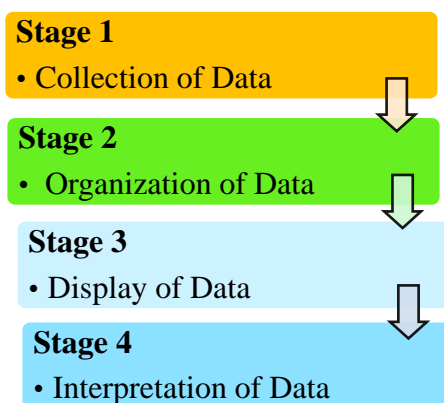


Data Presentation

1

Statistical Study

Statistical study consists of four stages:



Data Collection

In order to do data collection, we must know ‘*Why*’ we are examining the data or ‘*What*’ we want to know. The context shall tell ‘*Who*’ was measured, ‘*What*’ was measured, ‘*How*’ the data were collected, and ‘*When*’ and ‘*Why*’ the study was performed. Data collection refers to the process of gathering a set of information of variables or observations. There are two sources of data, **primary data** and **secondary data**.

- 1) **Primary data** are the data collected for the first time by the investigator himself/herself for a specific purpose. Data are from first hand sources such as
 - Questionnaire,
 - Interview,
 - Census,
 - Sample survey,
 - Direct observation, and
 - Focus group.
- 2) **Secondary data** are the data already collected or produced by someone else for some other purposes. Data received from secondary sources are for examples, printed material reports of government, bank, published material, websites, the World Wide Web (www.com), and Google.

Display of Data

Display of Data

A chart or a graph is a pictorial representation of data. Charts and graphs are used to display detailed information and relationships between quantitative data. Data can be displayed in various forms such as:

- Table;
- Pictorial Chart;
- Bar Chart;
- Pie Chart and
- Line graphs.

Table

A table is a way of arranging data in rows and columns. Rows are horizontal and go from left to right, while columns are vertical and go from top to bottom. Columns are usually identified by a name.

Pictorial Chart

A pictorial chart is a visual representation of data by using pictograms. It uses icons or pictures in relative sizes to highlight some data pattern and trends. A pictograph is a way of showing data using images. Each image stands for a certain number of things.

Bar Charts

Bar charts are graphs where vertical bars are used to represent the data. Bar graphs are useful to show how something changes over time, or to compare different items in a related category.

Pie Charts

Pie charts are typically used to show parts or percentage of a whole. Thus, a pie chart is named as it resembles a pie that has been sliced. Each *slice* in a pie chart is known as a *sector*. Together, all the sectors create a whole circle.









Line Graphs

A line graph or line chart is a type of chart which displays information as a series of data points connected by straight line. A line graph is a graph where the data is represented using a line plotted against the two axes. The line may be straight or curved. A line chart is often used to visualize a trend in data over intervals of time or a time series.

Example 1

A survey is conducted among a group of 210 students who travel to school. The table below displays the data collected. Construct the Pictorial chart to display the data collected. (Using one figure to represents 20 students)

Transportation	Car	Bus	Motor cycle	Train
Number of students	50	75	25	60

Car		
Bus		
Motor cycle		
Train		

Remark: Each figure represents 20 students.

3**Bar Graphs****A bar graph**

A **bar graph** is a visual display of data using vertical or horizontal bars. The width of each bar is the same whereas the height or length depends on the frequency of the item concerned.

To compare two collections of data, *a dual bar graph* is used. A dual bar graph can be constructed as follows.

