

# Graphical Presentation

MD. MAHFUZUR RAHMAN  
LECTURER, STATISTICS

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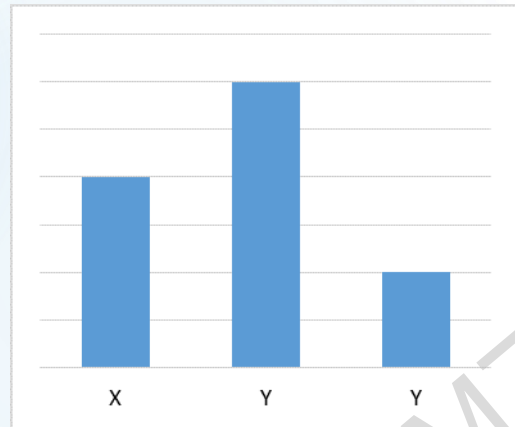
# Bar Chart

- ▶ A Bar Chart is drawn on an x-y graph and it has labelled horizontal or vertical bars that show different values.
- ▶ The size, length and color of the bars represent different values.
- ▶ Bar graph is very useful for non continuous data and it helps in comparing or contrasting the size of the different categories of the data provided.
- ▶ The widths of these bars have no significance but are taken to make the chart look attractive.

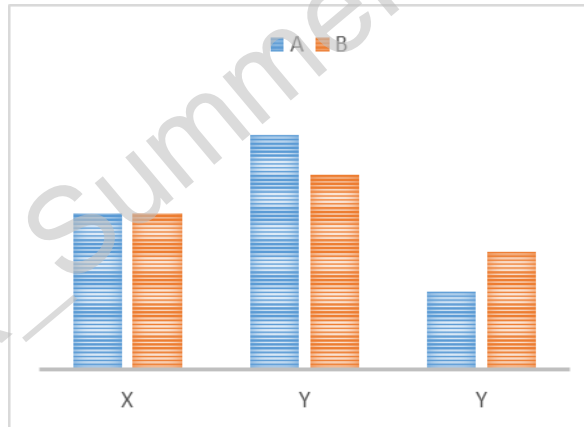
# Bar Chart

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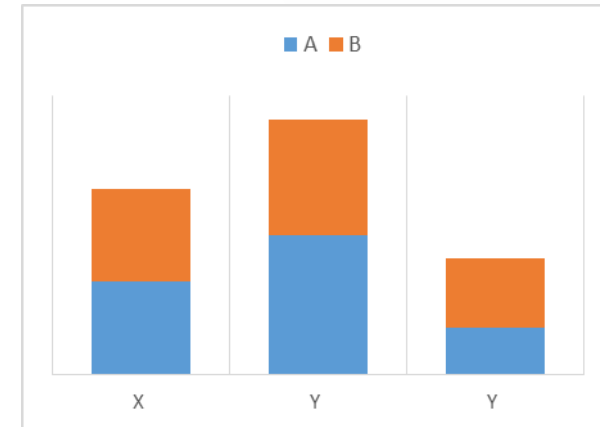
**Simple bar chart**



**Clustered/ Multiple Bar chart**



**Stacked/ Component bar chart**



# Pie Chart

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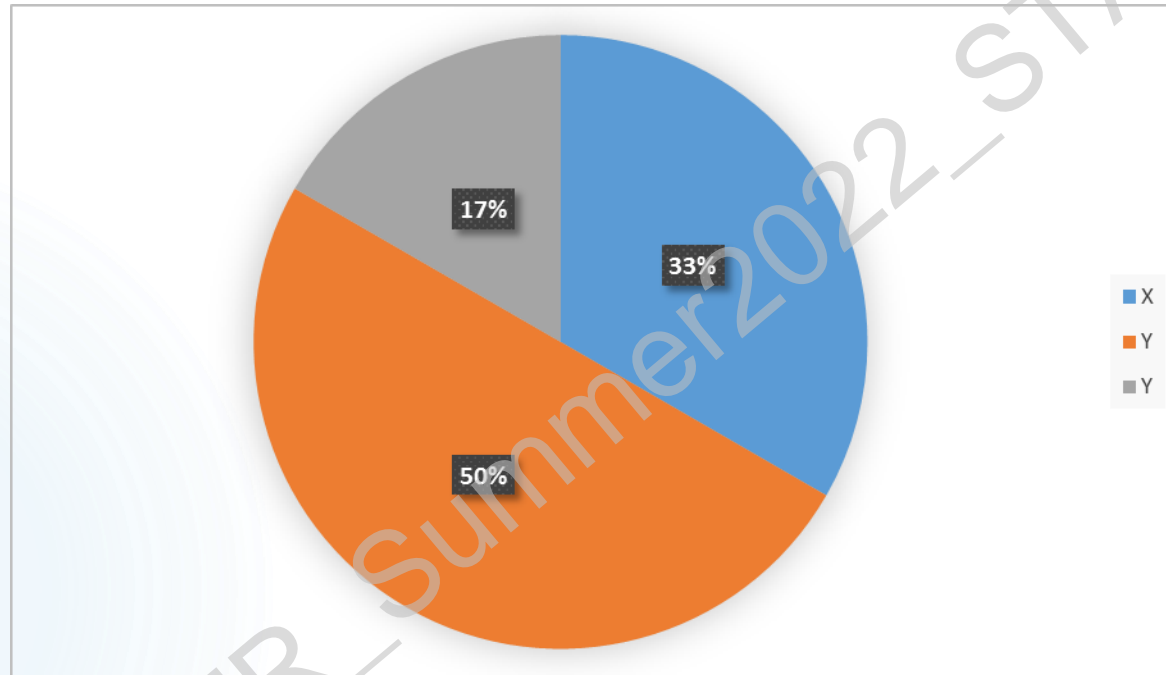
- ▶ Pie chart is also known as pie diagram, is an effective way of presenting percentage parts when the whole quantity is taken as 100. This is a useful device for presenting categorical data.
- ▶ It consists of a circle sub-divided into sectors, whose areas are proportional to the various parts into which the whole quantity is divided.

