MATHEMATICS FOR TECHNOLOGY

STATISTICS

Reference

First Edition

Norshahadah Abd Rahman

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Norshahadah Binti Abd Rahman

POLITEKNIK SANDAKAN SABAH

PREFACE

Mathematics For Technology : Statistics is specially written for Semester 1 students who is taking mathematics at local polytechnic. This book complies with the polytechnics syllabus for subject DBM10133 Mathematics for Technology which is one of subject under Mathematics, Science & Computer Department, Politeknik Sandakan Sabah for programme Diploma Aquaculture and Diploma Agrotechnology.

This book is only covered one topic from the syllabus which is Statistic and it was designed as a guide and reference book to deepen students' knowledge and understanding of the statistics topics. This book consists of subtopics Presentation of Statistical Data, Measure of Central Tendency and Dispersion. All notes about Statistic topics are produced in the form of an E-book to make it easier for students to get it. Enforcement exercise are also included in each subtopic.

It is hoped that with the availability of this E-book becomes an additional good reference for polytechnics students and the benefit found therein shared among all.

Norshahadah Abd Rahman

TABLE OF CONTENT

SUMMARY

This topic explains basic terminologies of statistics. Data presentation is made in the form of graphs and frequency distribution tables. Measure of central tendency is determined using formulaic and graphical methods. This topic also discusses the calculation of mean deviation, variance and standard deviation.

Learning Outcome:

The end of this topic, students will able to:

1. explain the statistical terminologies
2. show the ungrouped data diagrammatically by using pictograph, bar charts and pie chart.
3. construct a frequency distribution table and cumulative frequency distribution table.
4. draw a histogram, frequency polygon and an ogive.
5. calculate the mean, median and mode for grouped and ungrouped data by using formula method.
6. find the median and mode for by using graph method.
7. calculate the mean deviation, variance and standard deviation for ungrouped and grouped data.

1.1 PRESENTATION OF STATISTICAL DATA

1.1.1   DEFINE OF STATISTICAL TERMINOLOGY

Terminology	Definition
Statistics	Collection of methods for collecting, displaying, analysing, and drawing conclusions from data.
Data	Collection of facts, such as numbers, words, measurements, observations or even just descriptions of things.
Ungrouped Data	Collection of facts, such as numbers, words, measurements, observations or even just descriptions of things. Data which have not been arranged in a systemic order is called ungrouped or raw data.
Grouped Data	Data is given in intervals.
Frequency	Number of times a particular data point occurs in the set of data.
Frequency Distribution	Table that list each data point and its frequency.

1.1.2   PRESENTATION OF UNGROUPED DATA

A. Pictographs

A Pictograph is a way of showing data using images. Each image stands for a certain number of things.

Example 1

The number of lemon sold by Fizi' stall for six month shown as below. Present these data as a pictograph.

Month	Number of Coconut Sold
Jan	90
Feb	160
March	120
April	90
May	60
July	100

Number of Lemon Sold in 6 Month

Month	Number of Lemon Sold
Jan	🍋🍋🍋🍋🍋
Feb	🍋🍋🍋🍋🍋🍋🍋
March	🍋🍋🍋🍋
April	🍋🍋🍋🍋🍋
May	🍋🍋🍋🍋
July	🍋🍋🍋🍋🍋

🍋 = 20 Lemons   🍋 = 10 Lemons

B. Bar Chart

A bar graph is a way of summarizing a set of categorical data. It displays the data using a number of rectangles, of the same width, each of which represents a particular category. Bar graphs can be displayed **horizontally** or **vertically** and they are usually drawn with a gap between the bars (rectangles).

```
                        Bar Chart
        ┌───────────────────┼───────────────────┐
     Simple           Grouped/            Stacked/
                       Multiple           Composite
      ┌──┴──┐          ┌──┴──┐            ┌──┴──┐
  Vertical  Horizontal  Vertical  Horizontal  Vertical  Horizontal
```
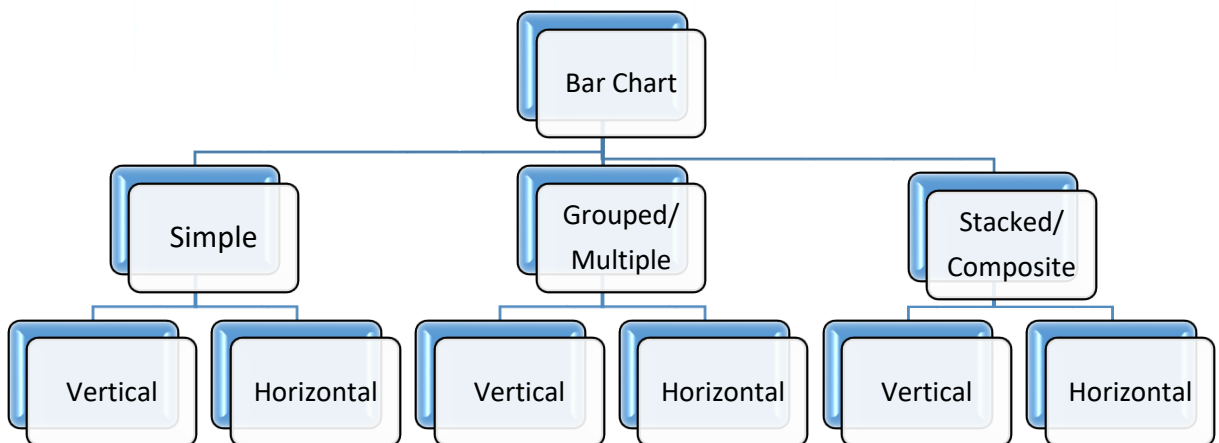
C. Simple Bar Chart

Example 2

A survey of 200 people revealed their most favourite local fruits in Malaysia.

Fruit	Banana	Durian	Star Fruit	Rambutan	Mangosteen	Jackfruit	Water Melon
People	25	45	15	35	30	15	25

Solution
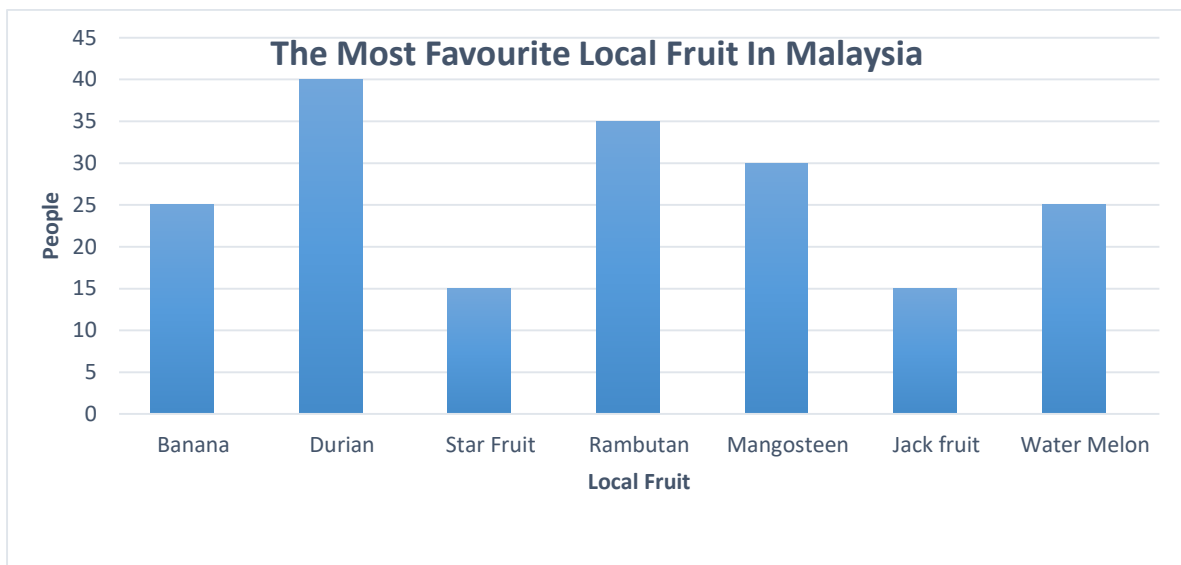
Graph 1: Vertical Bar Chart
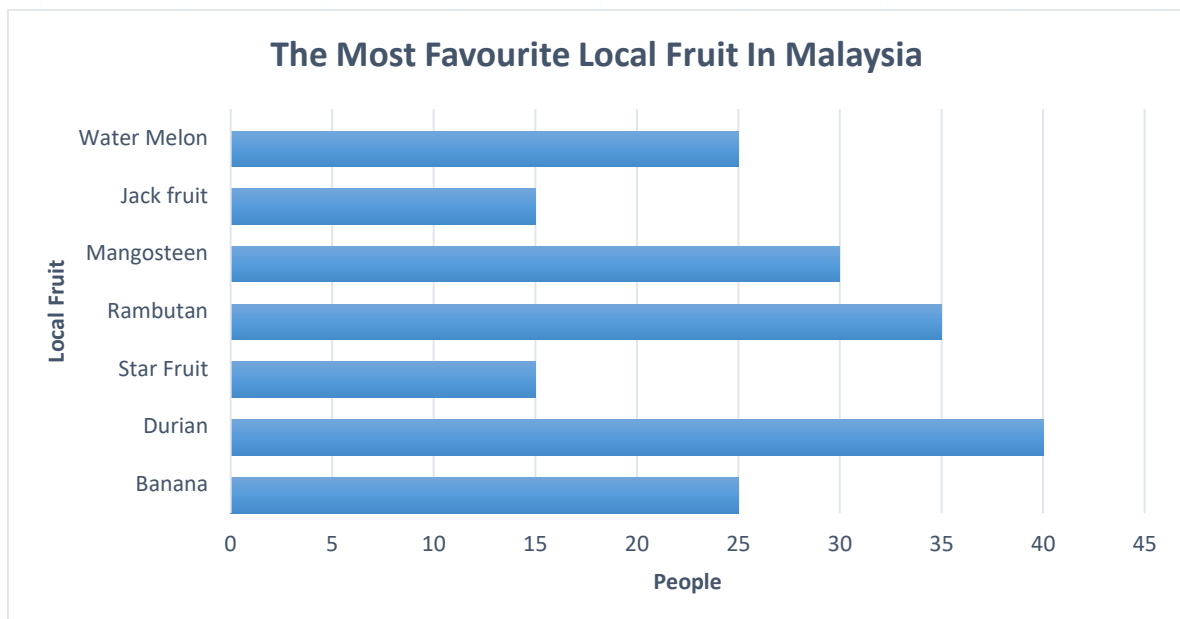
Graph 2: Horizontal Bar Chart