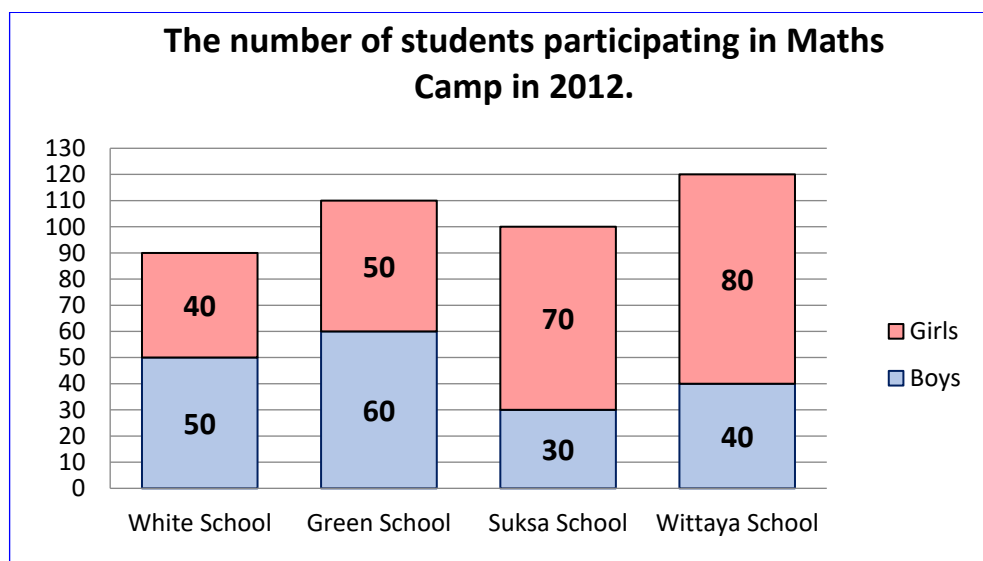
Example 2

The data in the table below shows the number of students from four schools participating in the Maths Camp 2012. Construct a dual vertical bar chart to represent the data.

Schools	White School	Green School	Suksa School	Wittaya School
Girls	40	50	70	80
Boys	50	60	30	40

Solution

A dual vertical bar graph representing the number of students from four schools participating in Maths Camp 2012 is as follows.

**Example 3**

From PISA 2006: Question M505: Litter
[\(<http://www.oecd.org/pisa>\).](http://www.oecd.org/pisa)

For a homework assignment on the environment, students collected information on the decomposition time of several types of litter that people throw away:

Type of Litter	Decomposition time
Banana peel	1-3 years
Orange peel	1-3 years
Cardboard boxes	0.5 years
Chewing gum	20-25 years
Newspapers	A few days
Polystyrene cups	Over 100 years

A student thinks of displaying the results in a bar graph.
 Give **at least one** reason why a bar graph is unsuitable for displaying these data.

Solution

The reasons why a bar graph is unsuitable for displaying these data are:

1) The different of data given are very broad. For example:

The decomposition time of:

- Newspapers a few days
- Polystyrene cups Over 100 years
- Chewing gum 20 -25 years
- Banana peel 1-3 years

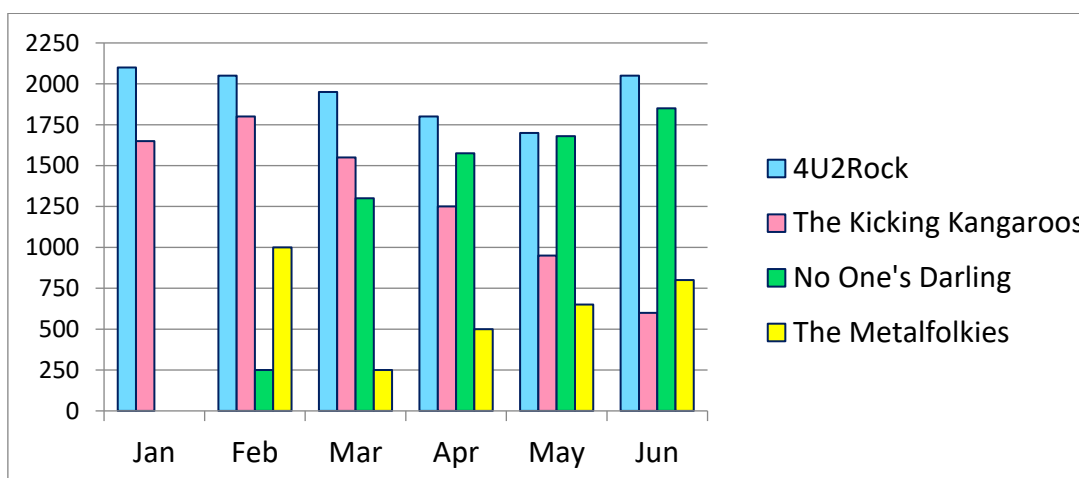
The difference in the lengths of the bars of the bar graph would be too big. If we make a bar with length **10** centimeters for polystyrene, the bar for cardboard boxes would be **0.05** centimeters.

