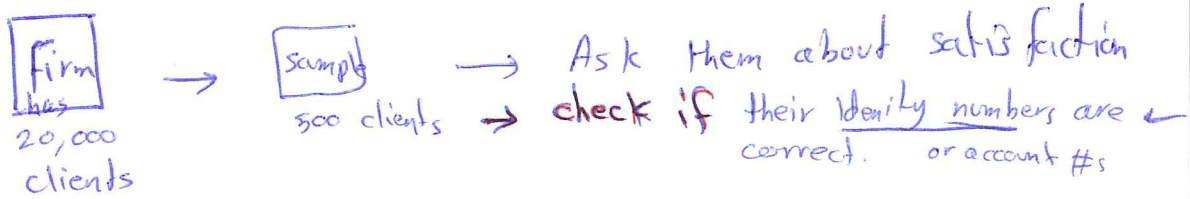


Chapter 1

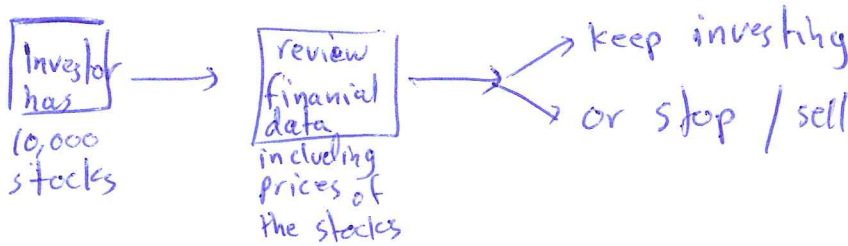
1.1 Applications in Business and Economics

Statistics is the art and science of collecting, analyzing, presenting and interpreting data.

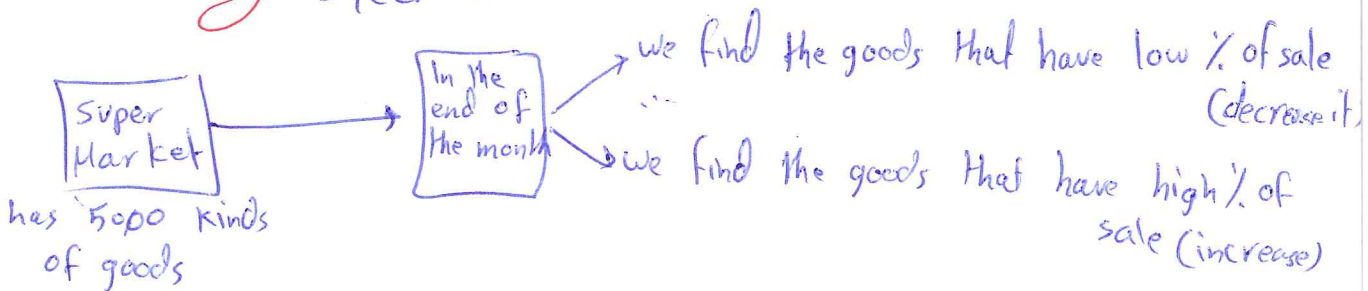
Accounting: Accounting firm use statistical sampling procedures when conducting audits for their clients.
 (الإجراء = التفتيش)



