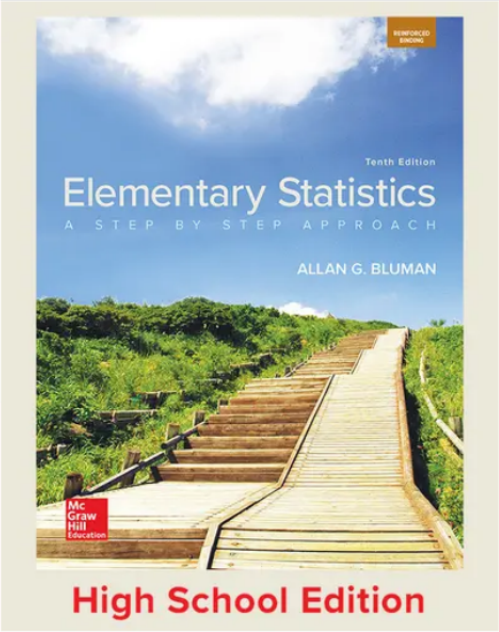
STAT 110: General Statistics



eStudy24
AFFORDABLE ONLINE LEARNING

شروحات مسجلة لكامل المنهج
شرح وحل جميع الواجبات
مراجعات وحل نماذج قبل
كل اختبار

Overview of Chapter 1

Sec. #	Title	Page(s)
	Introduction	2
1 - 1	Descriptive and Inferential Statistics	3 - 4
1 - 2	Variables and Types of Data	6 - 8
1 - 3	Data Collection and Sampling Techniques	11 - 16
1 - 4	Experimental Designs	18 - 19

Introduction

علم الاحصاء

- **Statistics** is the science of conducting studies to collect, organize, summarize, analyze and draw conclusions from data.

اجراء دراسات من اجل جمع تنظيم وتلخيص وتحليل
ووضع استنتاجات حول البيانات

Introduction

وصفية

Descriptive Methods!

- **Statistics** is the science of conducting studies to **collect, organize, summarize, analyze and draw conclusions** from **data**.

استدلال

Inferential Methods!

What is data?

The Joy of Stats!

1 – 1: Descriptive and Inferential Statistics

- **Data** are the values (measurements or observations) that **variables** under study can assume. A collection of data is called a **dataset**.

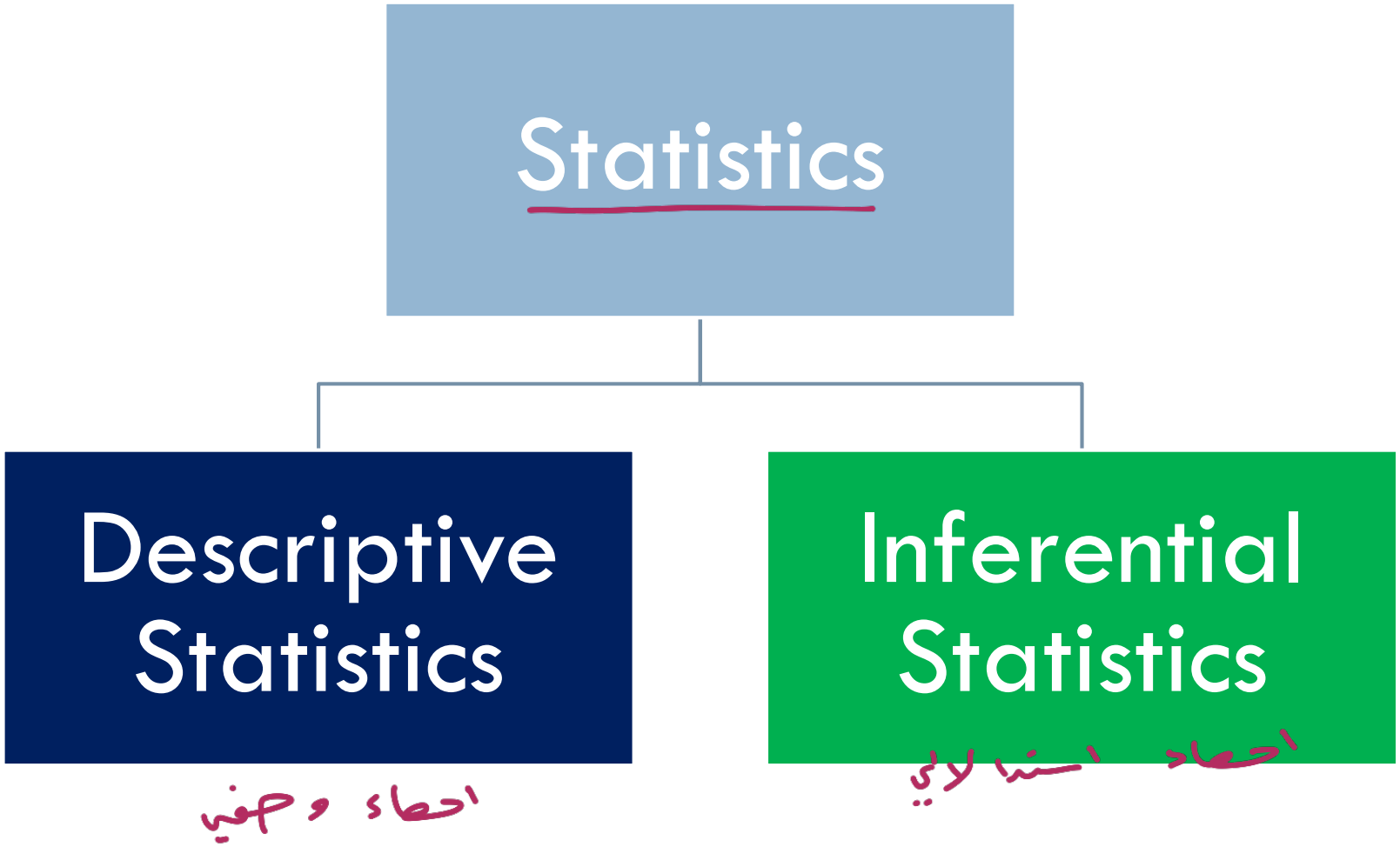
- A **variable** is a characteristic or attribute that can assume different values.

