

Chapter 2 Descriptive Statistics

Last class:

Descriptive statistics are **tabular, graphical** or **numerical** summaries of data.

Data can be classified as **qualitative** data and **quantitative** data.

Summarizing qualitative data

Frequency distribution
Relative frequency distribution
Percent frequency distribution
Bar graph
Pie chart

A **frequency distribution** is a **tabular** summary of data showing the frequency (or number) of items in each of several **nonoverlapping** classes.

- The sum of frequencies for all classes will always equal the number of elements in a data set.

Ex 1. 12 customers eating at a restaurant were asked to rate the quality of their food on a scale of 5 categories: excellent, good, average, slightly below average, bad
Their ratings are as follows

excellent	below average	average	below average
good	average	good	good
average	good	excellent	bad

→ Frequency distribution

Rating	Frequency	Relative Frequency	Percent Frequency
excellent	2	1/6	16.7
good	4	1/3	33.3
average	3	1/4	25
below average	2	1/6	16.7
bad	1	1/12	8.3
Total	12	1	100

A **relative frequency distribution** is a tabular summary of a set of data showing the relative frequency of each class.

The **relative frequency** of a class is the **proportion or fraction** of the total number of items belonging to the class.

It's computed by dividing the frequency of a class by the total number of items:

$$\text{Relative frequency} = \frac{\text{frequency}}{\text{sample size}} = \frac{\text{number of items in a class}}{\text{total number of items}}$$

A **percent frequency distribution** is a tabular summary of a set of data showing the percent frequency for each class.

The **percent frequency** of a class is the **percentage of** the items belonging to the class.

The percent frequency of a class is computed by multiplying the relative frequency by 100:

$$\text{Percent frequency} = \text{relative frequency} \times 100$$

- frequencies sum to the total number of items.
- relative frequencies always sum to 1
- percent frequencies always sum to 100

In our example:

Suppose we care only about whether the food quality is below average or not.

Rating	Frequency	Relative Frequency	Percent Frequency
average or above	9	9/12	75
below average	3	3/12	25
Total	12	1	100

Ex 2: Twenty viewers were asked if they liked or disliked the new TV show. Below are their responses. Let L represent liked and D represent disliked.

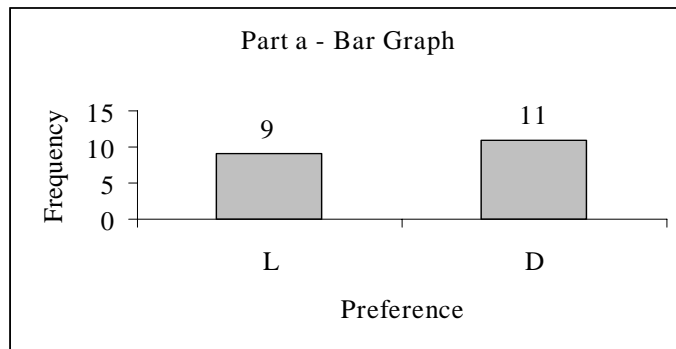
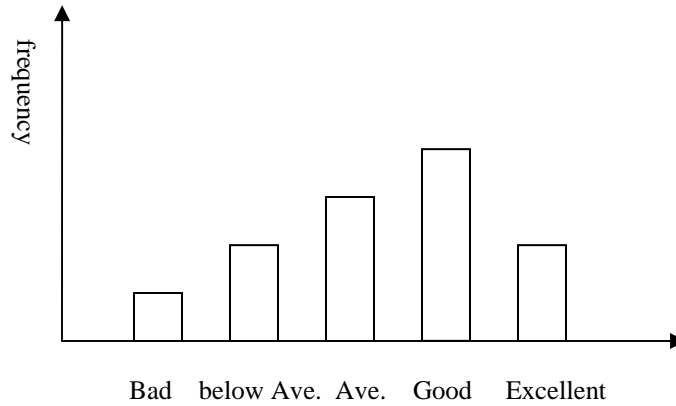
D	L	D	L	D
L	D	L	L	D
L	L	D	D	L
D	D	D	D	L

Frequency distribution and relative frequency distribution

Preferences	Frequency	Relative Frequency	Percent Frequency
L	9	0.45	45
D	<u>11</u>	<u>0.55</u>	<u>55</u>
Total	20	1.00	100

Bar graph: Bar graph is a graphical summary of data. It can be used to present frequency, relative frequency, percent frequency distribution.

