



Pure Math
FPMP0003
Semester 1 AY 2021-22
GROUP – 4
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Chapter 5: Statistics

Learning outcomes covered:

Understand basic concepts of descriptive statistics, mean, median, mode and summarize data into tables and simple graphs (bar charts, histogram, and pie chart).

Learning Objectives

- understand the basic concepts of descriptive statistics.
- compute the basic measures of central tendency.
- summarize a given data in to tables and graphs.

5.2 Summarizing Data into Tables and Graphs

In statistics we use various tables and diagrams to represent data which will facilitate easy interpretation and analysis of data.

Frequency Distributions

Categorical Frequency Distribution

This distribution is used when the data can be categorized into different groups or categories. Here the data may be numeric or non-numeric.

Classification	Frequency
Bank	5
Utilities	4
Properties	8
IT	5
Commerce	12
Industries	6
Total	40

Grouped Frequency Distribution

This distribution is used to represent numerical data in classes and intervals. See the following example:

Share Price	Number of Share holders
1 – 20	1000
21 – 40	850
41 – 60	450
61 – 80	300
81 – 100	250
101 – 120	150
Total	3000

Constructing a grouped frequency distribution

Step 1. Form the classes/class intervals. Pick out the highest and the lowest values and find the range of the data. Determine the class intervals. Number of intervals should be between 5 and 12 and they usually have equal widths. Ensure that each item of the data will be included in a unique class.

Step 2. Tally the values in the data set into the classes formed.

Step 3. Find the frequency of each class by totaling the tallies.

Example 1:

Seventeen students were asked how many hours they studied per day. Their responses, in hours, are as follows:

5, 6, 3, 3, 4, 7, 5, 3, 5, 6, 5, 4, 4, 3, 5, 5, 3

Construct the frequency distribution table.

Table value	Tally Marks	Frequency
3		5
4		3
5		6
6		2
7		1

$$\text{Relative frequency} = \frac{f}{n} \times 100$$

$$\text{Relative frequency} = \frac{f}{n}$$

where f is a frequency, n is total number of frequency

Note: We can express relative error in 100% or decimal to 1

Cumulative relative frequency is the accumulation of the previous relative frequencies. To find the cumulative relative frequencies, add all the previous relative frequencies to the relative frequency for the current row.

Example:2

Twenty students were asked how many hours they worked per day. Their responses, in hours, are as follows.

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

Construct frequency distribution.

[illegible]

Grouped data: The table Represents the heights, in inches, of a sample of 100 males semiprofessional soccer players. Find relative frequency and cumulative relative frequency for the frequency distribution

Heights (Inches)	59.95 – 61.95	61.95 – 63.95	63.95 – 65.95	65.95 – 67.95
Frequency	5	3	15	40

Heights (Inches)	67.95 – 69.95	69.95 – 71.95	71.95 – 73.95	73.95 – 75.95
Frequency	17	12	7	1

[illegible]

5.2.1 Representing Data Using Graphs and Charts

- **Bar Charts**

Bar charts (Bar Graphs/ Bar Diagrams) are used to represent categorical data. Bar graphs consist of bars that are separated from each other. The bars can be rectangles or they can be rectangular boxes (used in three-dimensional plots), and they can be vertical or horizontal.

- **Pie Charts**

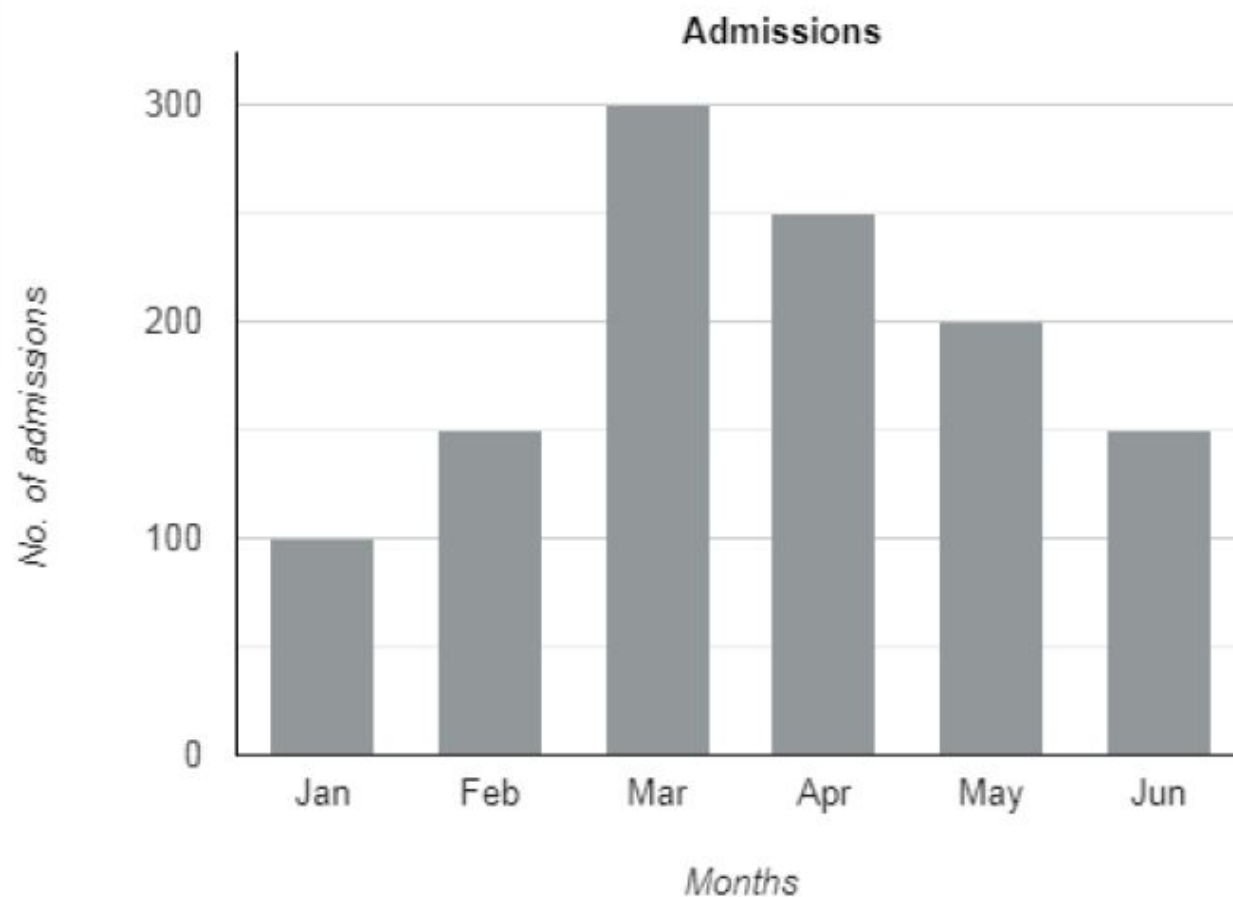
Pie charts are also used to represent the categorical data. This representation gives emphasis to the relative weightage of each category. In a pie chart, a circle is drawn and it is divided into sectors. Number of sectors will be the number of categories. The area of each sector is proportional to the frequency of the categorical variable it represents.