## **Limitations:**

- ▶ It is less effective than bar diagram for accurate reading and interpretation, particularly when series are divided into a large number of components or the differences among the components are very small. It is generally inadvisable to attempt to portray a series having more than five or six categories.

# Pie Chart

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# Chart (Diagram) Example

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## □ Example

The following is the frequency distribution table of highest education level of 145 randomly selected respondents-

Education level	No. of respondents (frequency)
No education	40
Primary	30
Secondary	25
Higher	50

Represent this in a bar and a pie chart

# Chart (Diagram) Example

## □ Example

The following is the frequency distribution table of highest education level of 145 randomly selected respondents-

Education level	No. of respondents (frequency)	Percentages	Angle (°)
No education	40	27.6	$= (40/145) * 360 = 99.3$
Primary	30	20.7	$= (30/145) * 360 = 74.5$
Secondary	25	17.2	$= (25/145) * 360 = 62.1$
Higher	50	34.5	$= (50/145) * 360 = 124.1$
<b>Total</b>	<b>145</b>	<b>100</b>	<b>360</b>

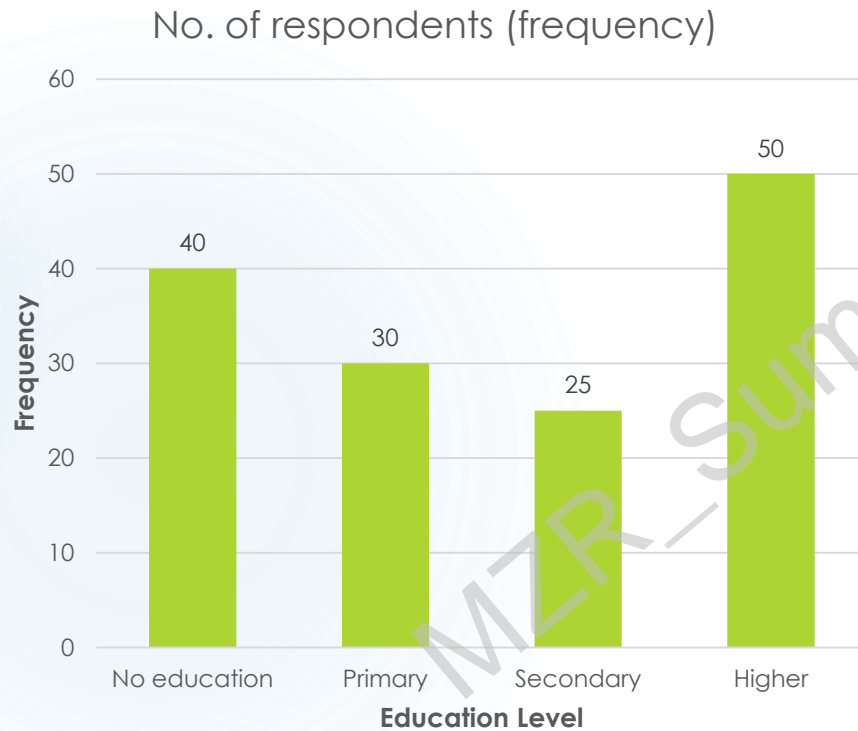
Represent this in a bar and a pie chart



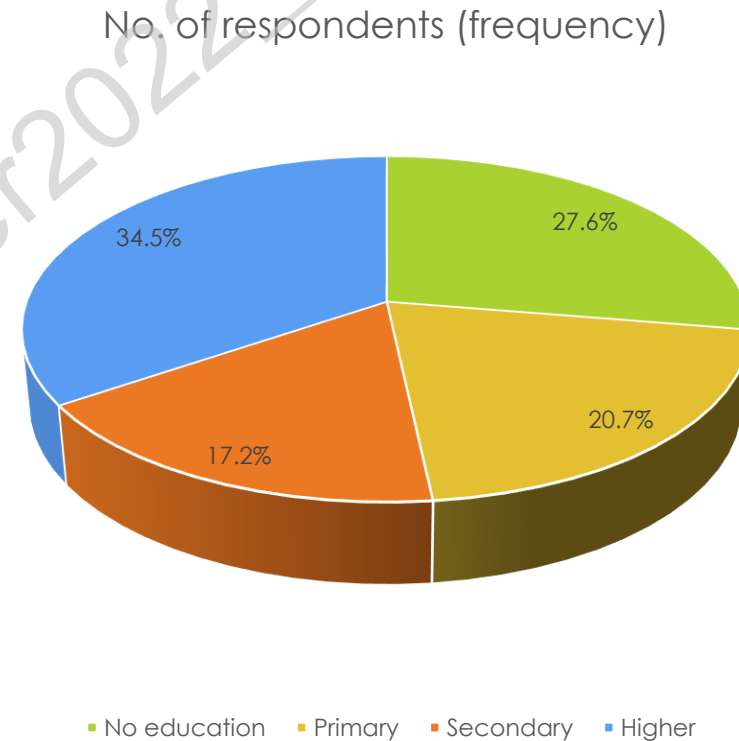
# Chart (Diagram) Example

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## Bar Chart



## Pie Chart



# Chart (Diagram) Example

## □ Example

The following is the Cross-tabulation of **Highest education level** by **Gender** of 145 randomly selected respondents-

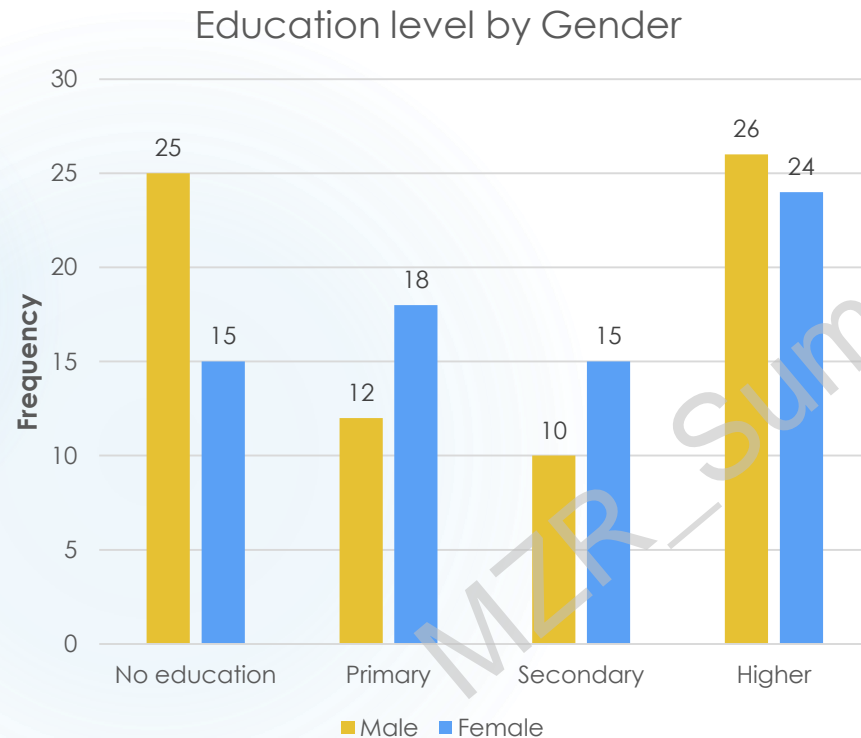
Education level	Gender		Total
	Male	Female	
No education	25	15	40
Primary	12	18	30
Secondary	10	15	25
Higher	26	24	50
<b>Total</b>	<b>73</b>	<b>72</b>	<b>145</b>

