful guides from Student Learning Development: Bar charts, Histograms, Presenting numerical data

What is a pie chart?

A pie chart is a circular graph that shows the relative contribution that different categories contribute to an overall total. A wedge of the circle represents each category's contribution, such that the graph resembles a pie that has been cut into different sized slices. Every 1% contribution that a category contributes to the total corresponds to a slice with an angle of 3.6 degrees.

Distribution of visitors by types of tourist attractions, Britain 1991

Wildlife Parks & Zoos
8%

Historic Houses & Monuments
15%

Museums & Galleries
42%

Theme Parks
35%

Source: National Tourist Board

What data can be presented using a pie chart?

- Pie charts are a visual way of displaying data that might otherwise be given in a small table.

- Pie charts are useful for displaying data that are classified into nominal or ordinal categories. Nominal data are categorised according to descriptive or qualitative information such as country of birth or type of pet owned. Ordinal data are similar but the different categories can also be ranked, for example in a survey people may be asked to say whether they classed something as very poor, poor, fair, good, very good.

- Pie charts are generally used to show percentage or proportional data and usually the percentage represented by each category is provided next to the corresponding slice of pie.

- Pie charts are good for displaying data for around 6 categories or fewer. When there are more categories it is difficult for the eye to distinguish between the relative sizes of the different sectors and so the chart becomes difficult to interpret.

Design issues

Pie charts provide a good visual representation of the data when the categories show some variation in size. When there are several similar-sized categories, a pie chart can end up looking cluttered and it may be difficult to interpret the data. In such cases consider whether a table would present the information more effectively.