2) Reason focuses on the variability of the data for some categories:

- The length of the bar for “Polystyrene cups” is undetermined.
- We cannot make one bar graph for 1-3 years or one bar graph for 20-25 year.

Example 4**From PISA 2012 Released Items : CHARTS**

In January, the new CDs of the bands *4U2Rock* and *The Kicking Kangaroos* were released. In February, the CDs of the bands *No One's Darling* and *The Metalfolkies* followed. The following graph shows the sales of the bands' CDs from January to June.

**Question 1: Charts**

How many CDs did the band *The Metalfolkies* sell in April?

- a) 250
- b) 500
- c) 1000
- d) 1270

Solution

From the Bar graph given,

CDs: **The Metalfolkies** sell in April 500 units

The answer is c) 500



Question 2: CHARTS

In which month did the band **No One's Darling** sell more CDs than the band **The Kicking Kangaroos** for the first time?

- a) No month
- b) March
- c) April
- d) May

Solution

From the Bar graph given,

In April, The band **No One's Darling** sell more CDs than the band **The Kicking Kangaroos** for the first time

The answer is c) April

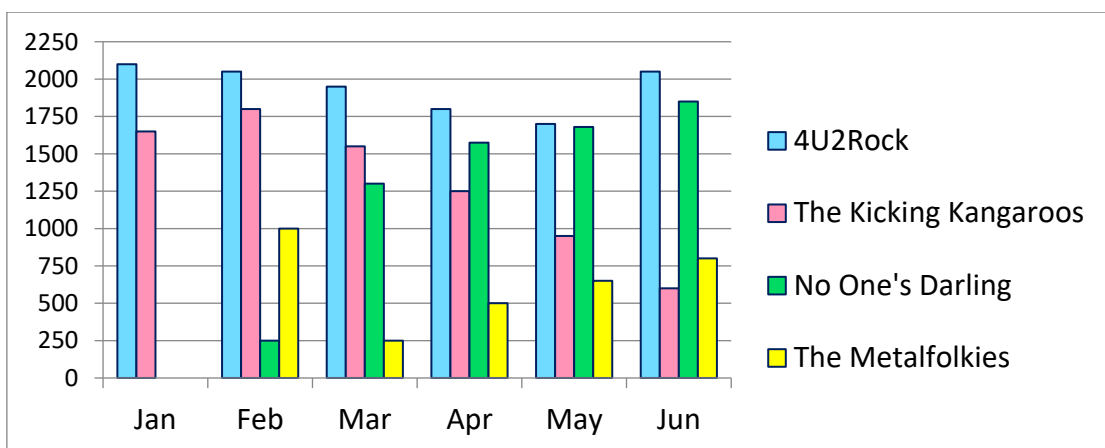


Question 3:

The manager of **The Kicking Kangaroos** is worried because the number of their CDs that sold decreased from February to June.

What is the estimate of their sales volume for July if the same negative trend continues?

- a) 70 CDs
- b) 370 CDs
- c) 670 CDs
- d) 1340 CDs



Solution

From the Bar graph given,

Interpret a bar chart and estimate the number of CDs sold in the future assuming that the linear trend continues.

If the same negative trend continues:

The estimate of CDs **The Kicking Kangaroos** sales volume for July is about 350 CDs.