D. Grouped/ Multiple Bar Chart

A chart depicting two or more characteristics in the form of bars of length proportional in magnitude of the characteristics.

Example 3

Draw a multiple bar chart to represent the import and export of Malaysia (values in RM) for the years 2010 to 2014.

Years	Imports	Exports
2010	7230	5260
2011	6850	7550
2012	10860	9655
2013	11725	8440
2014	12150	9150

Solution
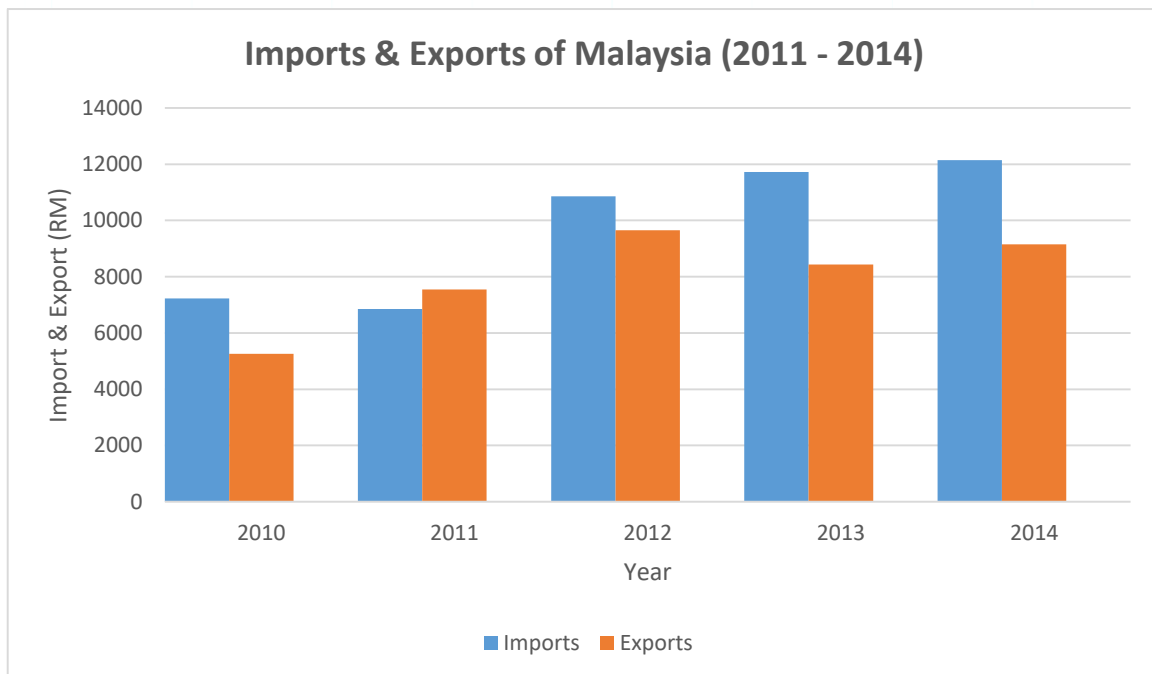
Graph 1: Vertical Double Bar Chart
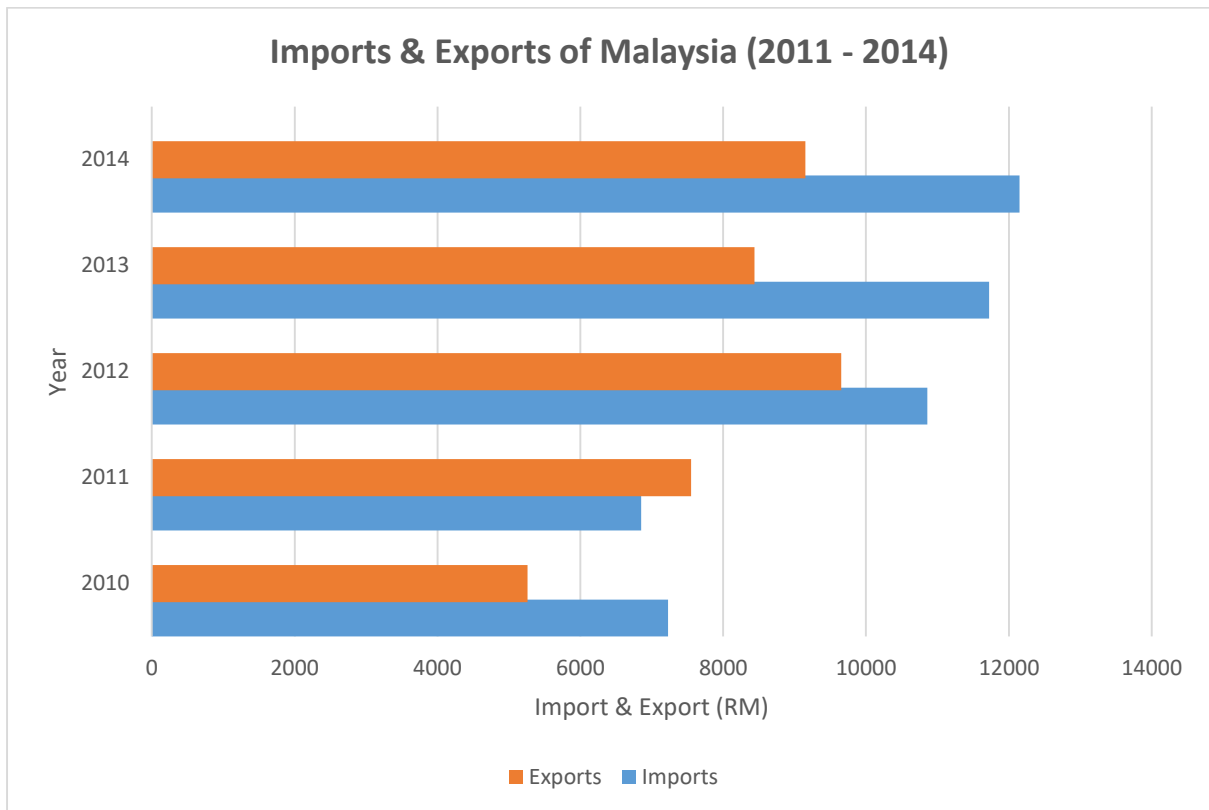
Graph 2: Horizontal Double Bar Chart

E. Stacked/ Composite/ Component Bar Chart

Sub-divided or component bar chart is used to represent data in which the total magnitude is divided into different or components.