It is usual for the different sectors of the pie chart to be arranged clockwise in order of magnitude. If there is a slice that does not contain a unique category of data but summarises several, for example "other types" or "other answers", then even if it is not the smallest category it is usual to display it last in order that it does not detract from the named categories of interest.
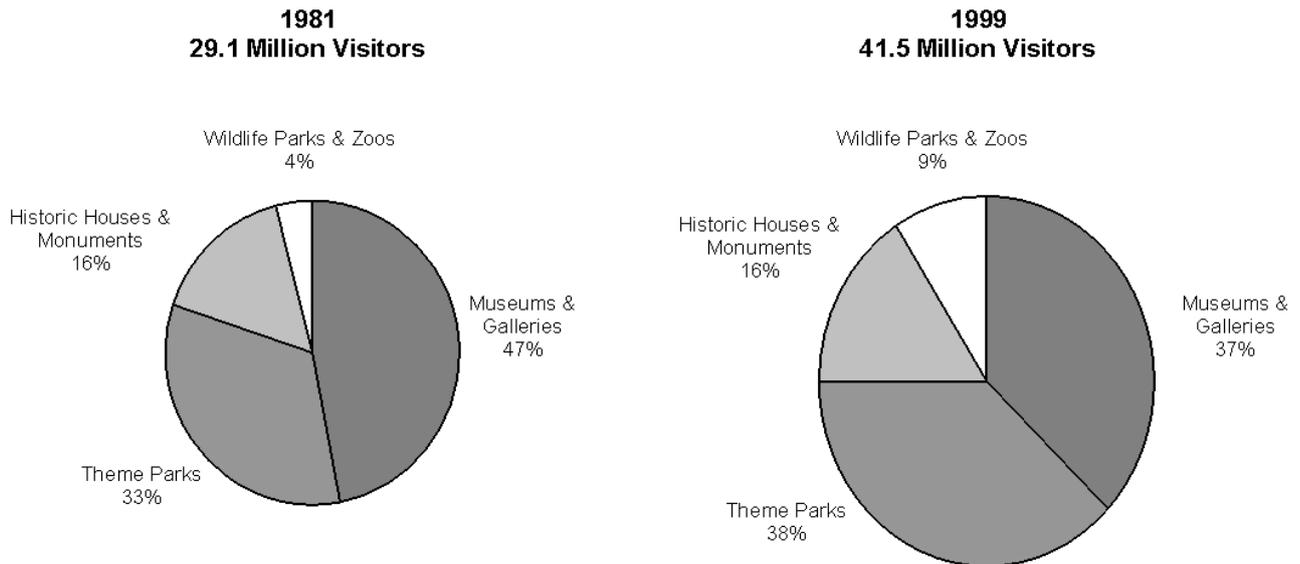
It is helpful to colour or shade the different slices so that they grade from dark to light tones as you move from the first to the last slice.
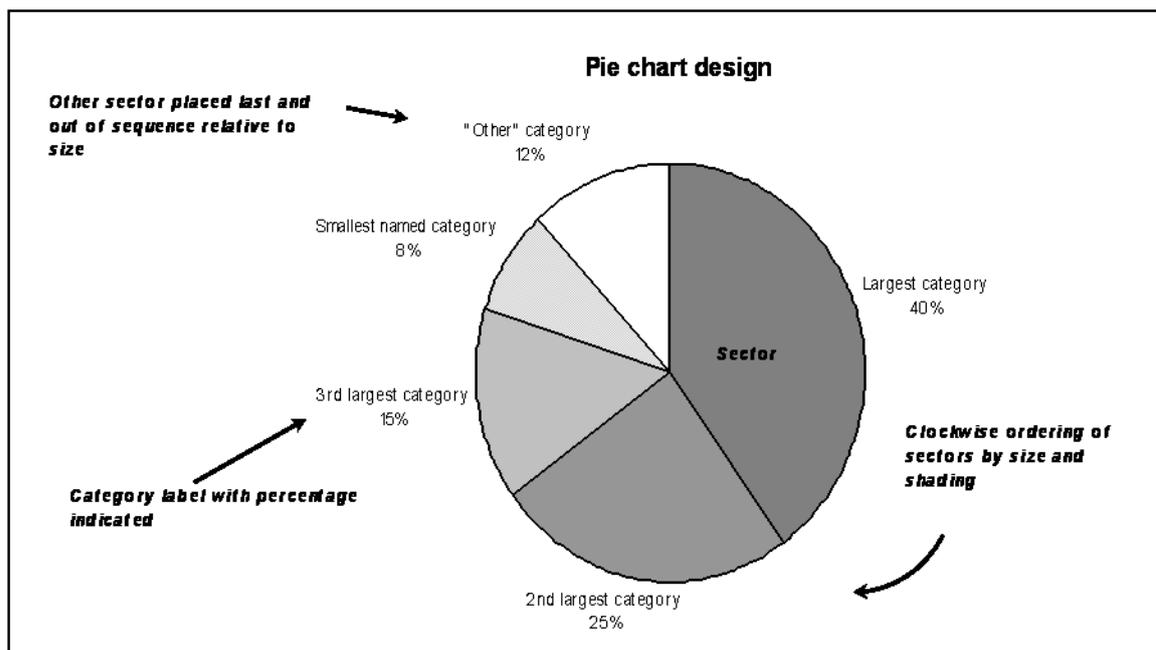
Comparing pie charts

Two or more pie charts can be used to compare two sets of data where the categories are the same or similar but there is a change in another variable, such as time or age. In such cases it is helpful to maintain the same ordering and colouring of slices in the second pie chart as the first in order to facilitate comparison. This may mean that in the second pie chart the slices are no longer presented in order of magnitude. If the two charts represent different sized totals show this by making the areas of the pie chart proportional to the totals they each represent.