The answer is b) 370 CDs



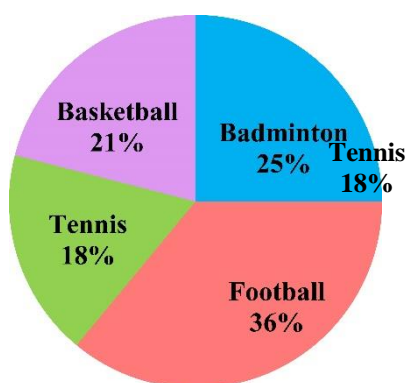
4

Pie Charts: Application

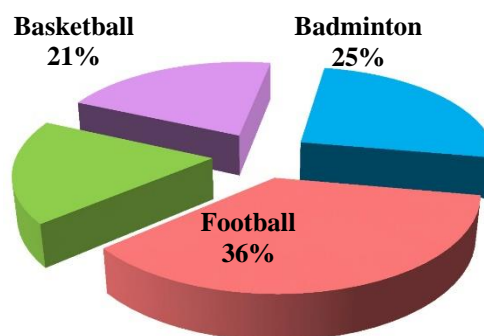
Pie Charts

Pie Charts, also known as circle graphs, are typically used to show parts or percentages of a whole. Because it resembles a pie that has been sliced, thus the name “pie chart.” Each *slice* in a pie chart is known as a *sector*. Together, all the sectors create a whole circle.

Pie charts do not show changes over time, but show relative proportion of a whole. The largest slice indicates the greatest proportion of the pie. Pie charts can be represented in 2-dimensional or 3-dimensional format. For example,



2-dimensional pie chart



3-dimensional pie chart

The above pie charts show the relative proportion of favorite sports of a group of boys.

Pie charts are effective when we need to compare the size of a slice with the whole pie, and show the relative proportion of the slice against the whole.

In a pie chart the *angle* of each sector is proportional to the number of items represented. Before the pie chart is drawn, the angle of each sector is calculated as the examples shown in the next section.

Example 5

The data in the table shows the favorite sports of a group of boys. Draw a pie chart to represent the data.

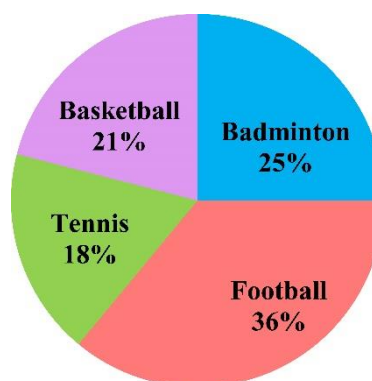
Favorite Sports	Number of boys
Badminton	36
Football	52
Tennis	26
Basketball	30

Solution

Step 1: Calculate the angle of each sector and percentage of the data as follows.

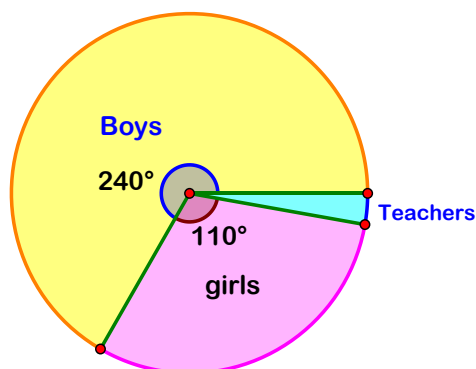
Favorite Sports	Number of boys	% of Data	Angle of Sector
Badminton	36	$\frac{36}{144} \times 100 = 25$	$\frac{36}{144} \times 360^\circ = 90^\circ$
Football	52	$\frac{52}{144} \times 100 = 36$	$\frac{52}{144} \times 360^\circ = 130^\circ$
Tennis	26	$\frac{26}{144} \times 100 = 18$	$\frac{26}{144} \times 360^\circ = 65^\circ$
Basketball	30	$\frac{30}{144} \times 100 = 21$	$\frac{30}{144} \times 360^\circ = 75^\circ$
Total	144		

Step 2: Draw a circle and mark down the center. Use a protractor to draw the center and the angle assigned to each sport.



Example 6 The pie chart represents the number of students and teachers in ABC School.

- a) If the total number of students and teachers in this school is 1,800, how many boys, girls, and teachers are there in ABC School?
- b) If $\frac{2}{5}$ of the girls are above 15 years old, find the angle of the sector that represents this.
- c) What percentage of the students are boys? Give your answer correct to the nearest percent.



Solution

a) From the pie chart,

For boys, the angle of the sector is 240° .