Represent this in a multiple bar chart and a component bar chart

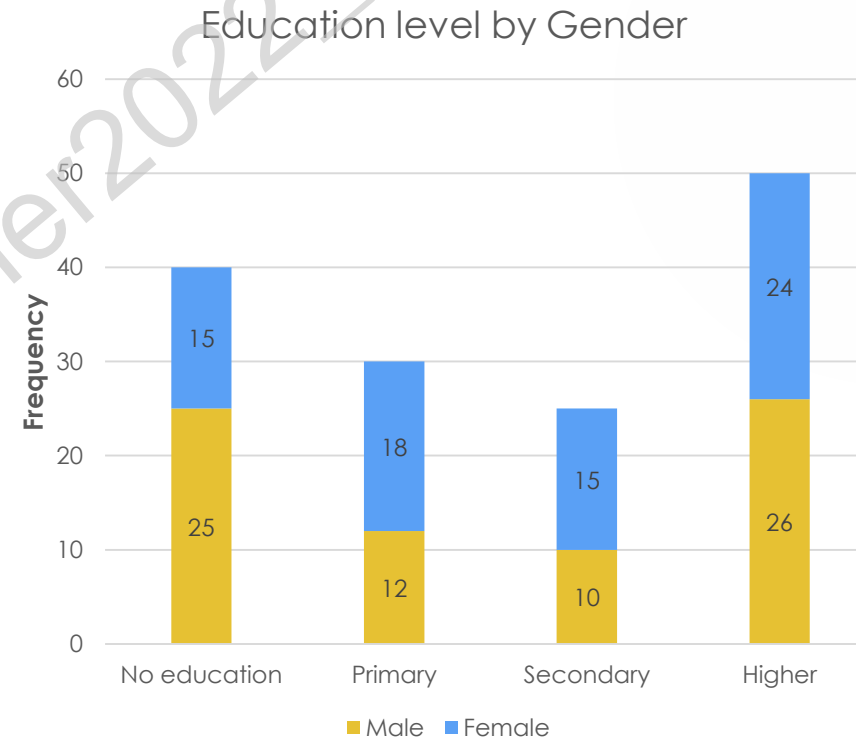
# Chart (Diagram) Example

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## Multiple Bar Chart



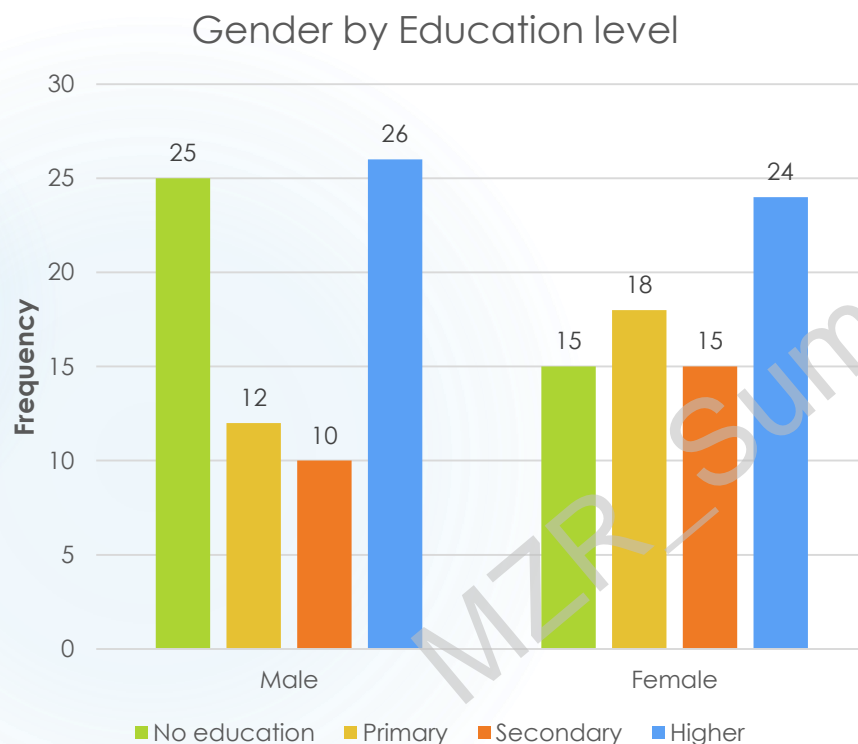
## Component Bar Chart



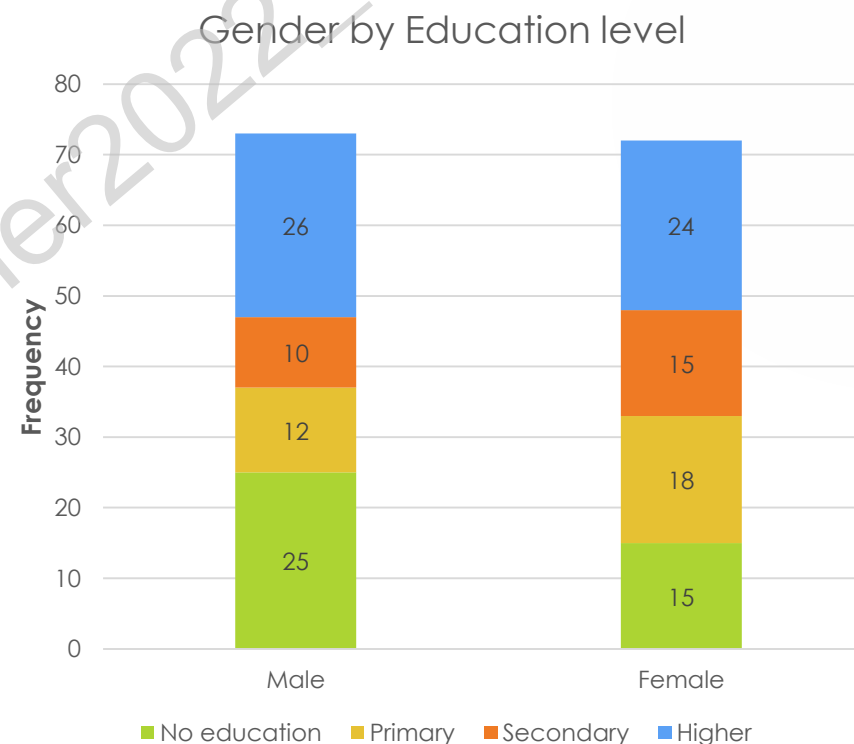
# Chart (Diagram) Example

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## Multiple Bar Chart



## Component Bar Chart



# Chart (Diagram) Example

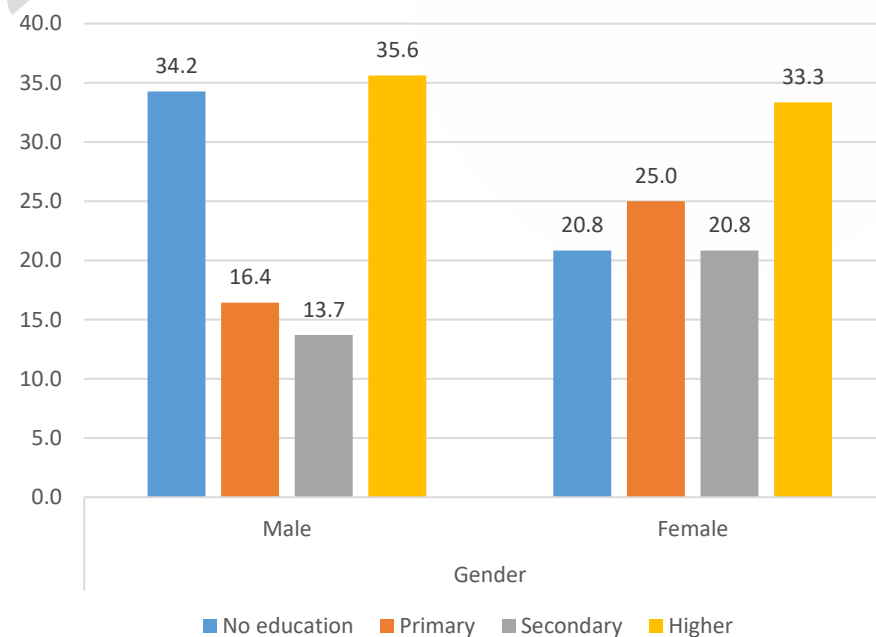
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Multiple bar chart taking percentages for each x-axis category-

Education level	Gender	
	Male	Female
No education	= $25/73*100\%$ = 34.2%	= $15/72*100\%$ = 20.8%
Primary	= $12/73*100\%$ = 16.4%	= $18/72*100\%$ = 25.0%
Secondary	= $10/73*100\%$ = 13.7%	= $15/72*100\%$ = 20.8%
Higher	= $26/73*100\%$ = 35.6%	= $24/72*100\%$ = 33.3%
Total	73	72

## Multiple Bar Chart

Percentage distribution for educational level  
(Percentages calculated for each x-axis category)



# Graphs (Plots)

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## □ Example

Below given a frequency distribution table of monthly family income of the respondent-

Monthly family income	No. of respondents
05-30	7
30-55	10
55-80	6
80-105	4
105-130	3

