Al-Mustaqbal University
Department Biomedical engineering
Class five
Subject: statistics for biomedical engineer
(Lecturer (Dr.alaa mohammed Hussein wais)
1st term – Lect. (mean)

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5.1 Graphs

Graphs: Graphs are a common method to visually illustrate relationships in the data.

The purpose of the graph: is to show numerical facts in visual form so that they can be understood quickly, easily and clearly.

Advantages:

1- Thus graphs are visual representations of data collected.

2-Data can also be presented in the form of a table; but a graphical presentation is easier to understand.

3- The design and presentation of the graph help the reader or audience interpret the data.

4- There are many different graph types to choose from to ensure that the graph type selected is the most appropriate for the data.

<u>Bar graph</u>: Bar charts are one of the most commonly used types of graph and are used to display and compare the number, frequency or other measure (e.g. mean) for different categories or groups.

1- The x-axis (the horizontal axis) represents the different categories it has no scale.

2- The y-axis (the vertical axis) does have a scale and this indicates the units of measurement.

Data is displayed either horizontally or vertically and allows viewers to compare items, such as amounts, characteristics, times, and frequency.

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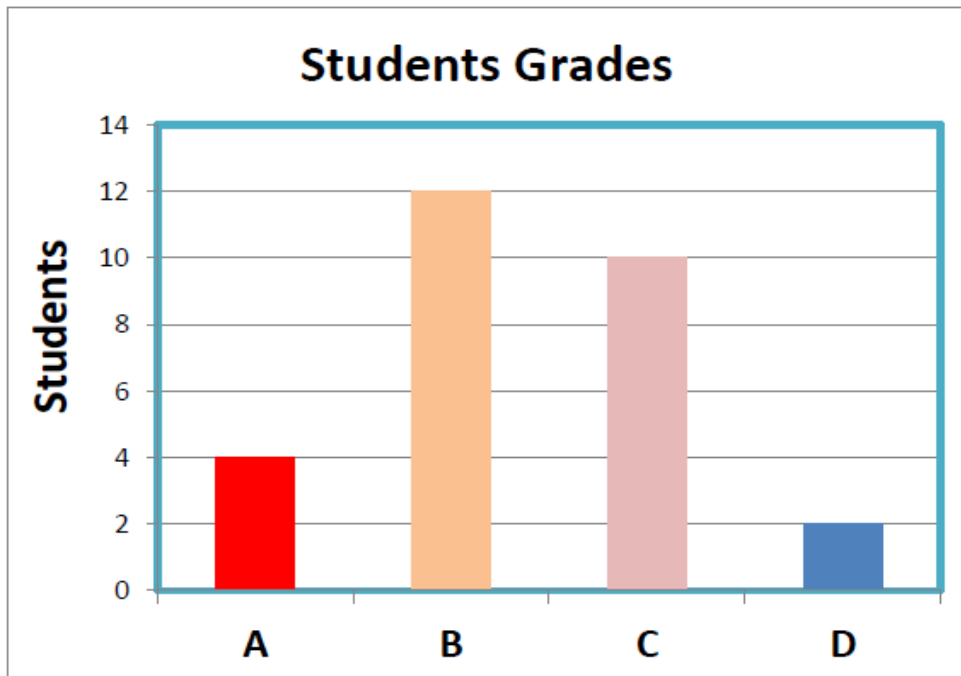1st term – Lect. (mean)

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The length of the bar is proportional to the number of observations for that value or category. The bars are separated by a space. The best use of a bar chart is to compare size or frequency of different values or categories of a variable.

Ex: In a recent test, this many students got these grades:
Grade: **A   B   C   D**
Students: 4   12 10 2
And here is the bar graph:

A grouped bar chart: is a special type of bar chart used to illustrate data from the cross-tabulation of two variables which results in multiple subcategories. The subcategories of the variables are individually represented by bars on the same chart

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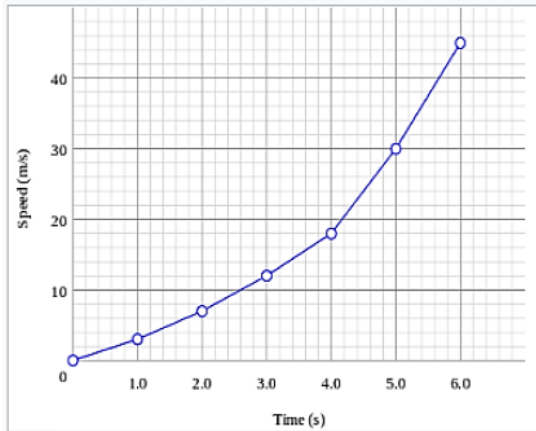1st term – Lect. (mean)