For girls, the angle of the sector is 110° .

$$\therefore \text{For teachers, the angle of the sector} \\ = 360^\circ - 240^\circ - 110^\circ = 10^\circ$$

$$\text{Number of boys} = \frac{240}{360} \times 1800 = 1200$$

$$\text{Number of girls} = \frac{110}{360} \times 1800 = 550$$

$$\text{Number of teachers} = \frac{10}{360} \times 1800 = 50$$

b) If $\frac{2}{5}$ of the girls are above 15 years old, find the angle of the sector that represents this.

The angle of the sector for girls above 12 years old

$$= \frac{2}{5} \times 110^\circ = 44^\circ$$

c) What percentage of the students are boys? Give your answer correct to the nearest percent.

$$\begin{aligned} \text{The number of students} &= \text{Number of boys} + \text{Number of girls} \\ &= 1,200 + 550 \\ &= 1,750 \end{aligned}$$

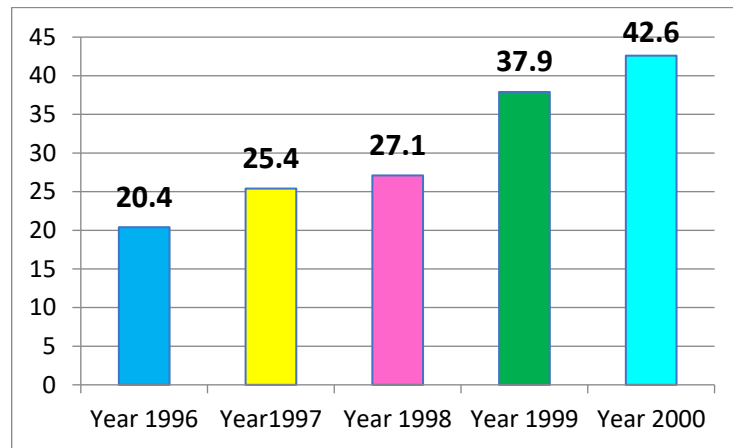
$$\begin{aligned} \therefore \text{Percentage of boys} &= \frac{1,200}{1,750} \times 100\% \\ &= 69\% \text{ (correct to the nearest \%)} \end{aligned}$$



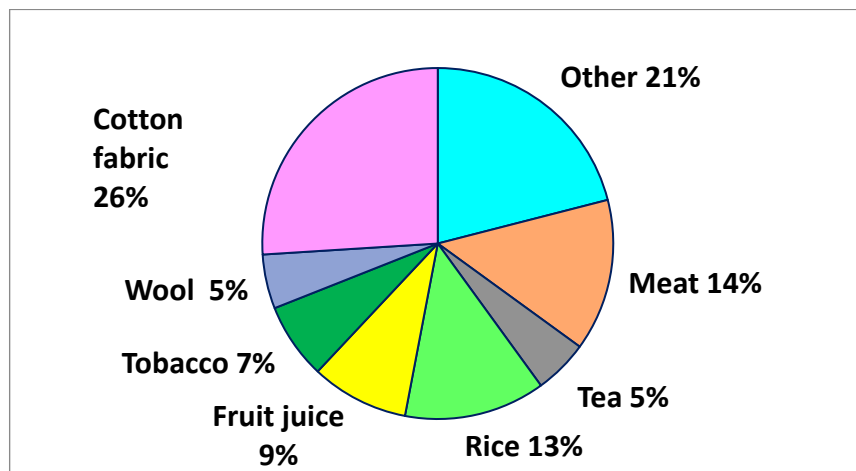
Example 7**From PISA 2006: Question M438: Exports**
(<http://www.oecd.org/pisa>)

The graphics below show information about exports from Zedland, a country that uses zeds as its currency.

**Total annual exports from Zedland in
Millions of Zeds, 1996-2000**



Distribution of exports from Zedland in 2000

**Question 1: Exports**

What was the total value (in millions of zeds) of exports from Zedland in 1998?

Solution

From the Bar graph given, the total value of exports from Zedland in 1998 is 27.1 million zeds or 27 100 000 zeds.

Question 2: What was the value of fruit juice exported from Zedland in 2000?