Show this in a histogram, a frequency polygon and an Ogive

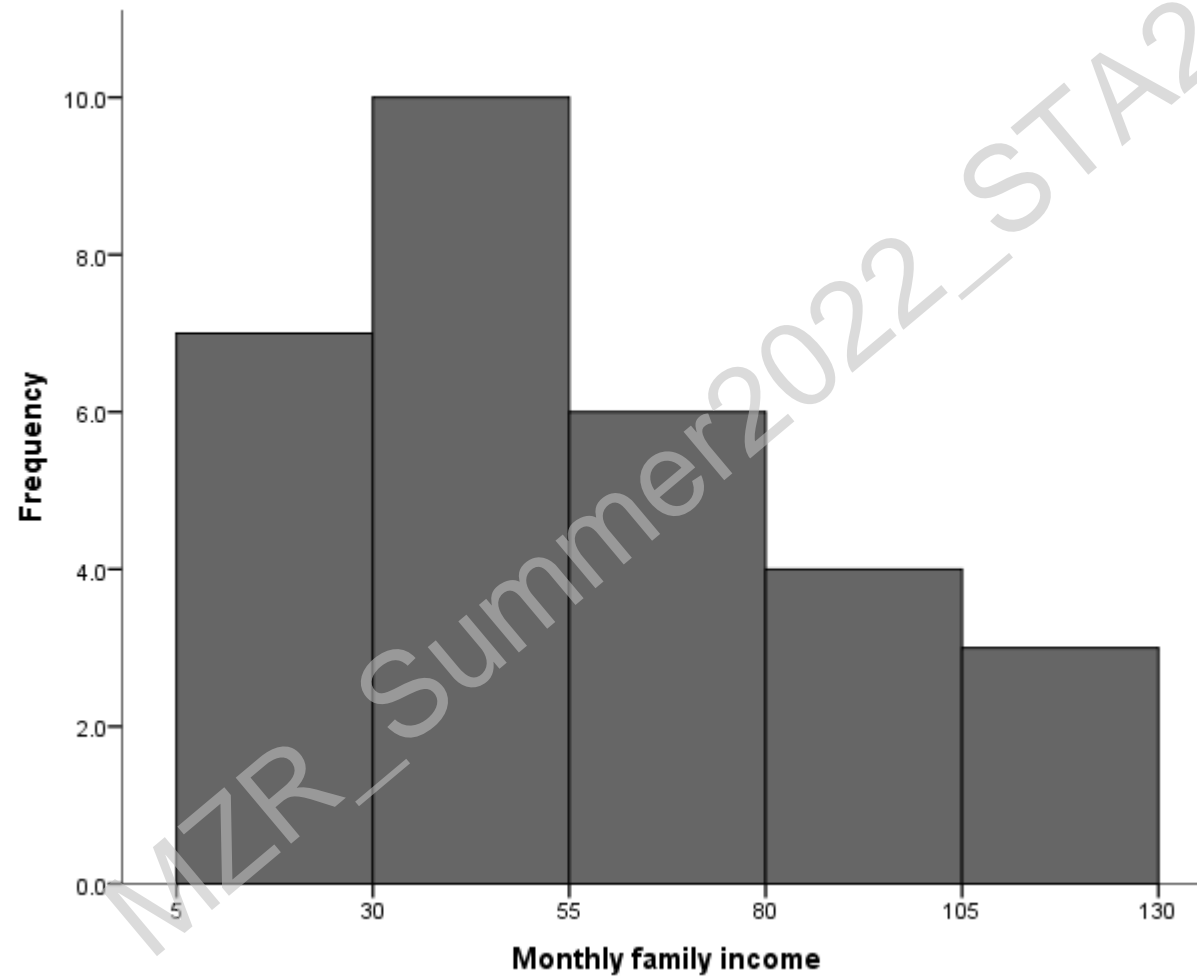
# Histogram

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- ▶ Histogram is the most accurate graph that represents a frequency distribution. In the histogram the scores are spread uniformly over the entire class interval. The class intervals are plotted on the x-axis and