Changes in the distribution of visitors to different types of tourist attractions in Britain between 1981 and 1999

1981
29.1 Million Visitors

Wildlife Parks & Zoos
4%

Historic Houses &
Monuments
16%

Museums &
Galleries
47%

Theme Parks
33%

1999
41.5 Million Visitors

Wildlife Parks & Zoos
9%

Historic Houses &
Monuments
16%
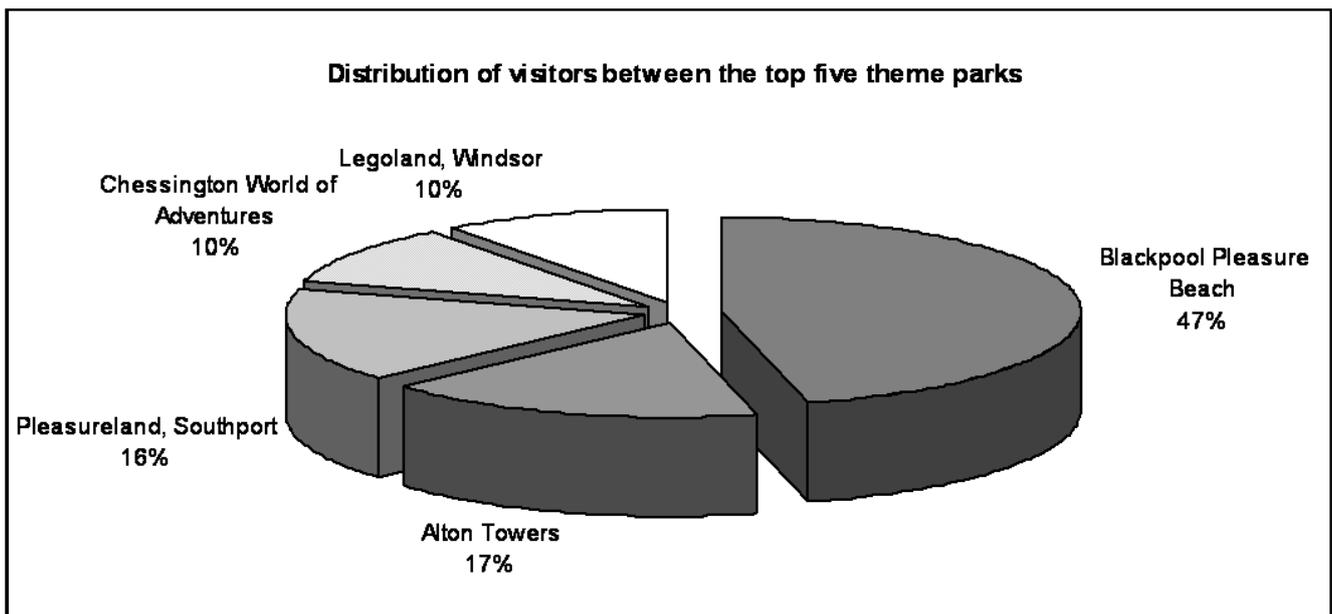
Museums &
Galleries
37%

