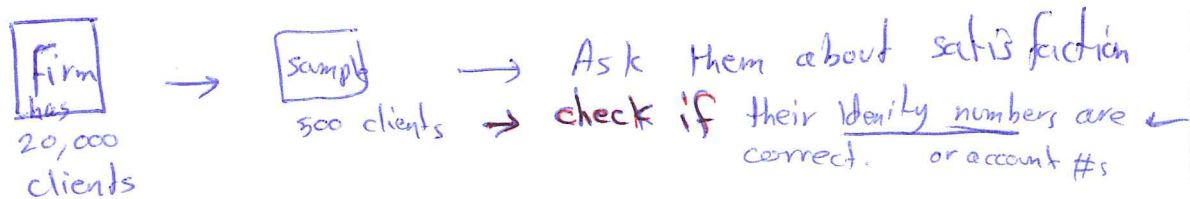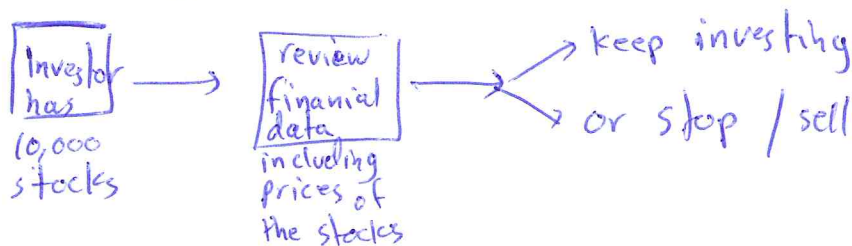# Stat 2310
## Chapter 1

**1·1** Applications in Business and Economics

<u>Statistics</u> is the art and science of collecting, analyzing, presenting and interpreting data.
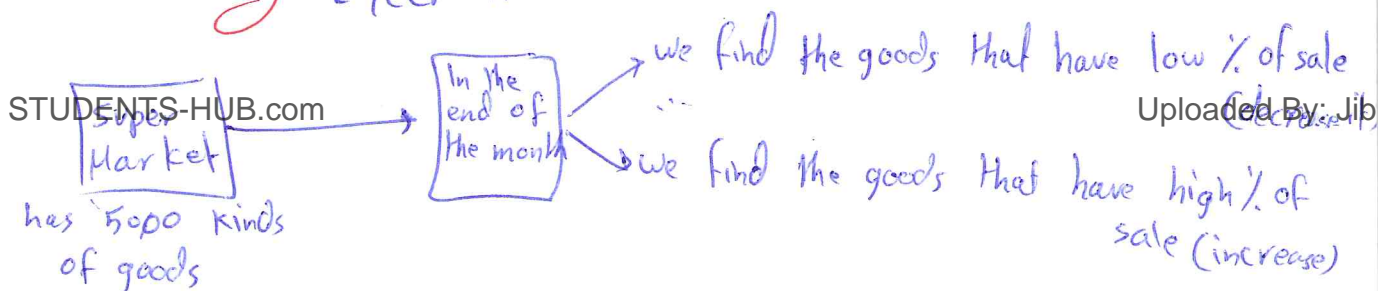
**Accounting:** Accounting firm use statistical sampling procedures when conducting audits for their clients.
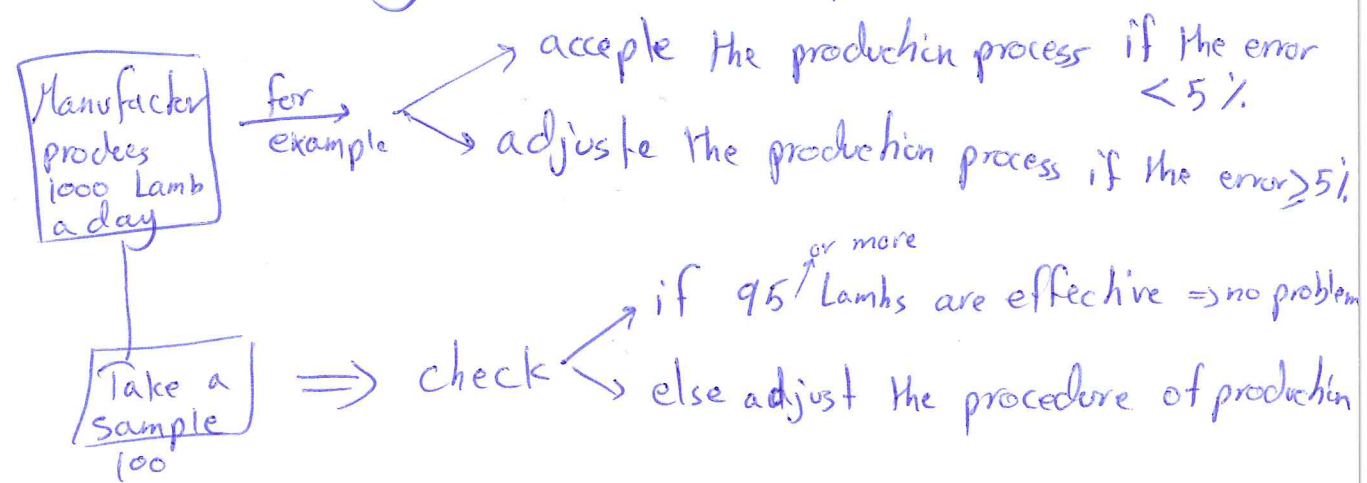<span dir="rtl">اجراءات = التشيق</span>