From the Bar graph given, the total value of exports from Zedland in 2000
= 42.6 million zeds

Solution

From the Pie chart graph given, the value of fruit juice exports from Zedland in 2000 = 9%

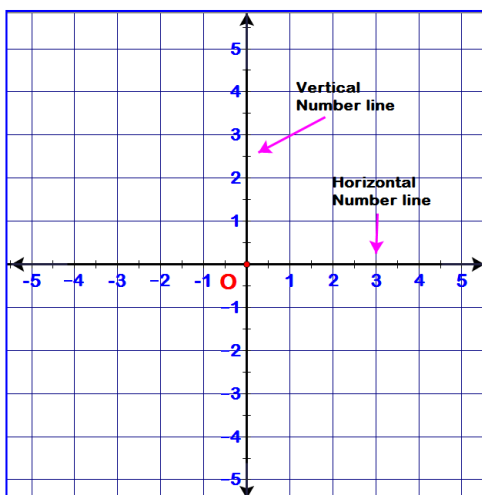
The value of fruit juice exported from Zedland in 2000 = $\frac{9}{100} \times 42.6$ million zeds
= 3.834 million zeds \square

5

Line Graphs

Line graphs are graphs where the data are represented using a line plotted to the two axes: x-axis and y-axis. The line may be straight or curved.

A graph has two axes that are perpendicular to each other. The horizontal number line is called the **x-axis** while the vertical number line is called the **y-axis**. The point where the two axes intersect is called the **origin** and denoted by the letter **O**. The axes divide the Cartesian plane into four quadrants that are numbered counterclockwise.



The Cartesian plane can be called the **x-y plane** or the **rectangular coordinate plane**. The system used for describing the position of any point on the Cartesian plane is known as the **Cartesian coordinate system**.

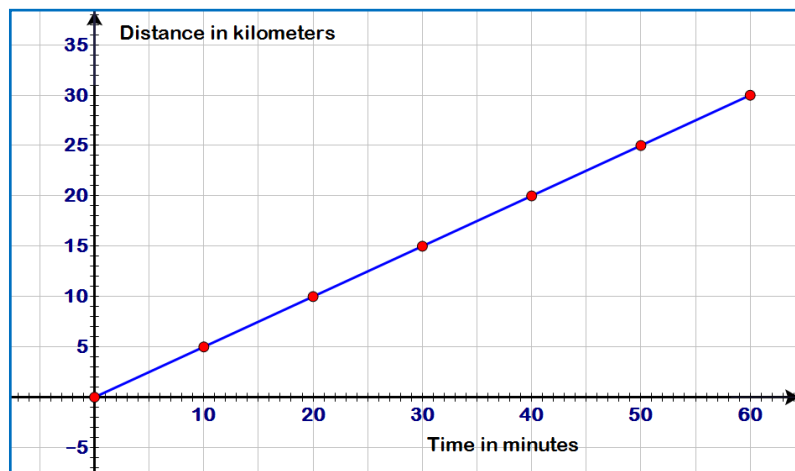
The location of each point in a coordinate plane can be described by a pair of numbers called **an ordered pair (x, y)** with the x-coordinate followed by the y-coordinate.

In mathematics, we can investigate whether there is any relationship between two variables, x and y. For example,

Example 8

A graph that shows the relationship between the distance travelled and the time taken in a journey. The table below shows the distance-time relationship of a journey made by a car. The total distance is 30 kilometers, x represents the number of minutes taken and y represents the number of kilometers travelled.

x (min)	0	10	20	30	40	50	60
y (km)	0	5	10	15	20	25	30
(x, y)	(0, 0)	(10, 5)	(20, 10)	(30, 15)	(40, 20)	(50, 25)	(60, 30)

Solution

The figure shows the graph of the journey. The graph can be represented by a straight line. It tells us that the car is travelling in 60 minutes at a constant speed.

6

Line Graphs Application in Business

Gold Price in Thailand

The official currency of Thailand is the **Thai Baht**. The Thailand Baht is issued and controlled by the central bank of the country, known as the Bank of Thailand. The central bank was established in 1942, and not only manages the nation's currency but has other responsibilities as well designed to provide financial and monetary stability for the country.

Secondary Data from:

<https://goldprice.org/gold-price-thailand.html>

60 Days Gold Price in Thailand Apr13 - June 14, 2021



One Year Gold Price in Thailand July 2020 - June 2021