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and are clustered together into meaningful groups. The best use of a grouped bar chart is to compare size or frequency of subcategories within multiple categories.
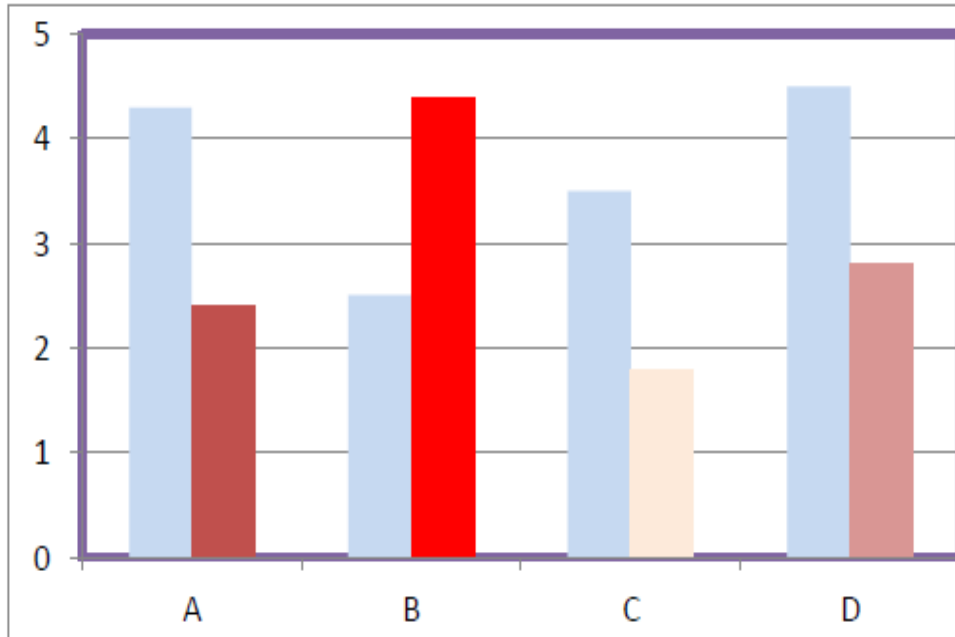
Line graph: Line graphs can be used to show how information or data change over time. They have an x-axis (horizontal) and y-axis (vertical). Usually the x-axis shows the time period and the y-axis shows what is being measured.

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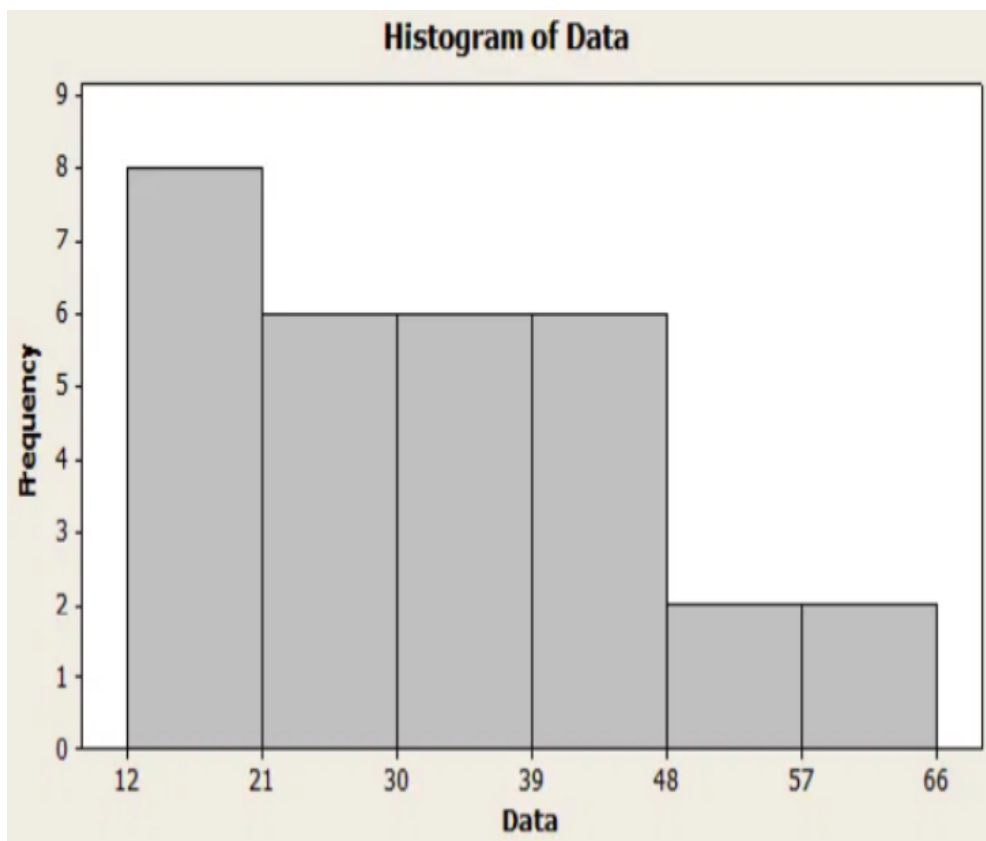| Elapsed Time (s)	Speed (m s^{-1})
0	0
1	3
2	7
3	12
4	20
5	30
6	45.6