- On one axis (usually the horizontal axis), we specify the labels for each of the classes.
- A frequency, relative frequency, or percent frequency scale can be used for the other axis (usually the vertical axis).
- Draw a bar of fixed width above each class label, and extend the height appropriately.
- The bars are separated to emphasize the fact that each class is a separate category.



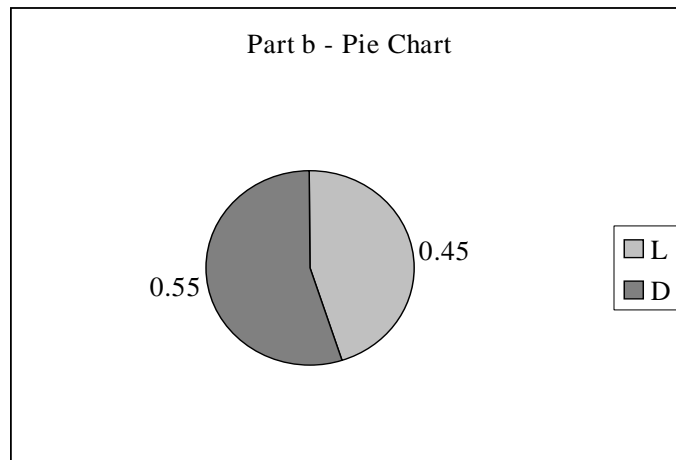
Pie chart: Pie chart is another graphical summary of data. It can be used to present relative and percent frequency distribution.

First draw a circle, subdivide the circle into sectors that correspond to the relative frequency for each class

Since there are 360 degrees in a circle, a class with a relative frequency of a would consume $a(360)$ degrees of the circle

Rating	Relative Frequency	Number of degrees in a pie chart
excellent	1/6	60
good	1/3	120
average	1/4	90
below average	1/6	60
bad	1/12	30
Total	1	360

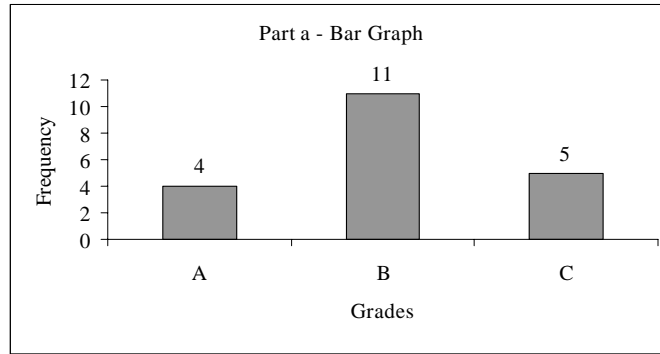
Preferences	Relative Frequency	Number of degrees in a pie chart
L	0.45	162
D	<u>0.55</u>	<u>198</u>
Total	1.00	360



Ex 3 A student has completed 20 courses in the School of Arts and Sciences. Her grades in the 20 courses are shown below.

A B A B C
 C C B B B
 B A B B B
 C B C B A

Grade	Frequency	Relative Frequency	Percent Frequency
A	4	0.20	20
B	11	0.55	55
C	<u>5</u>	<u>0.25</u>	<u>25</u>
Total	20	1.00	100



Grade	Relative Frequency	Number of degrees in a pie chart
A	0.20	72
B	0.55	198
C	<u>0.25</u>	<u>90</u>
Total	1.00	360