Firm has 20,000 clients → Sample 500 clients → Ask them about satisfaction → check if their Identity numbers are correct.  or account #s

**Finance:** Fainacial anaysts use statistical information to guide their investment recomendation.

Investor has 10,000 stocks → review finanial data including prices of the stocks → keep investing or stop / sell

**Marketing:** Electronic scanners at checkout counters.

Super Market has 5000 kinds of goods → In the end of the month → we find the goods that have low % of sale ... → we find the goods that have high % of sale (increase)

# Production Quality Control of the production

Manufactor produces 1000 Lamb a day → for example →
- → accepte the production process if the error < 5%.
- → adjuste the production process if the error > 5%.

Take a sample 100 ⟹ check →
- → if 95 or more Lambs are effective ⟹ no problem
- → else adjust the procedure of production

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

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

- inflation rates
- Producer Price Index   مقياس معدل التغير في اسعار للتسعين الجملة بيوفرجم
- unemployment rate
- manufacturing capacity utilization   استخدام الشركة التصنيعية

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

Thus, we use statistical information about the indicators $X_1, X_2, X_3$ to forecaste the inflation rates.
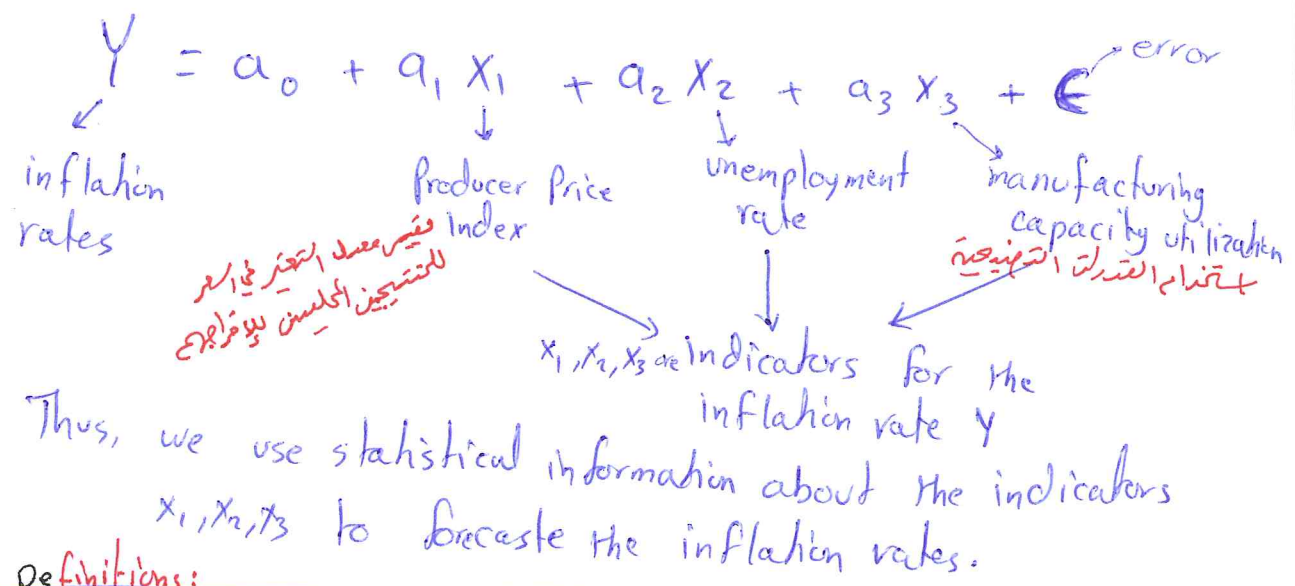
Definitions:

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 measurments for a particular element.

Example:

| St. number | Sex | Final score | year |
|------------|-----|-------------|------|
| 1 | F | 70 | 2010 | → observation |
| 2 | F | 85 | 2011 |
| 3 | M | 90 | 2010 | ↓ variables |
| 4 | F | 80 | 2010 |
| 5 | M | 88 | 2011 | → measurment |
| ⋮ | ⋮ | ⋮ | ⋮ |
| 100 | M | 75 | 2011 | → data set |

③

elements →

Sample of 100 students final score in slat 231.

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## Scales of Measurments:

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
   nonumeric.

   Example: ① level of satisfaction by using internet
   
   Excellent, Very good, good, bad
   
   ② Participants in Marthon
   
   $1^{st}$, $2^{nd}$, $3^{rd}$, $4^{th}$, ..., $10^{th}$
   
   ③ The $1^{st}$ 5 top students in Stat 231

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 scal are always numeric

Example ① Test score example: three students

② Tempreature

| Day | 1 | 2 | 3 |
|-----|---|---|---|
| T | 5 | 0 | -5 |

| s.t | scor |
|-----|------|
| 1 | 80 | ] 20 point |
| 2 | 60 | |
| 3 | 55 | ] 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

* **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.
  Test score

scale of measurement

| Nominal | Ordinal | Interval | Ratio |

qualitative data | quantitative data
how much
how many

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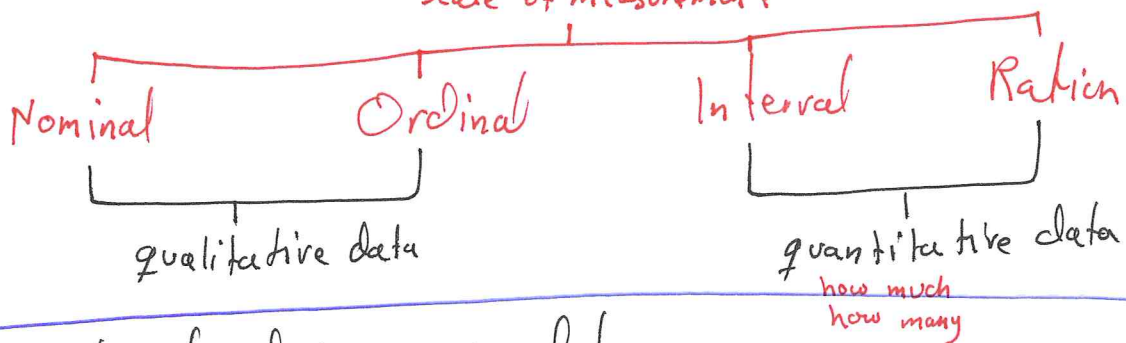
# Cross - Sectional and time series data

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

  Exp. student's acheivement in 2005 "Tawjeehi"

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

  Exp. students acheivement "Tawjeehi" from 2005-2009

**Example 1** Cross-Sectional 2005

| 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

The same as above

Year
2005
2006
2007
2008
2009



Time Series data in Math (same exam)