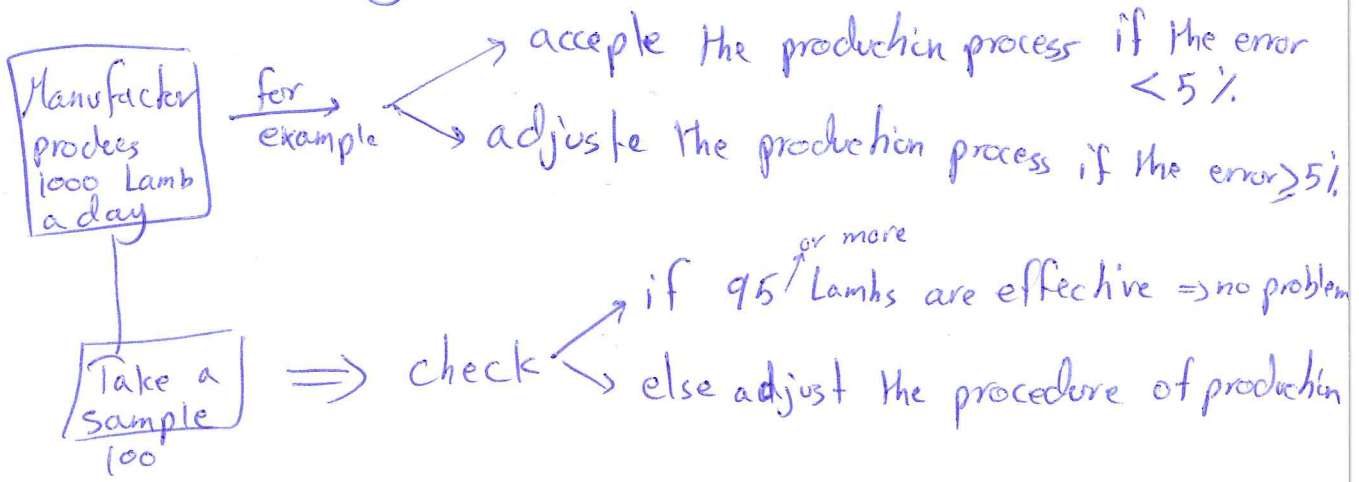
Finance: Financial analysts use statistical information to guide their investment recommendation.



Marketing: Electronic scanners at checkout counters.



Production Quality Control of the production (2)



Economics: Economics provide forecasts about the future of the economy or some aspect of it.

$$Y = a_0 + a_1 X_1 + a_2 X_2 + a_3 X_3 + \epsilon$$

Y → inflation rates
 X_1 → Producer Price Index
 X_2 → unemployment rate
 X_3 → manufacturing capacity utilization
 ϵ → error

فقيس معدل التضخم في ايام
 للتتبعين المجلسين للوقت
 استخدام القدرات التشغيلية

X_1, X_2, X_3 are indicators for the inflation rate Y

Thus, we use statistical information about the indicators X_1, X_2, X_3 to forecast the inflation rates.

Definitions:

1.2] Data: are the facts and figures collected, analyzed and summarized for presentation and interpretation.

Data set: all the data collected in a particular study

Elements: the entities on which data are collected.

Variable: is a characteristic of interest for the elements.

Observation: is the set of measurements for a particular element.

Example.

st. number	Sex	Final score	year
1	F	70	2010
2	F	85	2011
3	M	90	2010
4	F	80	2010
5	M	88	2011
⋮	⋮	⋮	⋮
100	M	75	2011

③

→ observation

↓ variables

→ elements

→ measurement

→ data set

Sample of 100 students final score in stat 231.

Scales of Measurements:

① **Nominal scale:** The scale of measurement for a variable when the data are labels or names used to identify an attribute of an element.

Example: student Gender, Faculty name

② **Ordinal scale:** The scale of measurement for a variable if the data exhibit the properties of the nominal data and the order or rank is meaningful. Ordinal data may be numeric or nonnumeric.

Example: ① level of satisfaction by using internet
Excellent, Very good, good, bad

② Participants in Marathon
1st, 2nd, 3rd, 4th, ..., 10th

③ The 1st 5 top students in Stat 231.

(4)

3 Interval scale: The scale of measurement for a variable if the data demonstrate the properties of ordinal data and the interval between values is expressed in terms of a fixed unit of measure.

Interval scale are always numeric

Example ① Test score example: three students

② Temperature

Day	1	2	3
T	5	0	-5

s.t	Score
1	80
2	60
3	55

} 20 point
} 5 point

4 Ratio Scale: The scale of measurement of a variable if the data demonstrate all the properties of interval data and the ratio of two values is meaningful. Ratio data are always numeric.

Example ① Distance, height, weight, time

Note that in the ratio scale, zero value indicates that nothing exists for the variable at that point.