the frequencies on the y-axis. Each interval is represented by a separate rectangle.
- ▶ The area of each rectangle is proportional to the number of measures within the class- interval. The entire histogram is proportional to the statistical data set.

# Histogram

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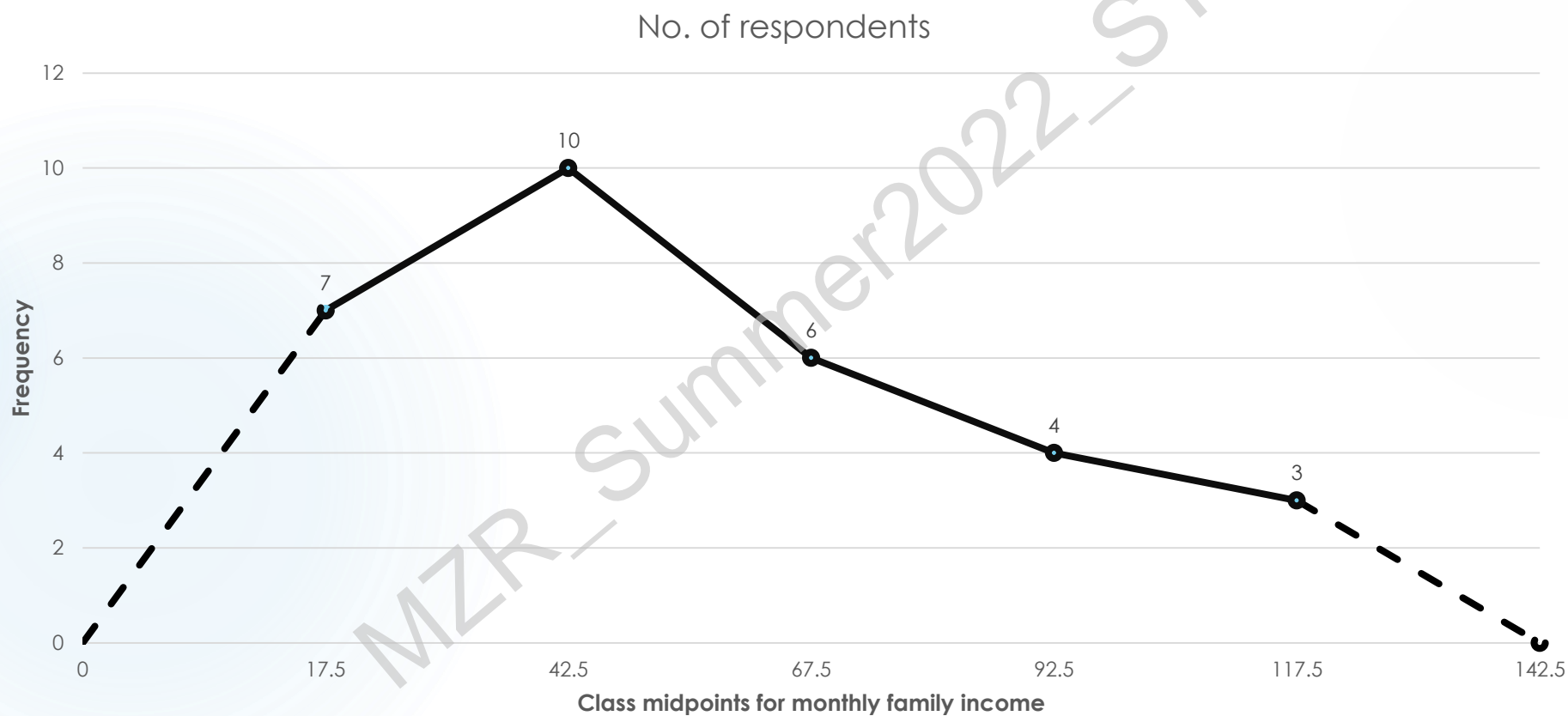
# Frequency Polygon