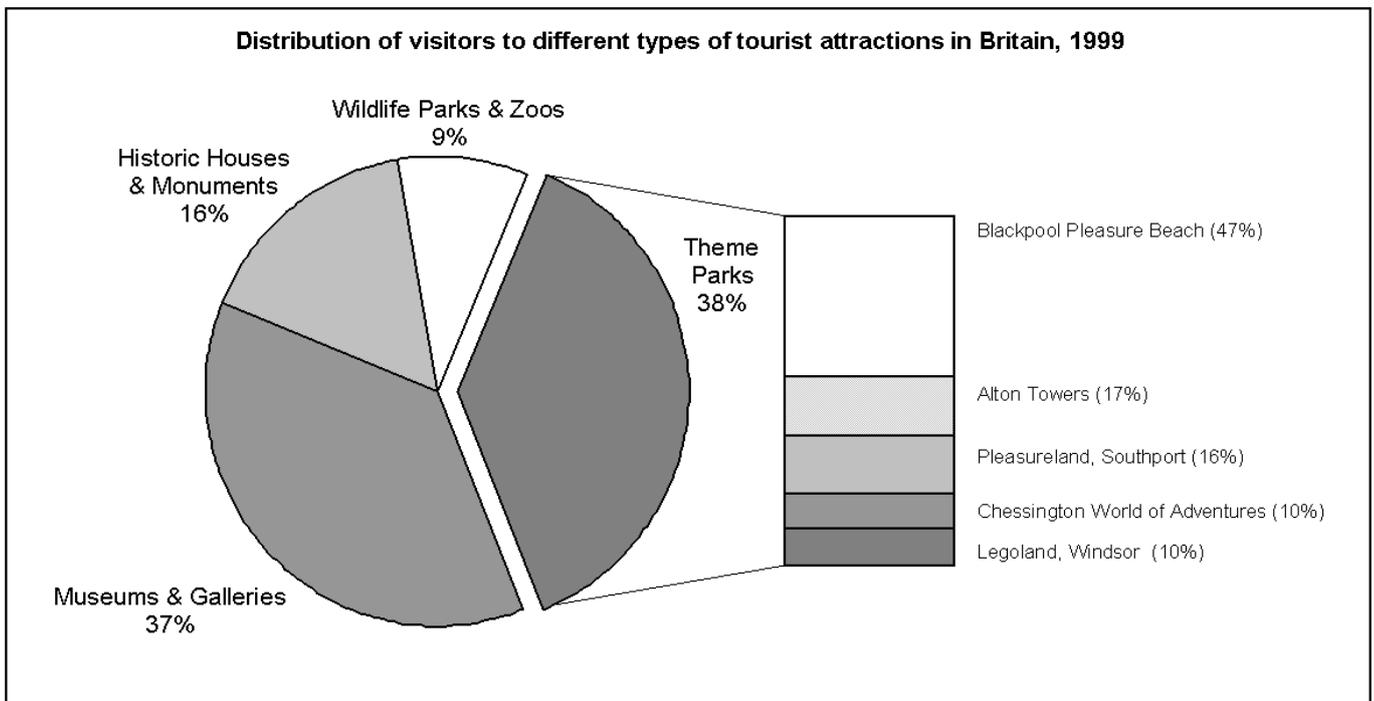Theme Parks
38%

3D effects and exploding pie charts

Avoid design elements that detract from the message you are trying to convey such as 3D effects and exploding slices. These can produce optical effects that make it hard to compare different categories.

For example, in the 3D- exploding pie chart below, the slice representing Alton Towers appears quite a bit larger than that for Pleasureland although there is actually only a 1% difference between the two categories. Also, both slices for Chessington World and Legoland represent 10% but again they appear different sizes due to the 3D perspective.

In this example separating (exploding) the different wedges of the pie chart also adds to the difficulty of interpreting the data and estimating the relative size of different sectors.

Distribution of visitors between the top five theme parks

Legoland, Windsor
10%

Chessington World of
Adventures
10%

Blackpool Pleasure
Beach
47%

Pleasureland, Southport
16%

Alton Towers
17%

There are however occasions when the use of an exploding pie chart can enhance the presentation of the data. For example if you wish to highlight information in one category/wedge in particular, or when additional information is provided about a particular category as is shown in the example below.

Distribution of visitors to different types of tourist attractions in Britain, 1999

Wildlife Parks & Zoos
9%

Historic Houses
& Monuments
16%

Theme
Parks
38%

Museums & Galleries
37%

Blackpool Pleasure Beach (47%)

Alton Towers (17%)

Pleasureland, Southport (16%)

Chessington World of Adventures (10%)

Legoland, Windsor (10%)

Where next?

This guide has outlined the various ways in which pie charts can be used to present data and has also provided design and presentation advice. Information about other graph and chart types and any specific design issues related to them can be found in the companion study guides: *Bar charts and Histograms.* The study guide *Presenting numerical data* provides guidance on when to use graphs to present information and compares the uses of different graph and chart types.