② Two cars : Car 1 costs 20,000 \$
Car 2 costs 60,000 \$

The ratio $\frac{60,000}{20,000} = 3$ shows that car 2 is three times costs more than car 1.

Qualitative and Quantitative data

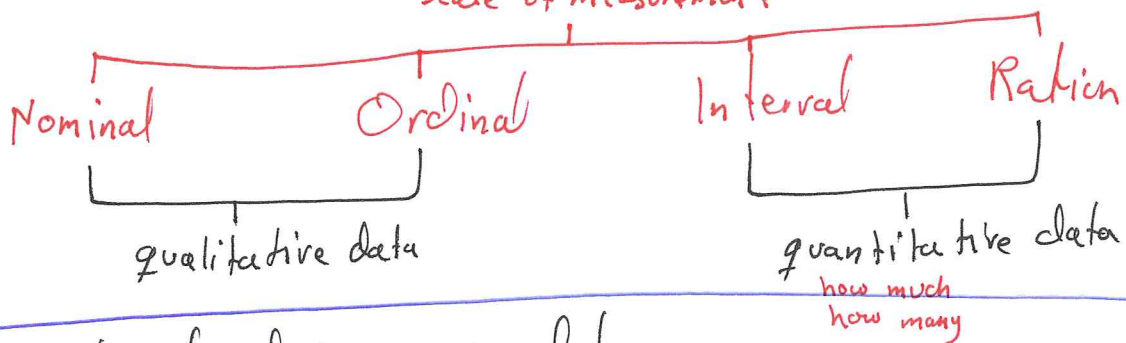
(5)

* **Qualitative data:** Labels or names used to identify an attribute of each element. Qualitative data use either the nominal or ordinal scale of measurement and may be nonnumeric or numeric.

* **Quantitative data:** Numeric values that indicate how much or how many of something. Quantitative data are obtained using either the interval or ratio scale of measurement.

* **Qualitative variable:** A variable with qualitative data.
Exp. Gender

* **Quantitative variable:** A variable with quantitative data.
scale of measurement: Test score



Cross-sectional and time series data

* **Cross sectional data:** are data collected at the same or approximately the same point in time

Exp. student's achievement in 2005 "Tawjeehi"

* **Time series data:** are data collected over several time period.

Exp. student's achievement "Tawjeehi" from 2005-2009

Example 1 Cross-sectional 2005

(6)

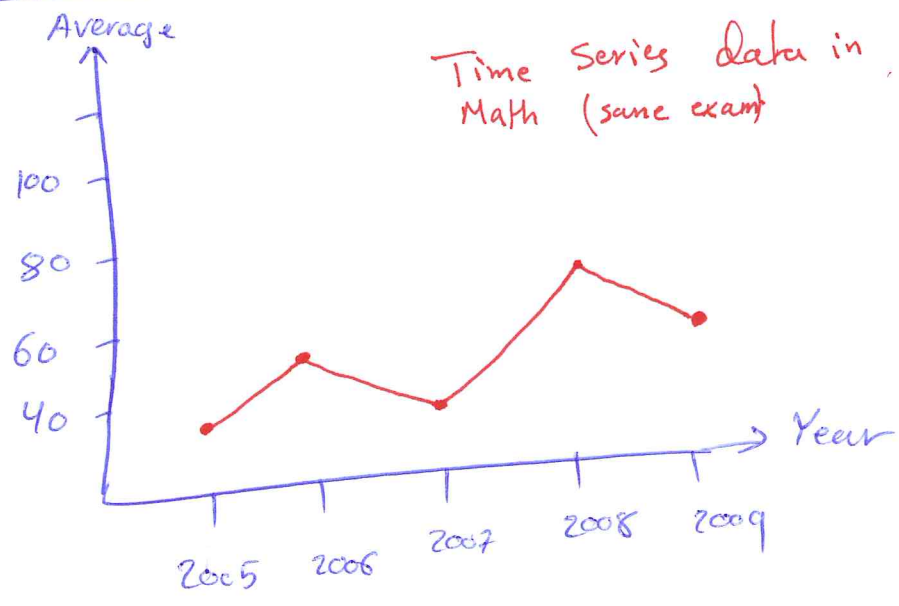
St. No.	Math	Science	Eng	---	Average
1	70	80	90		80
2	60	77	83		75
3	81	50	90		66
⋮	⋮	⋮	⋮	⋮	⋮