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Monthly family income	Class Midpoints	No. of respondents
05-30	17.5	7
30-55	42.5	10
55-80	67.5	6
80-105	92.5	4
105-130	117.5	3

# Frequency Polygon

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# Cumulative Frequency Curve (Ogive)

Monthly family income	No. of respondents	Cumulative Frequency	
		Less than type	Greater than type
05-30	7	7	30
30-55	10	17	23
55-80	6	23	13
80-105	4	27	7
105-130	3	30	3

# Cumulative Frequency Curve (Ogive)

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## Less Than Type Ogive

Less than type Ogive for monthly family income



## Greater Than type Ogive

Greater than type Ogive for monthly family income



# How does a histogram differ from a bar diagram?

- ▶ A histogram is basically a set of adjacent rectangles whose areas represent the frequencies, while in a bar diagram the spacing of bars are quite arbitrary and the heights of the rectangles represent the frequencies.
- ▶ A bar diagram is an one-dimensional figure while a histogram is a two dimensional figure.
- ▶ Histogram is constructed for numerical data of continuous frequency distribution while the bar diagram is usually constructed for categorical data.

# The Stem and Leaf Display

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Stem and leaf plot is a graphical technique of representing quantitative data that can be used to examine the shape of a frequency distribution. **Here "stem" represent the tens (leading digits) and the "leaf" represent the units (trailing digits).** Compared to other techniques it is an easy and quick way of displaying data.

Tukey (1977) first proposed the technique. It allows us to use the information contained in a frequency distribution to show

- ❑ The range of score
- ❑ Concentration of scores
- ❑ The shape of the distribution
- ❑ Presence of any specific values or scores not represented in the entire data set
- ❑ Whether there are any stray or extreme values in the distribution.

# The Stem and Leaf Display

- The following data represented the marks obtained by 20 students in a statistics test.

84	17	78	45	47	53	76	54	75	22
66	65	55	54	51	33	39	19	54	72

Use the stem leaf plot to display the data.

Solution: Here the highest score is 84 and lowest score is 17. The stem and leaf diagram is given below-

Stem	Leaf
1	7 9
2	2
3	3 9
4	5 7
5	3 4 5 4 1 4
6	6 5
7	8 6 5 2
8	4

Stem	Leaf
1	7,9
2	2
3	3, 9
4	5,7
5	1,3,4,4,4,5
6	5,6
7	2,5,6,8
8	4

# The Stem and Leaf Display

Example:

The following data represent the amount of insurance (in units of thousand taka) purchased by 30 people from an insurance company in a given week:

31	44	51	35	76	84	110	50	56	61
40	48	61	85	90	92	40	65	120	125
100	105	115	70	77	120	75	80	92	115

Construct a stem and leaf plot to display the data.

Let us consider the following data:

17.0	17.7	15.9	15.2	16.2	17.1	15.7	17.3	13.5	16.3
14.6	15.8	15.3	16.4	13.7	16.2	16.4	16.1	17.0	15.9

Construct a stem and leaf plot to display the data.



# Cross Tabulations

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The study of patterns that may exist between two or more categorical variables is common in practice. Often by cross-tabulating the data, these patterns can be explained. One can present cross tabulations in tabular form (contingency tables) or graphical form (side by side charts).

## The Contingency table

A contingency table presents the results of two categorical variables. The joint responses are classified so that the categories of one variable are located in the rows and the categories of the other variable are located in the columns. The values located at the intersections of the rows and columns are called **cells**. Depending on the type of contingency table constructed, the cells for each row-column combination contain the frequency, the percentage of the overall total, the percentage of the row total, or the percentage of the column total.

Table: Frequency distribution of students by religion and sex			
Religion	Sex		Total
	Male	Female	
Muslim	25	20	45
Hindu	12	12	24
Christian	8	6	14
Buddha	5	3	8
Others	2	2	4
Total	52	43	95