Example 4

The table bellows shows the quantity in hundred kg of rice, wheat and corn produced on a certain farm during the years 2010 to 2014. Construct a composite bar chart to illustrate the data.

Years	Rice	Wheat	Corn	Total
2010	55	20	15	90
2011	72	18	15	105
2012	62	15	16	93
2013	66	17	14	97
2014	56	21	13	90

The Quantity Of Rice, Wheat and Corn
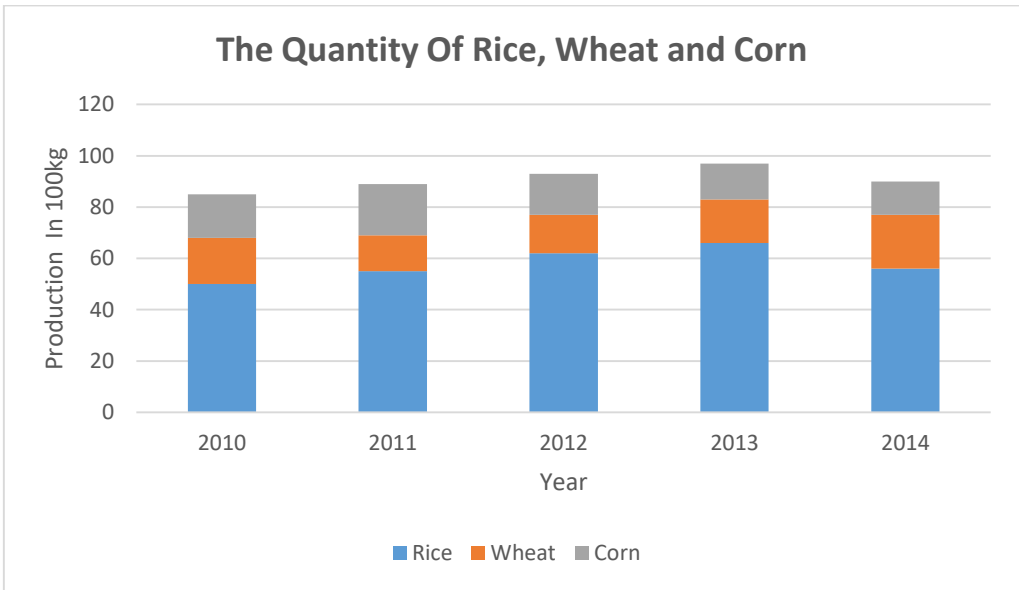
Graph 1: Vertical Composite Bar Chart

The Quantity Of Rice, Wheat and Corn
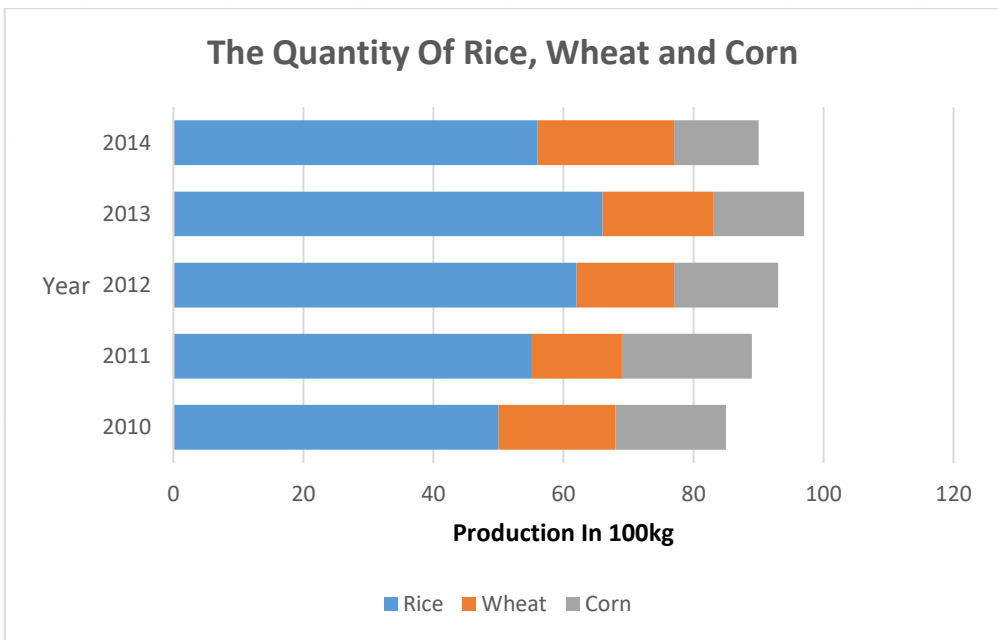
Graph 2: Horizontal Composite Bar Chart

F. Pie Chart

A special chart that uses "pie slices" to show relative sizes of data.

Example 5

Imagine you just did a survey of your friends to find which kind of Astro Channel they liked best. Here are the results:

Favourite Type of Astro Channel				
Warna	Prima	Citra	Oasis	Naura
8	10	7	4	6

Solution

Astro Channel	Frequency	Percentage (%)	Degree (∘)
Ria	8	$\dfrac{8}{35} \times 100 = \textbf{23}$	$\dfrac{8}{35} \times 360 = \textbf{82}$
Prima	10	$\dfrac{10}{35} \times 100 = \textbf{29}$	$\dfrac{10}{35} \times 360 = \textbf{103}$
Oasis	7	$\dfrac{7}{35} \times 100 = \textbf{20}$	$\dfrac{7}{35} \times 360 = \textbf{72}$
Sport	4	$\dfrac{4}{35} \times 100 = \textbf{11}$	$\dfrac{4}{35} \times 360 = \textbf{41}$
Ceria	6	$\dfrac{6}{35} \times 100 = \textbf{17}$	$\dfrac{6}{35} \times 360 = \textbf{62}$
Total	**35**	**100**	**360**

Favourite Type of Astro Channel

Ceria, 6, 17%

Ria, 8, 23%

Sport, 4, 11%

Oasis, 7, 20%

Prima, 10, 29%
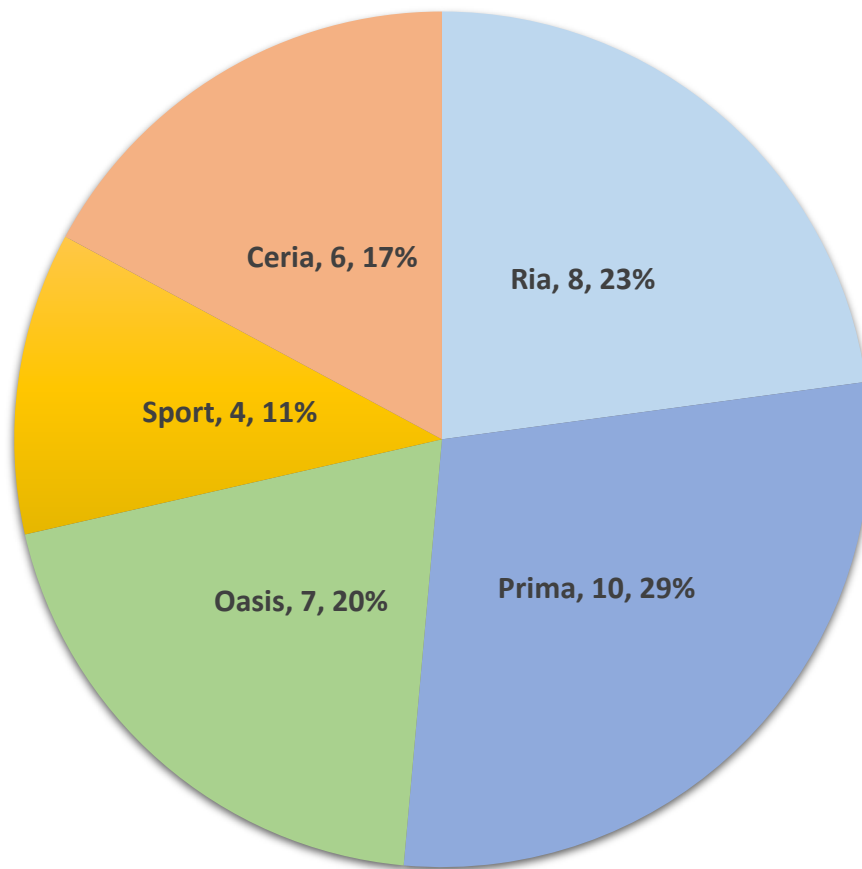
PRESENTATION OF GROUP DATA

