Pie Chart | Pie Graphs

Definition 1: Pie graph (chart): A pie graph or pie chart is a circle that is divided into slices according to the percentage of the data values in each category.

A pie chart allows us to observe the proportions of sectors relative to the entire data set. It can be used to display either qualitative or quantitative data.

Each slice of the pie chart represents a category with its frequency count and the corresponding percentage.

Pie Charts are circles subdivided into a number of "slices." The area of each represents the relative proportion data points falling into a given category. Pie charts are the preferred method for graphing both nominal data and percentages.

Rule 1: A **pie chart** makes use of sectors in a circle. The angle of a sector is proportional to the frequency of the data. The formula to determine the angle of a sector is:

$$\text{Angle of sector} = \frac{freq.\ of\ \ data}{Total\ \ freq.} \times 360^0$$

CONSTRUCTING PIE CHARTS: Study the following steps of constructing a pie chart:

Step 1: Calculate the angle of each sector, using the formula

$$\text{Angle of sector} = \frac{freq.ofdata}{Totalfreq.} \times 360^0$$

Step 2: Draw a circle using a compass
Step 3: Use a protractor to draw the angle for each sector.

Step 4: Label the pie chart and all its sectors.

Example 1: In a school, there are 750 students in Year 1, 420 students in Year 2 and 630 students in Year 3. Draw a pie chart to represent the number of students in these groups.

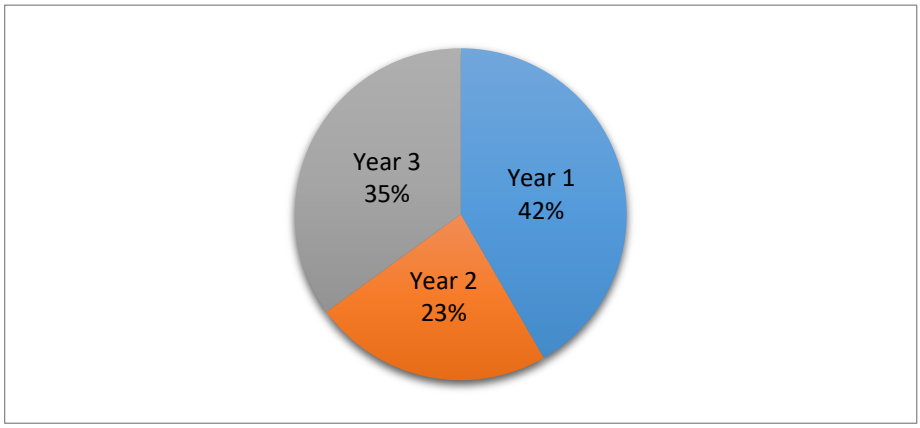
Total number of students = 750 + 420 + 630 = 1,800.

$$\text{Year 1 : size of angle} = \frac{750}{1800} \times 360^0 = 150^0$$

$$\text{Year 2 : size of angle} = \frac{420}{1800} \times 360^0 = 84^0$$

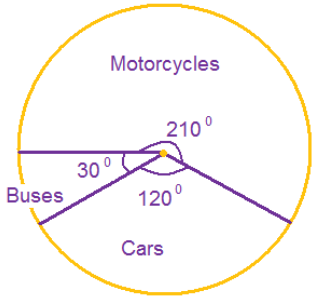
$$\text{Year 3 : size of angle} = \frac{630}{1800} \times 360^0 = 126^0$$

Draw the circle, measure each sector; label each sector and the pie chart.



We could also use a given pie chart to answer some questions about the data.

Example 2: The following pie chart shows a survey of the numbers of cars, buses and motorcycles that passes a particular junction. There were 150 buses in the survey.



a) What fraction of the vehicles were motorcycles?

Fraction of motorcycles = $\frac{Angle\ of\ \ sector}{360^0} = \frac{210^0}{360^0} = \frac{7}{12}$

b) What percentage of vehicles passing by the junction were cars?

To convert the angle of a sector into a percentage, we use the formula:

Percentage = $\frac{Angle\ of\ \ sector}{360^0} \times 100\%$

Percentage of cars = $\frac{120^0}{360^0} \times 100\% = 33\frac{1}{3}\%$

c) Calculate the total number of vehicles in the survey.

Let x be the total number of vehicles $= \frac{30^0}{360^0} \times x = 150 \Rightarrow x = 150 \times \frac{360^0}{30^0} = 1,800$

The total number of vehicles is 1,800

d) How many cars were in the survey?

Number of cars $= \frac{120^0}{360^0} \times 1800 = 600$

Advantages - Pie charts can:

- display relative proportions of multiple classes of data
- show areas proportional to the number of data points in each category
- summarize a large data set in visual form
- be visually simpler than other types of graphs
- permit a visual check of the reasonableness or accuracy of calculations
- require minimal additional verbal or written explanation
- be easily understood due to widespread use in business and the media

Disadvantages - Pie charts can:

- reveal little about central tendency, dispersion, skew, or kurtosis
- fail to reveal key assumptions, norms, causes, effects, or patterns
- fail to describe the attribute, behavior, or condition of interest
- be easily manipulated to yield false impressions