Histogram: also called a **frequency distributions graph**, is a specialized type of bar graph that resembles a column graph, but without any gaps between the columns. It is used to represent data from the measurement of a continuous variable. Individual data points are grouped together in classes to show the frequency of data in each class. The frequency is measured by the area of the column. These can be used to show how a measured category is distributed along a measured variable

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Example

CLASSES	FREQUENCY
12 − 21	8
21 − 30	6
30 − 39	6
39 − 48	6
48 − 57	2
57 − 66	2

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➢ **The Pie Graph**

Pie graphs are used extensively in statistics. The purpose of the pie graph is to show the relationship of the parts to the whole by visually comparing the sizes of the sections. Percentages or proportions can be used. The variable is nominal or categorical.
A **pie graph** is a circle that is divided into sections or wedges according to the percentage of frequencies in each category of the distribution.

This frequency distribution shows the number of pounds of each snack food eaten during the Super Bowl. Construct a pie graph for the data.

Snack	Pounds (frequency)
Potato chips	11.2 million
Tortilla chips	8.2 million
Pretzels	4.3 million
Popcorn	3.8 million
Snack nuts	2.5 million
Total $n = 30.0$ million	

Solution
Step 1 Since there are 360_ in a circle, the frequency for each class must be converted into a proportional part of the circle. This conversion is done by using the formula $\quad \text{Degrees} = \dfrac{f}{n} \bullet 360°$

where f _ frequency for each class and n _ sum of the frequencies. Hence, the following conversions are obtained. The degrees should sum to 360_.*

Potato chips $\quad \dfrac{11.2}{30} \cdot 360° = 134°$

Tortilla chips $\quad \dfrac{8.2}{30} \cdot 360° = 98°$

Pretzels $\quad \dfrac{4.3}{30} \cdot 360° = 52°$

Popcorn $\quad \dfrac{3.8}{30} \cdot 360° = 46°$

Snack nuts $\quad \dfrac{2.5}{30} \cdot 360° = 30°$

Total $\quad\quad\quad\quad\quad\quad\quad 360°$

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Step 2 Each frequency must also be converted to a percentage. Recall from Example 2–1 that this conversion is done by using the formula

$$\% = \frac{f}{n} \cdot 100$$

Hence, the following percentages are obtained. The percentages should sum to 100%.[†]

Potato chips $\dfrac{11.2}{30} \cdot 100 = 37.3\%$

Tortilla chips $\dfrac{8.2}{30} \cdot 100 = 27.3\%$

Pretzels $\dfrac{4.3}{30} \cdot 100 = 14.3\%$

Popcorn $\dfrac{3.8}{30} \cdot 100 = 12.7\%$

Snack nuts $\dfrac{2.5}{30} \cdot 100 = 8.3\%$

Total 99.9%

Step 3 Next, using a protractor and a compass, draw the graph using the appropriate degree measures found in step 1, and label each section with the name and percentages, as shown in Figure 2–14.

Super Bowl Snacks

Popcorn 12.7%

Snack nuts 8.3%

Pretzels 14.3%

Potato chips 37.3%

Tortilla chips 27.3%