Data presented in the form of frequency distribution is called grouped data.

```
┌─────────────────────────┐        ┌─────────────────────────┐
│                         │        │     Exclusive Form      │
│  Frequency Distribution │────────│  (Continuous Interval   │
│                         │        │         Form)           │
└─────────────────────────┘        └─────────────────────────┘
```
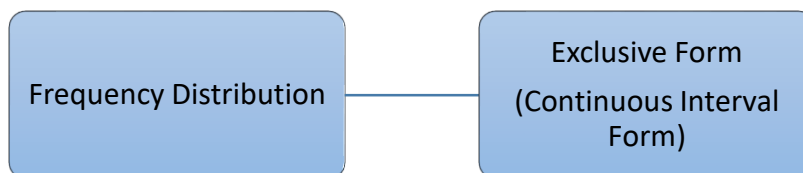
Example 1

Given below are the marks obtained by 40 students in an examination:

6	50	96	46	34	26	22	18	92	82
74	90	20	38	78	72	68	10	34	42
78	66	56	50	24	6	16	34	96	68
30	38	64	64	38	42	56	64	40	46

Solution

A. Discontinuous Interval Form (or Inclusive Form)

Lower limit →

Upper limit →

Class Interval	Tally Marks	Frequency
0 - 20	IIII	5
21 - 40	THL THL I	11
41 - 60	THL IIII	9
61 - 80	THL THL	10
81 - 100	THL	5
Total		**40**

Here,

- The class 0 – 20 means, marks obtained from 0 to 20, i.e., including both.
- So, 21 – 40 means between 21 and 40 including 21 and 40

B. Construction of Frequency Distribution

Example 2

Construct a frequency distribution with suitable class interval size of marks obtained by 50 students of a class are given below:

33	60	48	52	73	85	22	43	36	49
45	57	53	62	66	69	74	87	25	31
61	64	82	78	46	75	62	70	37	44
57	67	65	68	69	72	61	66	60	51
67	75	64	53	66	54	40	56	77	63

Solution

No	Step	Solution
1.	Find the data range $$Range = Largest\ value - smallest\ value$$	Range = 87 − 22 = 65
2.	Find the number of classes: $$K = 1 + 3.3\ log\ N$$ Where: K= Number of Classes N = total number of observations.	K = 1 + 3.3 log 50 = 6.61 = 7 *must be a round number toward* Ex: 6.24 = 7 5.2 = 6 5.8 =6
3.	Find the class width/class size/class interval $$Class\ width = \frac{Data\ range}{Number\ of\ classes}$$	$$Class\ width = \frac{65}{7}$$ = 9.28 = 10
4.	Find the class boundaries $$Class\ Boundaries = \frac{Upper\ limit\ of\ a\ class + lower\ limit\ of\ next\ class}{2}$$	Ex: $$Lower\ Class\ Boundary = \frac{31 + 32}{2}$$ $$Upper\ Class\ Boundary = \frac{41 + 42}{2}$$ *must be a round number toward* Ex: 6.24 = 7 5.2 = 6 5.8 =6

Class Interval	Tally	Frequency	Boundaries
22 – 31	III	3	21.5 – 31.5
32 – 41	IIII	4	31.5 – 41.5
42 – 51	ЖII	7	41.5 – 51.5
52 – 61	ЖЖIII	11	51.5 – 61.5
62 – 71	ЖЖЖ	15	61.5 – 71.5
72 – 81	ЖII	7	71.5 – 81.5
82 – 91	III	3	81.5 – 91.5
Total		**50**	

C. Histogram

A histogram is a graphical display of data using bars of different heights.

Example 3

The table bellows shows the marks obtained by 50 students of a class in PSS.

     i)   Built a frequency distribution table

     ii)   After that built a histogram

Class Interval	Frequency
22 – 31	3
32 – 41	4
42 – 51	7
52 – 61	11
62 – 71	15
72 – 81	7
82 – 91	3
Total	**50**

Class Interval	Frequency	Boundaries
22 – 31	3	21.5 – 31.5
32 – 41	4	31.5 – 41.5
42 – 51	7	41.5 – 51.5
52 – 61	11	51.5 – 61.5
62 – 71	15	61.5 – 71.5
72 – 81	7	71.5 – 81.5
82 – 91	3	81.5 – 91.5
Total	**50**	

The Marks Obtained By 50 Students Of A Class In PSS
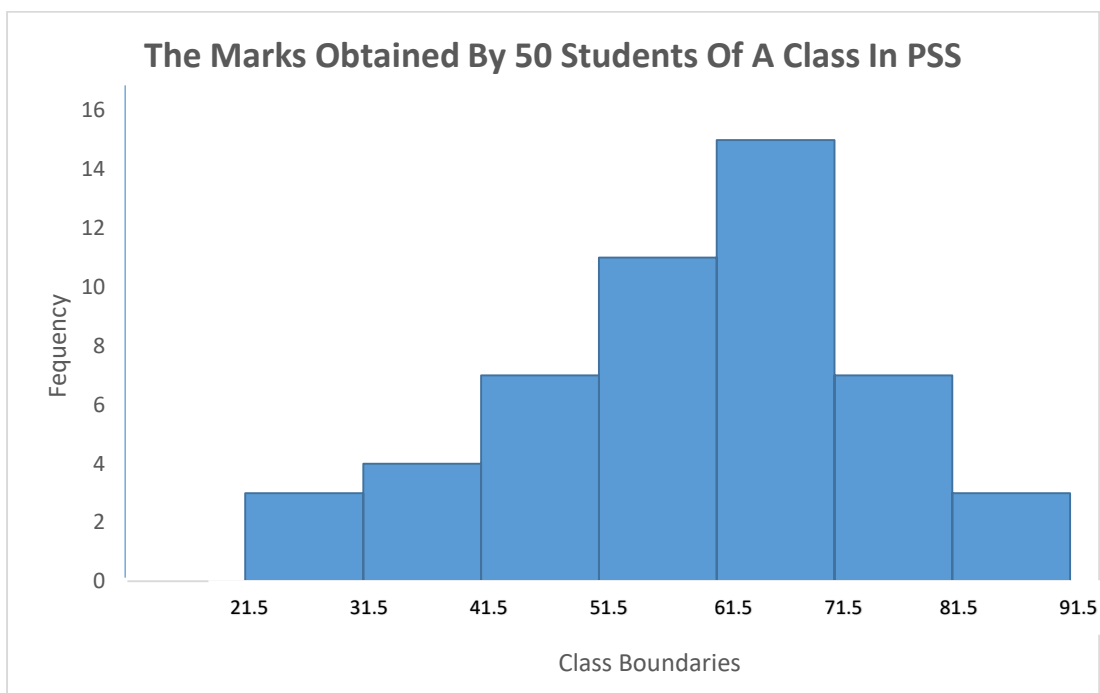
D. Frequency Polygon

A graph made by joining the middle-top points of the columns of a frequency histogram

Class Interval	Frequency	Boundaries	Midpoint
22 – 31	3	21.5 – 31.5	26.5
32 – 41	4	31.5 – 41.5	36.5
42 – 51	7	41.5 – 51.5	46.5
52 – 61	11	51.5 – 61.5	56.5
62 – 71	15	61.5 – 71.5	66.5
72 – 81	7	71.5 – 81.5	76.5
82 – 91	3	81.5 – 91.5	86.5
Total	**50**		