Example 2

Time Series data

Year
2005
2006
2007
2008
2009

The same as above



1.3

Data Sources :

7

Existing sources

(Data already exist in some institution)

- Examples:
- 1) Ministry of Education
 - # of schools
 - # of teachers
 - 2) Palestinian Central Bureau of statistic } Gov.
 - 3) Companies → Non Gov.
 - Alpha
 - Banks, clients, employer, salaries
 - Travel Agency, tourists -

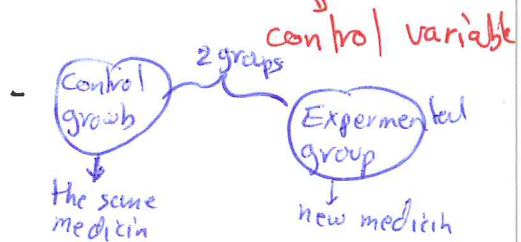
Existing sources is good if you need to obtain data in short period

Statistical studies (data not exist)

Experimental studies

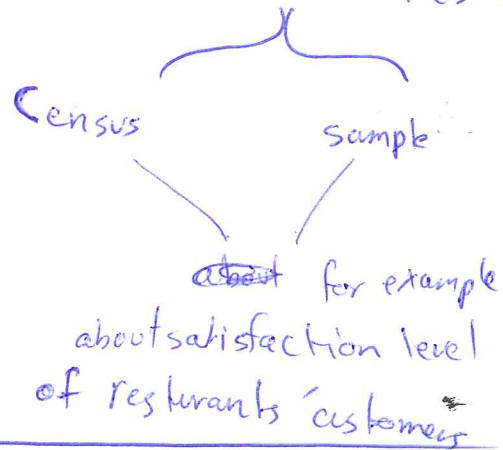
We get data by conduction experiments.

Example: to know how a new drug (medicine) affects the blood pressure.



Non experimental studies (Observational studies)

No control variable



Data Acquisition Errors: *تأثير المتغيرات*

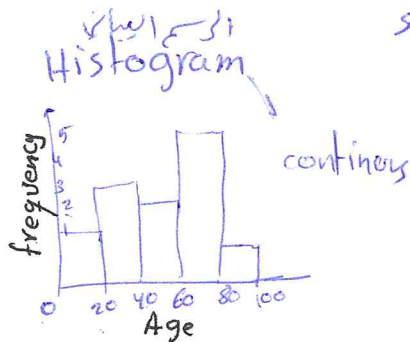
- Data should be collected in a correct procedure. Otherwise error occurs. For example, writing 25 as 52
- the person answers wrong.

1.4) Descriptive Statistics

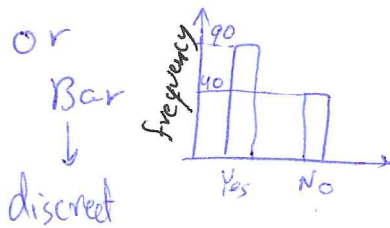
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are tabular, graphical and numerical summaries of data.

Car	freq.
BMW	20
Mercedes	15
Skoda	30



numerical descriptive statistics: average (mean)



1.5) Statistical Inference

Population is the collection of all the elements of interest
 ← طابعا، عناصر (عنا، لعن) ←

Sample: is a subset of the population. →

Census: A survey to collect data on the entire population
 ← نسبة السجينة في بيرزيت ←

Sample survey: A survey to collect data on a sample. →

Statistical inference: The process of using data obtained from a sample to make estimates or test hypothesis about the characteristic of a population.

\bar{x} : average
 s
 :

Ex. We need to test that % of smoking student in BZU is 10%. Take sample 100 ask