Figure: Frequency distribution of religion by sex

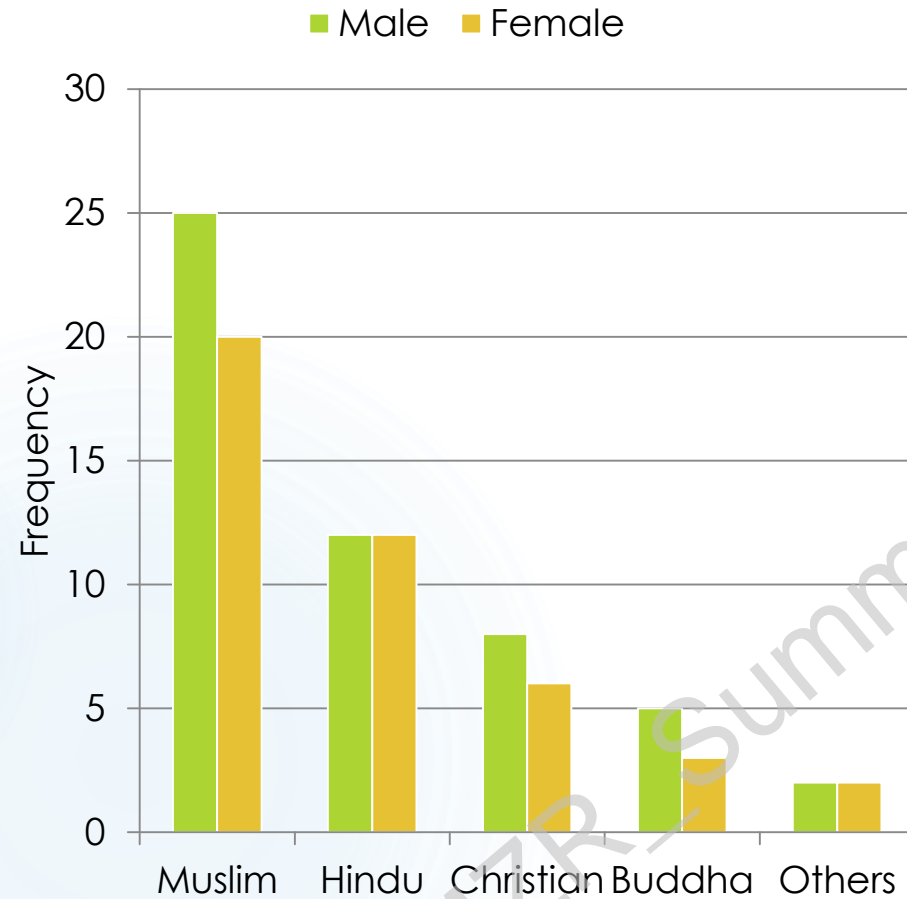
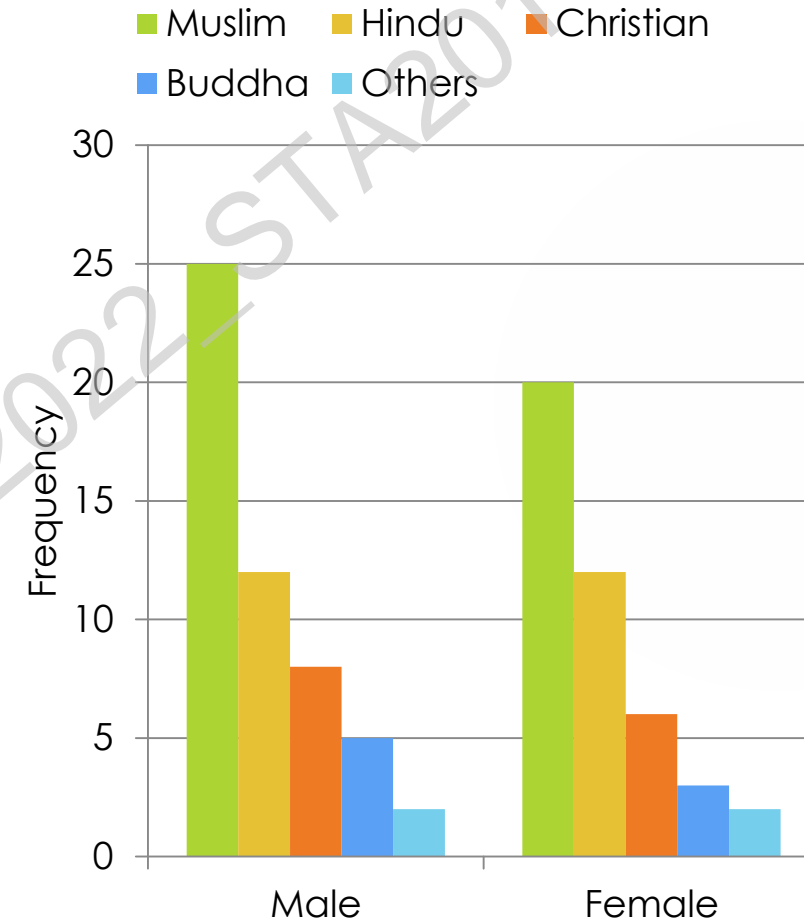


Figure: Frequency Distribution of Sex by religion



# Scatter Diagram

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- It is used to display two quantitative variables which are believed to be inter-related.
- For example height and weight, age and height, income and expenditure.

Height and weight of 10 students at their 20th birthday	
Height (in cm)	Weight (in kg)
176	80
172	78
155	60
160	64
145	48
158	55
180	88
166	68
175	72
140	45

**SCATTER DIAGRAM OF HEIGHT AND WEIGHT OF 10 STUDENTS AT THEIR 20TH BIRTHDAY**