Midpoint:

$$\frac{upper\ limit + lower\ limit}{2}$$

The Marks Obtained By 50 Students Of A Class In PSAS
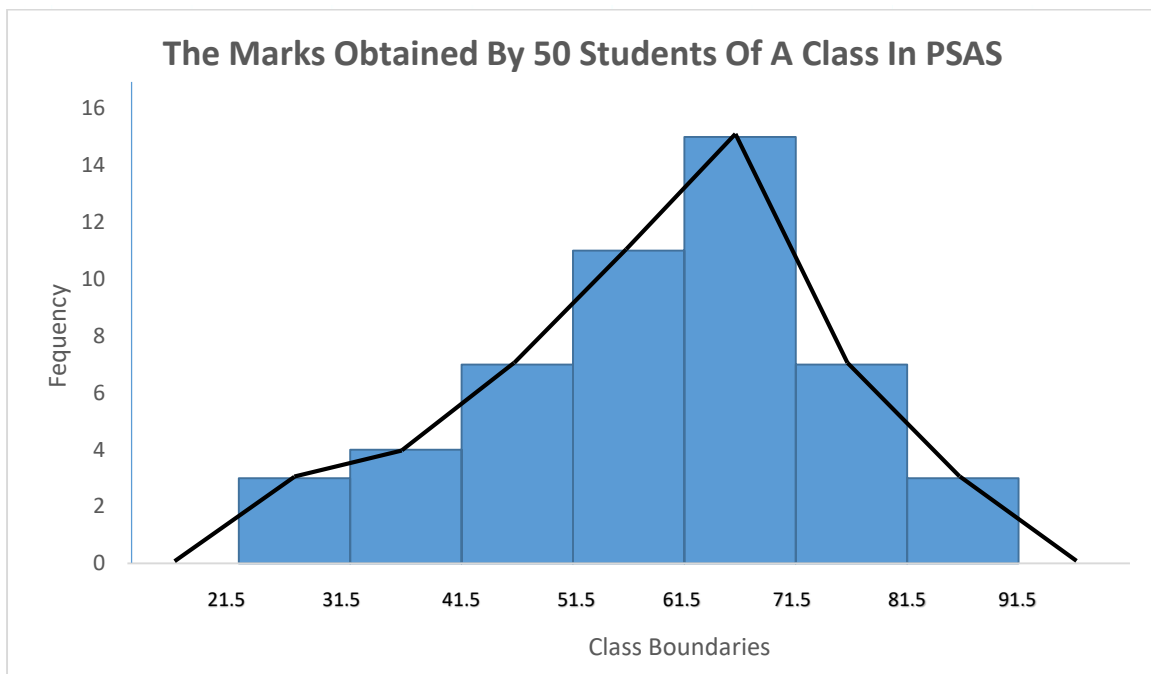
E. Ogive

Example 4

The following frequency distribution table gives the marks obtained by 50 students.

i.   Draw a **less than** cumulative frequency distribution ogive curve

ii.   Draw a **more than** cumulative frequency distribution ogive curve

Class Interval	Frequency	Boundaries
22 – 31	3	21.5 – 31.5
32 – 41	4	31.5 – 41.5
42 – 51	7	41.5 – 51.5
52 – 61	11	51.5 – 61.5
62 – 71	15	61.5 – 71.5
72 – 81	7	71.5 – 81.5
82 – 91	3	81.5 – 91.5
Total	**50**	

Solution

i.

Class Boundaries	Cumulative Frequency
Less than 21.5	0
Less than 31.5	3
Less than 41.5	7
Less than 51.5	14
Less than 61.5	25
Less than 71.5	40
Less than 81.5	47
Less than 91.5	50
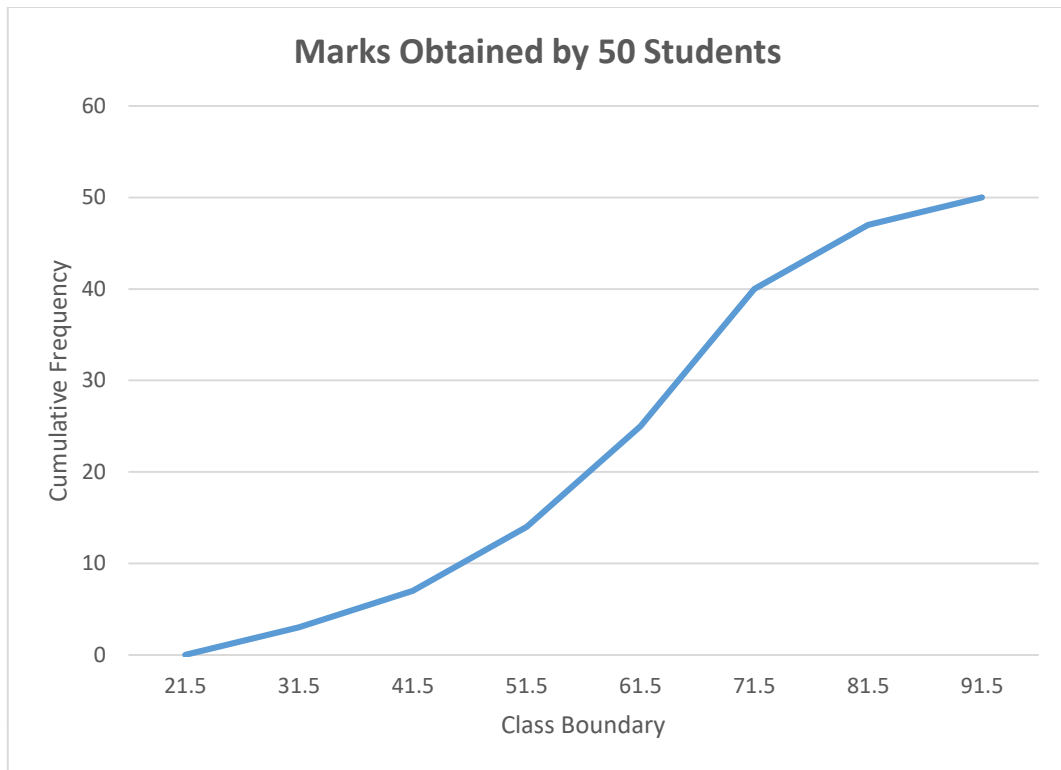
Graph 1: Ogive Less Than

ii.

Class Boundaries	Cumulative Frequency
More than 21.5	50
More than 31.5	47
More than 41.5	43
More than 51.5	36
More than 61.5	25
More than 71.5	10
More than 81.5	3
More than 91.5	0
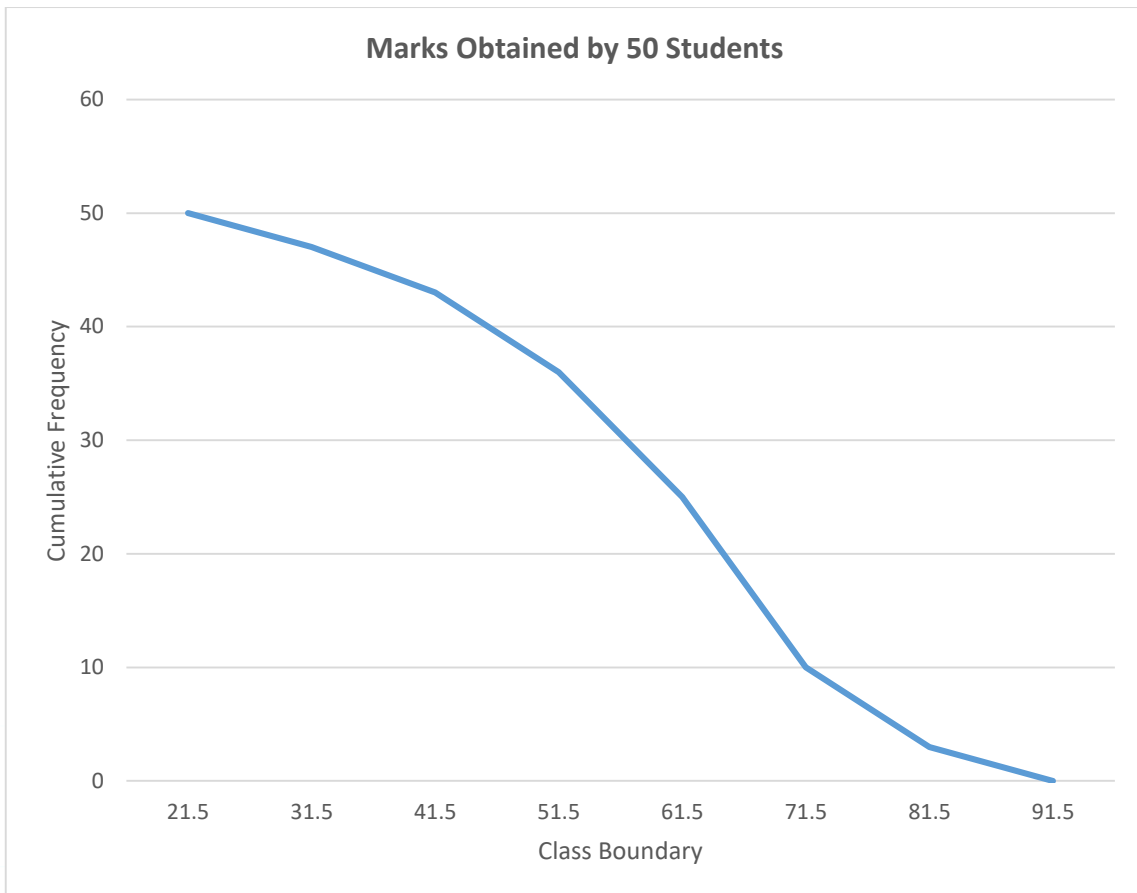
Graph 2: Ogive More Than

Question 1

The number of low cost houses built by a developer in five projects are given in the table below. By using the symbol ⬭ to represent 50 low cost houses, construct a pictograph for the data.