- **Histogram**

A histogram consists of contiguous (adjoining) boxes. It has both a horizontal axis and a vertical axis. The horizontal axis is labeled with what the data represents (for instance, distance from your home to school). The vertical axis is labeled either frequency or relative frequency (or percent frequency or probability). The graph will have the same shape with either label. The histogram (like the stem plot) can give you the shape of the data, the center, and the spread of the data.

The following table shows the number of admissions at a training institute for the months January to June. Construct a bar chart for the data.

Month	Jan	Feb	Mar	Apr	May	Jun
No. of admissions	100	150	300	250	200	150



In a college there are 400 students in the Foundation Program, 450 in the First Year Diploma, 350 in the Second Year Diploma and 250 in the Higher Diploma. Construct a pie chart for the data.

Total number of students = $400 + 450 + 350 + 250 = 1450$

Angle corresponding to Foundation Program = $\frac{400}{1450} \times 360^\circ = 99.31^\circ$

Percentage = $\frac{400}{1450} \times 100 = 27.6\%$

Angle corresponding to First Year Diploma = $\frac{450}{1450} \times 360^\circ = 111.72^\circ$

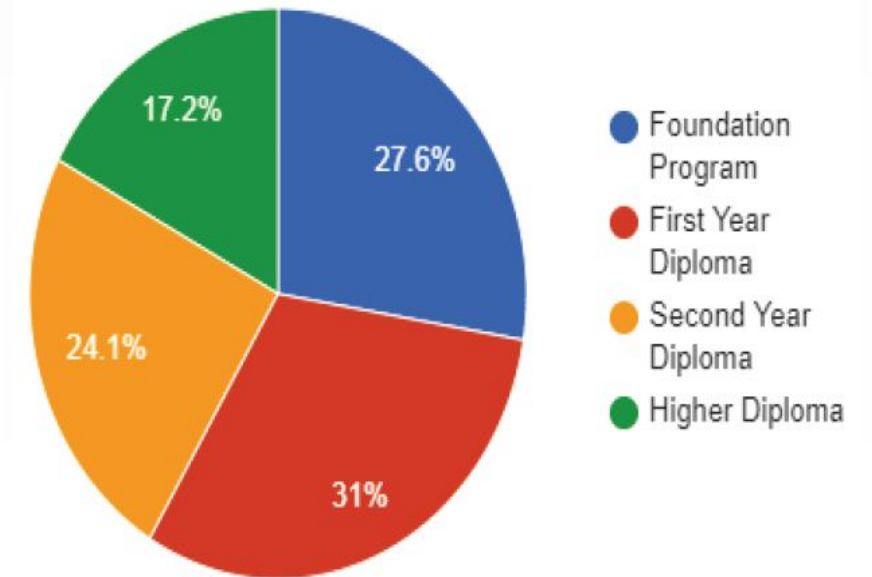
Percentage = $\frac{450}{1450} \times 100 = 31\%$

Angle corresponding to Second Year Diploma = $\frac{350}{1450} \times 360^\circ = 86.90^\circ$

Percentage = $\frac{350}{1450} \times 100 = 24.1\%$

Angle corresponding to Higher Diploma = $\frac{250}{1450} \times 360^\circ = 62.07^\circ$

Percentage = $\frac{250}{1450} \times 100 = 17.2\%$



The following distribution shows the marks of 15 students of a class in the midterm examination. Construct a histogram for the data.

Marks	0-4	4-8	8-12	12-16	16-20
No. of students	1	3	5	4	2

