# 'How To' Guide – Drawing Pie Charts

A pie chart is a circular graph that shows the relative contribution that different categories contribute to an overall total. A sector 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. They show each category in relation to each other (show how they are proportional).

## Example

This table shows how 600 pupils travel to school.

| Category | Frequency | Fraction | Angle |
|----------|-----------|----------|-------|
| Walk | 200 | $\frac{200}{600}$ | 120° |
| Bike | 100 | $\frac{100}{600}$ | 60° |
| Car | 75 | $\frac{75}{6000}$ | 45° |
| Train | 75 | $\frac{75}{600}$ | 45° |
| Bus | 150 | $\frac{150}{600}$ | 90° |
| Total | 600 | 1 | 360° |

E.g. The angle for walk $= \frac{200}{600} \times 360 = 120°$
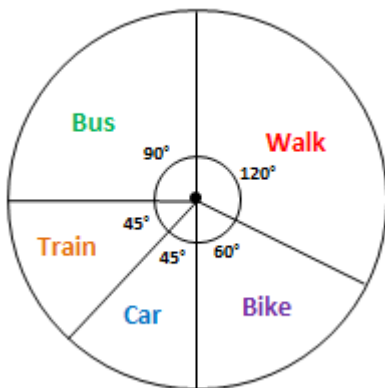


## Note

- The pie chart has a title.
- The fractions total one whole.
- The angles total 360°.
- The sectors are all formed using the centre of the circle.
- The sectors are labelled.

## How we teach it

- Find the total frequency.
- Write out each section as a fraction (frequency ÷ total frequency).
- Calculate the angle (fraction × 360°).
- Use a ruler to draw the radius of the circle. Draw a line from the exact centre of the circle to the outside of the circle.
- Place your protractor at the centre of your circle so that the 0° line matches up with the radius.
- Draw the first slice by marking a dot at the appropriate angle. Draw a line from this point to the circle.
- To draw the rest of the slices rotate your protractor so that the 0° line matches up with your new lines.
- Continue doing this until you have completed your pie chart.
- Label each sector and write a title for the pie chart, starting with *"A pie chart to show…"*

## 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 should only be used for categorical data (data sorted into categories).
- 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.
- Be as accurate as possible with your protractor. Even being 1° out each time will massively affect your last angle!
- Make sure your angles add up to 360°.

## Common mistakes

- Percentages are worked out instead of angles (look out for pupils multiplying by 100 instead of 360).
- The total frequency is added up wrong, leading to wrong calculations.
- Angles are rounded incorrectly, so the angles do not add up to 360°.
- Every angle is measured from the original horizontal line instead of moving the protractor each time.

Common mistakes also include using a pie chart when it is not appropriate to do so. If your pie chart has too many slices it makes it hard to see the difference between them. Also if your slices are a very similar size it is hard to clearly see which is bigger.

The following are examples of the different types of pie charts you may see and how they can be misinterpreted.



In the misleading pie chart, Item C appears to be at least as large as Item A, whereas in actuality, it is less than half as large.
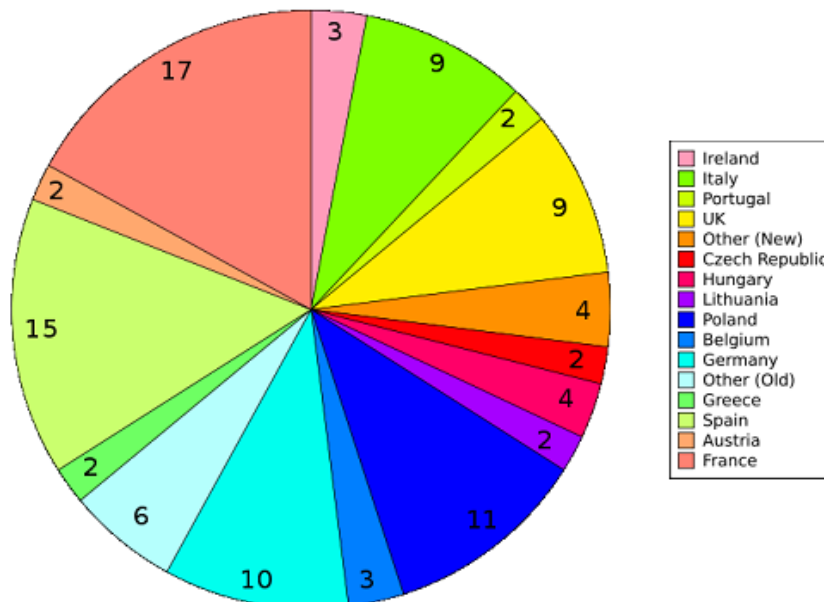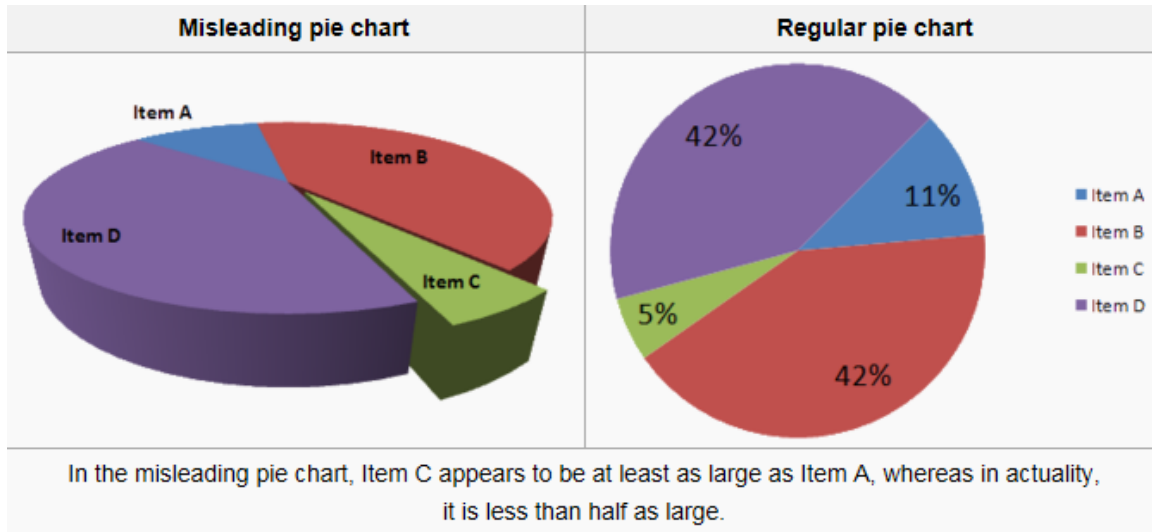


Figure 20. Percentage of EU Farm Land by Country in 2004.

Here, there are too many sections for the pie chart to be read clearly.