Project 1	Project 2	Project 3	Project 4	Project 5
350	400	500	300	250

Question 2

The number of people who have donated blood in a blood donation campaign for four days are given in the table below. By using the symbol ☺ to represent 30 donors, construct a pictograph for the data.

Day	Number of Blood Donors
Monday	150
Tuesday	120
Wednesday	210
Thursday	60

Question 3

The table below shows the number of candidate who passes in driving test conducted by a driving school for the first four months of 2020. By using suitable scales, construct a vertical bar chart to represent the data.

Month	January	February	March	April
Number of Candidate	50	30	35	40

Question 4

The table below shows the sales of five type of books in a bookstore in a certain day. Based on the data, construct a pie chart to represent the data.

Book	Number of Book
Science	12
Management	33
Education	16
Decoration	33
Novel	34

1.2 MEASURE OF CENTRAL TENDENCY AND DISPERSION

Measure of Central Tendency

- Single value or a category of items that is used to represent a set of data. It is used to determine the central value of a set of data.

- There important type of measure of central tendency are the mean, median and mode.

  Mean : the **average value** of a set of data that is obtained by dividing the sum of all the values of data by the number of data

- **Median** : **middle value** of a set of data that has been arranged in an ascending order.

- **Mode : t**he value or a category of items that occurs **most frequently** in a set of data.

Measure of Central Dispersion

- Measure of dispersion describe how the values of data spread out in a set of data.

- Mean deviation, variance and standard deviation are commonly used to measure the dispersion of a set of data.

1.2.1	MEAN, MEDIAN AND MODE FOR UNGROUPED DATA

Ungrouped Data Without A Frequency Table
The masses of ten students, in kg, are 45, 60, 55, 47, 48, 52, 65, 64, 48 and 52.

A. Mean (Ungrouped data without frequency)

Example 1

4, 6, 3, 3, 1, 5, 2

The data above shows the number of books read by a group of students in a year. Calculate the mean number of books read by the students in a year.

$$Mean, \bar{x} = \frac{4 + 6 + 3 + 3 + 1 + 5 + 2}{7}$$

$$= \frac{24}{7}$$

$$\boldsymbol{Mean, \bar{x} = 3.43}$$

Formula:

$$Mean, \bar{x} = \frac{\sum x}{n}$$

$$n - number\ of\ data$$

B. Median

a) The data below shows the distances in km, of the houses of 7 students from their faculty. Find the median.

$$5, 3, 6, 7, 4, 5, 2$$

b) The data below shows the distances in km, of the houses of 10 students from their faculty. Find the median.

$$5, 3, 6, 7, 4, 5, 2, 3, 1, 3$$

a) Arrange the data in ascending order

$$2, \ 3, \ 4, \ 5, \ 5, \ 6, \ 7$$

$$Number\ of\ data, n$$
$$= 9\ (odd)$$

One number in the middle

Median = 5

b) Arrange the data in ascending order

$$1, \ 2, \ 3, \ 3, \ 3, \ 4, \ 5, \ 5, \ 6, \ 7$$

$$Number\ of\ data, n$$
$$= 10\ (even)$$

Two number in the middle

$$Median = \frac{3+4}{2}$$

$$\boldsymbol{Median = 3.5}$$

C. Mode

Example 3

a) The data below shows the distances in km, of the houses of 7 students from their faculty. Find the mode of distance.

$$5, 3, 6, 7, 4, 5, 2$$

b) The data below shows the distances in km, of the houses of 10 students from their faculty. Find the mode of distance.

$$5, 3, 6, 7, 4, 3, 2, 3, 1, 3$$

c) The data below shows the distances in km, of the houses of 10 students from their faculty. Find the mode of distance.

$$5, 3, 6, 7, 4, 5, 2, 3, 1$$

Solution

a)	5, 3, 6, 7, 4, 5, 2	**Mode = No mode**
b)	5, **3**, 6, 7, 4, **3**, 2, **3**, 1, **3**	**Mode = 3**
c)	**5**, **3**, 6, 7, 4, **5**, 2, **3**, 1	**Mode = 3 and 5 (multimode)**

1.2.2	**MEAN, MEDIAN AND MODE FOR GROUPED DATA**

A. Mean

Formula:

$$Mean, \bar{x} = \frac{\sum fx}{\sum f}$$

$f - frequency$

$x - midpoint$

Formula to calculate midpoint:

$$Midpoint = \frac{lower\ limit + upper\ limit}{2}$$

@

$$Midpoint = \frac{lower\ class\ boundary + upper\ class\ boundary}{2}$$

Example 1

The table below shows the distance, in km, between a group of students' house and their school. Based on the table, calculate the mean, median and mode for the distance.

Distance (km)	Number of Students
1 − 2	6
3 − 4	5
5 − 6	7
7 − 8	3
9 − 10	4

Solution

Distance (km)	Number of Students, f	Midpoint, x	fx
1 − 2	6	1.5	9
3 − 4	5	3.5	17.5
5 − 6	7	5.5	38.5
7 − 8	3	7.5	22.5
9 − 10	4	9.5	38
	$\sum f = 25$		$\sum fx = 125.5$

$$Mean, \bar{x} = \frac{\sum fx}{\sum f} = \frac{125.5}{25} = 5.02$$

B. Median

Example 2

Formula:

$$Median, = L + \left[\frac{\frac{\sum f}{2} - F}{f_m}\right] c$$

L − Lower boundary for median class

$\sum f$ − sum of frequency

F − Cumulative frequency before median class

f_m − frequency for the median class

c − size of the median class (upper boundary − lower boundary)

Find the median class:

1. Calculate the $\dfrac{\Sigma f}{2}$

$$\frac{\Sigma f}{2} = \frac{25}{2} = 12.5$$

refer to the cumulative frequency column

to determine median class

2. Insert Cumulative Frequency column

Median class

Distance (km)	Number of Students, f	Cumulative Frequency, F
$1-2$	6	6
$3-4$	5	11
$5-6$	7	18
$7-8$	3	21
$9-10$	4	25

12.5

$Median\ class => \mathbf{5-6}$

$L - Lower\ boundary\ for\ median\ class = \mathbf{4.5}$

$\sum f - sum\ of\ frequency = \mathbf{25}$

$F - Cumulative\ frequency\ before\ median\ class = \mathbf{11}$

$f_m - frequency\ for\ the\ median\ class = \mathbf{7}$

$c - size\ of\ the\ median\ class\ (upper\ boundary - lower\ boundary) = 6.5 - 4.5$
$= \mathbf{2}$

$$Median = 4.5 + \left[\frac{\frac{25}{2} - 11}{7}\right] 2$$

$$= \mathbf{4.9}$$

C. Mode

Formula:

$$Mode, = L + \left[\frac{d_1}{d_1 + d_2}\right] c$$

L − Lower boundary for mode class

d_1 − difference frequency of the mode class and frequency **before** mode class

d_2 − difference frequency of the mode class and frequency **after** mode class

c − size of the mode class (upper boundary − lower boundary)

Solution

Find the mode class :

1. Find the highest frequency to determine mode class

Distance (km)	Number of Students, f
1 − 2	6
3 − 4	5
5 − 6	7
7 − 8	3
9 − 10	4

Mode class

Highest frequency

Mode class => **5 − 6**

L − Lower boundary for mode class = **4.5**

d_1 − difference frequency of the mode class and frequency before mode class

= 7 − 5 = **2**

d_2 − difference frequency of the mode class and frequency after mode clas
= 7 − 3 = **4**

c − size of the mode class (upper boundary − lower boundary) = 6.5 − 4.5
= 2

$$Mode = 4.5 + \left[\frac{2}{2 + 4}\right] 2$$

$$= 5.17$$

MEDIAN AND MODE FOR GROUPED DATA BY USING GRAPH

A. Median (Ogive)

Example 1

The table below shows the electricity bill of 50 families of Kampung Bahagia in certain month. From the data, find the median without using any formula.

Electricity Bill (RM)	Number of Families
30 – 39	6
40 – 49	10
50 – 59	7
60 – 69	9
70 – 79	11
80 – 89	4
90 – 99	3

Solution

1. Construct a cumulative frequency table (less than)

Electricity Bill (RM)	Number of Families, f	Cumulative Frequency, F
29.5	0	0
39.5	6	6
49.5	10	16
59.5	7	23
69.5	9	32
79.5	11	43
89.5	4	47
99.5	3	50

2. Draw an ogive

The Electricity Bill of 50 Families of Kampung Bahagia

$$\frac{\sum f}{2} = \frac{50}{2}$$

Cumulative Frequency (y-axis)

Class Boundaries (x-axis): 29.5, 39.5, 49.5, 59.5, 69.5, 79.5, 89.5, 99.5

— Ogive

3. Find the median

From the ogive, median $= \frac{\sum f}{2} = \frac{50}{2} = 25$ (refer y-axis)

$$= \mathbf{62.5} \text{ (x-axis)}$$

B. Mode (Histogram)

Example 2

The table below shows the electricity bill of 50 families of Kampung Bahagia in certain month. From the data, find the mode without using any formula.
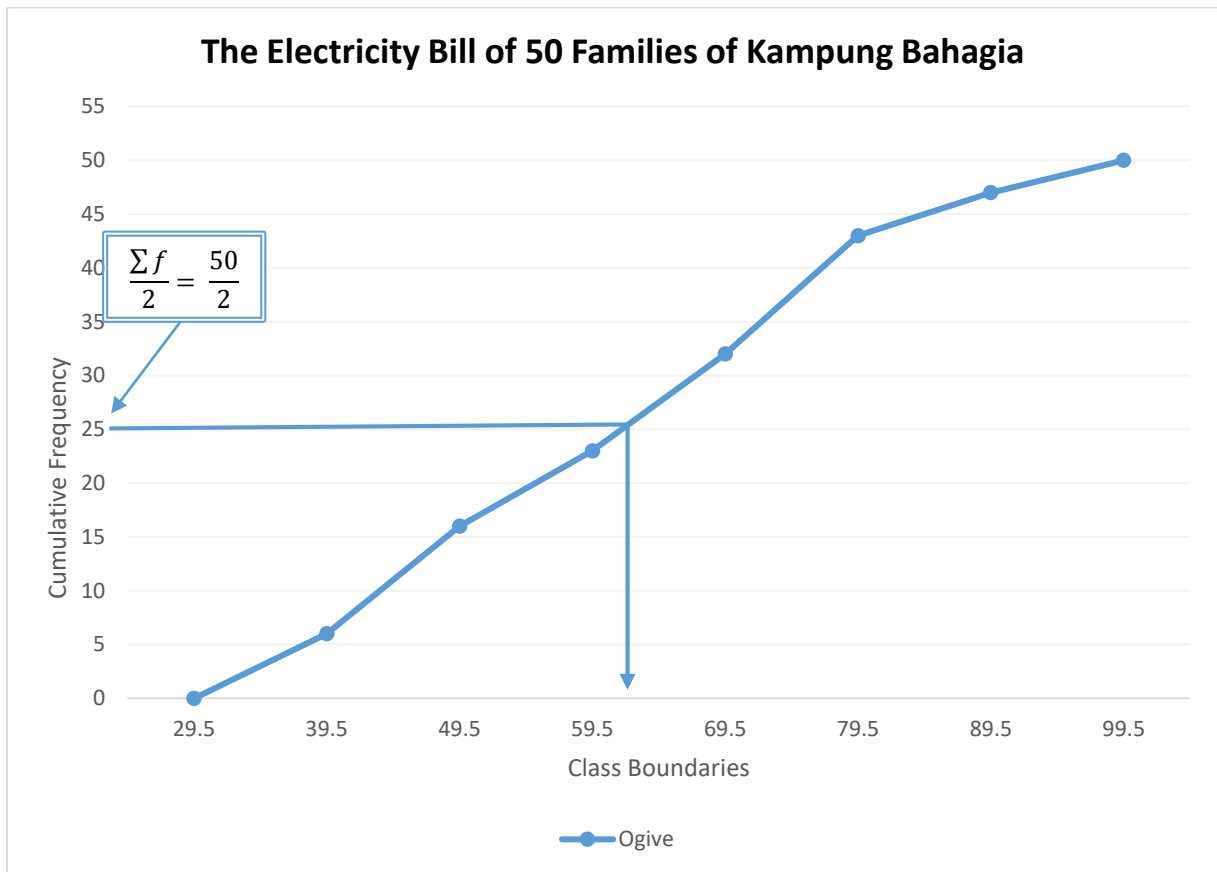
Electricity Bill (RM)	Number of Families
30 – 39	6
40 – 49	10
50 – 59	7
60 – 69	9
70 – 79	11
80 – 89	4
90 – 99	3

Solution

1. Add class boundary column

Electricity Bill (RM)	Number of Families, f	Class Boundary
30 – 39	6	29.5 – 39.5
40 – 49	10	39.5 – 49.5
50 – 59	7	49.5 – 59.5
60 – 69	9	59.5 – 69.5
70 – 79	11	69.5 – 79.5
80 – 89	4	79.5 – 89.5
90 – 99	3	89.5 – 99.5

2. Find the modal class from the histogram

The Electricity Bill of 50 Families of Kampung Bahagia
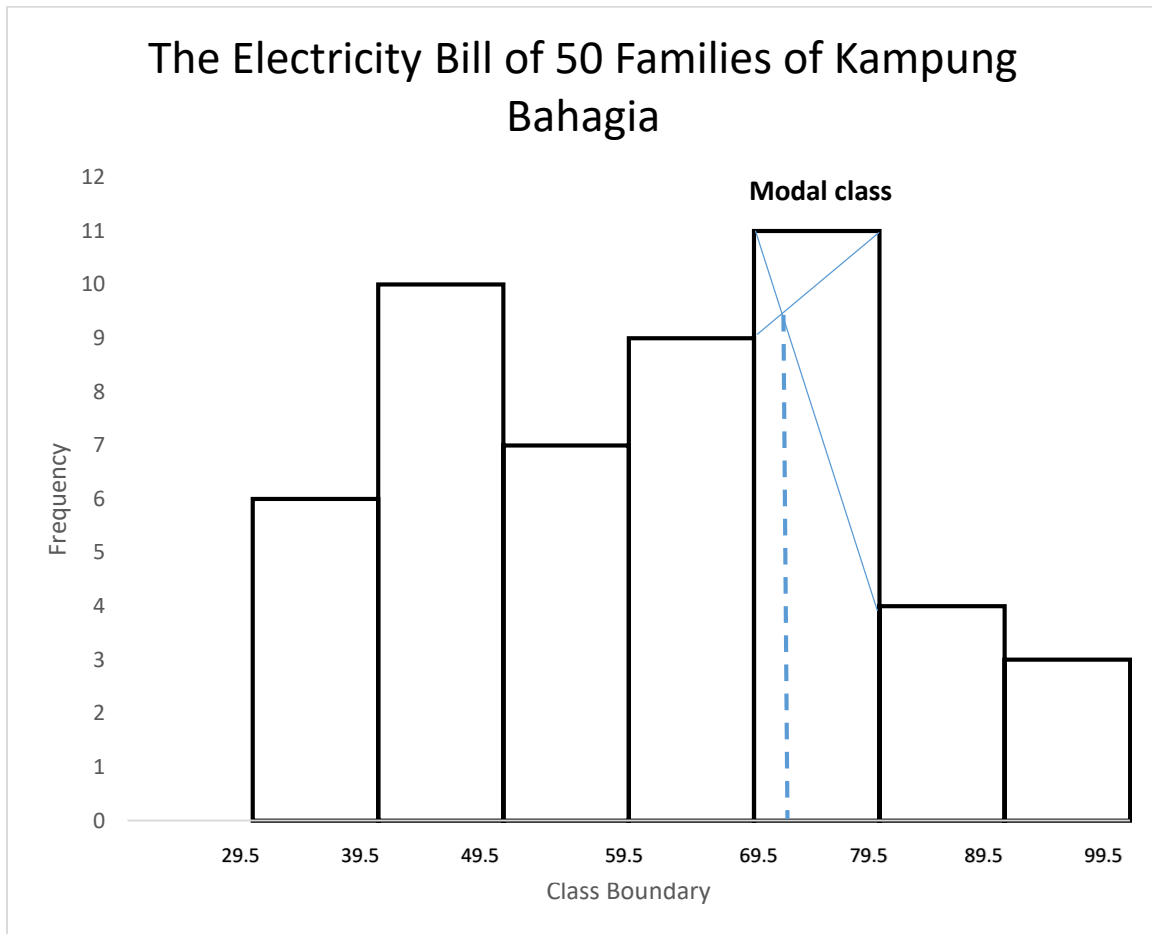
3. Mode from the histogram $= \mathbf{71.5}$

<table>
<tr><td>**1.2.4**</td><td>**MEAN DEVIATION, VARIANCE AND STANDARD DEVIATION**</td></tr>
</table>

A. Ungrouped Data

Mean Deviation, Variance and Standard Deviation

Example 1

$$4, 2, 3, 5, 7$$

The data above shows the ages, in years, of 5 children who have received medical treatment in a hospital. Calculate the mean deviation, variance and standard deviation.

Solution

1. Find the **mean, $\bar{x}$**

$$Mean, \bar{x} = \frac{\sum x}{n} = \frac{4+2+3+5+7}{5} = \frac{21}{5} = \mathbf{4.2}$$

2. Construct a table

$$|4 - 4.2| = 0.2$$

Age, x	$|x - \bar{x}|$	$(x - \bar{x})^2$
4	0.2	0.04
2	2.2	4.84
3	1.2	1.44
5	0.8	0.64
7	2.8	7.84
$\sum x = 21$	$\sum |x - \bar{x}| = 7.2$	$\sum (x - \bar{x})^2 = 14.8$

$$(4 - 4.2)^2 = 0.04$$

3. Formula and Solution

Mean	Formula	Solution
Mean Deviation	*Mean Deviation, E* $$= \frac{\sum|x - \bar{x}|}{n}$$ $x - data \quad \bar{x} - mean$ $n - number\ of\ data$	$n = 5$, $\sum|x - \bar{x}| = 7.2$, $$E = \frac{\sum|x - \bar{x}|}{n} = \frac{7.2}{5} = \mathbf{1.44}$$
Variance	$$S^2 = \frac{\sum(x - x)^2}{n}$$	$n = 5$, $\sum(x - x)^2 = 14.8$,

	$x - data$ $\quad$ $\bar{x} - mean$ $n - number\ of\ data$	$S^2 = \dfrac{\sum(x - \bar{x})^2}{n}$ $S^2 = \dfrac{14.8}{5} = \mathbf{2.96}$
Standard Deviation	$S = \sqrt{Variance}$	$S = \sqrt{Variance}$ $S = \sqrt{2.96} = \mathbf{1.72}$

B. Grouped Data

Mean Deviation, Variance and Standard Deviation

Example 1

The following frequency table shows the speed of 25 vehicles recorded by traffic officer in an operation.

Speed (km h $^{-1}$)	Number of cars
61 – 65	1
66 – 70	2
71 – 75	6
75 – 80	5
85 – 90	7
95 – 100	4

Solution

Speed (km h $^{-1}$)	Number of cars, f	x	fx	$\lvert x - \bar{x}\rvert$	$\lvert x - \bar{x}\rvert f$	$(x - \bar{x})^2$	$(x - \bar{x})^2 f$
61 – 65	1	63	63	15.4	15.4	237.16	237.16
66 – 70	2	68	136	10.4	20.8	108.16	216.32
71 – 75	6	73	438	5.4	32.4	29.16	174.96
76 – 80	5	78	390	0.4	2	0.16	0.8
81 – 85	7	83	581	4.6	32.2	21.16	148.12
86 – 90	4	88	352	9.6	38.4	92.16	368.64
	$\sum f$ $= 25$		$\sum fx$ $= 1960$		$\sum \lvert x - \bar{x}\rvert f$ $= 141.20$		$\sum (x - \bar{x})^2 f$ $= 1146$

1. Find the mean, $\bar{x}$

$$Mean, \bar{x} = \frac{\sum fx}{\sum f} = = \frac{1960}{25} = \mathbf{78.4}$$

Formula:

$$\text{Mean Deviation}, E = \frac{\sum |x - \overline{x}| f}{\sum f}$$

$x - midpoint \qquad \overline{x} - mean \qquad f - frequency$

Formula:

$$\text{Variance}, S^2 = \frac{\sum (x - \overline{x})^2 f}{\sum f}$$

$x - midpoint \qquad \overline{x} - mean \qquad f - frequency$

Formula:

$$\text{Standard Deviation}, S = \sqrt{Variance}$$

$$\text{Mean Deviation}, E = \frac{\sum |x - \overline{x}| f}{\sum f} = \frac{141.20}{25} = \mathbf{5.65}$$

$$\text{Variance}, S^2 = \frac{\sum (x - \overline{x})^2 f}{\sum f} = \frac{1146}{25} = \mathbf{45.84}$$

$$\text{Standard Deviation}, S = \sqrt{Variance} = \sqrt{45.84} = \mathbf{6.77}$$

SUMMATIVE EXERCISE 2

Question 1

The data below shows the highest temperature being recorded in a Sandakan city in the month of July. Construct a frequency distribution table for data.

27	24	30	34	21	28	31	34	25	35
33	37	28	22	24	40	30	37	34	31
36	21	27	30	34	37	23	32	35	29

Question 2

The information below refers to the diameters of reel of wire is measured in 50 places. Construct a frequency distribution table for data using 6 classess. Draw a historam and frequency polygon.

22	10	90	25	23	25	41	12	20	41
89	13	66	32	47	33	52	65	65	47
88	13	71	90	37	81	53	55	64	50
19	90	72	44	57	73	53	45	30	11
17	87	70	40	67	80	11	34	15	14

Question 3

The age of signer of declaration of independence are shown below.

a. Construct a frequency table for the data
b. Construct a histogram and frequency polygon
c. Draw an ogive

41	54	47	40	39	35	50	37	49	42	70	32
44	52	39	50	40	30	34	69	39	45	33	42
44	63	60	27	42	34	50	42	52	38	36	45
35	43	48	46	31	27	55	63	46	33	60	62
35	46	45	34	53	50	50					

Question 4

Find the mean, median and mode for the following set of data

2, 7, 10, 9, 2, 5, 16

Question 5

Given the following set of data:

5, 7, 3, 12, 6, 7, 7, 2

Find the mean, median and mode

Question 6

The time taken (in minute) by 16 students to answer Mathematics question given by their lecturer as assignment in the class is given as follows. Find the mean, median and mode.

Time Taken	Frequency
6 – 8	3
9 – 11	2
12 – 14	6
15 – 17	4
18 – 20	1

Question 7

Based on the following data, constructing an ogive. Hence, determine the median.

Length (cm)	Frequency
5 – 7	3
8 – 10	6
11 – 13	8
14 – 16	7
17 – 19	3
20 – 22	1
23 – 25	2

Question 8

The length of 60 pencil water colour supply by an art teacher are shown in the table below. Construct a histogram for the above data and estimate the mode from the histogram.

Length (mm)	Frequency
80 – 99	12
100 – 119	10
120 – 139	16
140 – 159	14
160 – 179	8

Question 9

Find the mean deviation, variance and standard deviation of the following data.

8, 3, 4, 6, 1, 2, 3

Question 10

Calculate the mean deviation, variance and standard deviation.

Marks	Trainees
6 – 10	8
11 – 15	9
16 – 20	5
21 – 25	6
26 – 30	2

Faizah Omar, Lau Too Kya, Phang Yook Ngor and Zainudin Awang (2011). Oxford Fajar Polytechnics Series Statistics Second Edition. Shah Alam: Oxford Fajar Sdn. Bhd.

Lee Beng Hin, Lee Khaik Yong and Rohana Ismail (2011). Q & A Matriculation Mathematics Semester 2 Updated. Shah Alam: Oxford Fajar Sdn. Bhd.

MATHEMATICS FOR TECHNOLOGY

STATISTICS
Reference
First Edition

This book is written mainly for the students pursuing Diploma Agrotechnology and Diploma Aquaculture for Malaysian Polytechnics. It covers vital area of statistics ranging from data presentation, measure of central tendency and measure of dispersion.