- ***What is the difference between a measurement and an observation?***

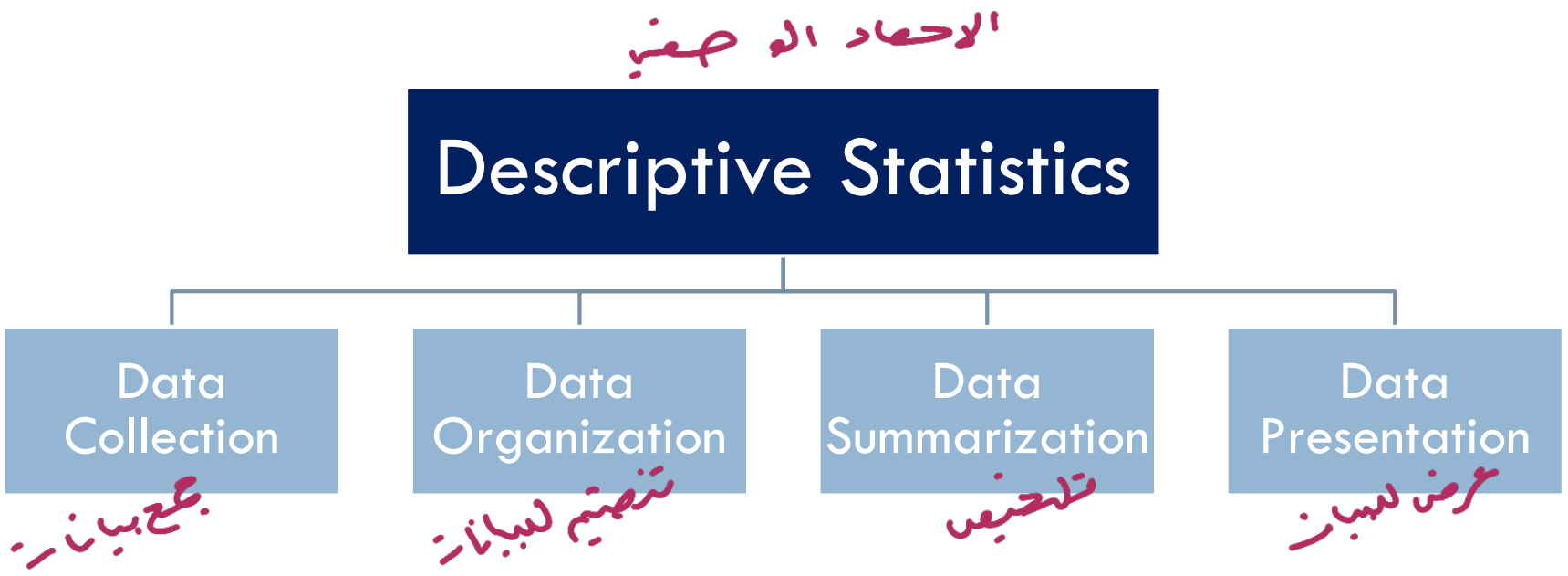
measurement:- quantifies property using instrument

Observation :- describing phenomena

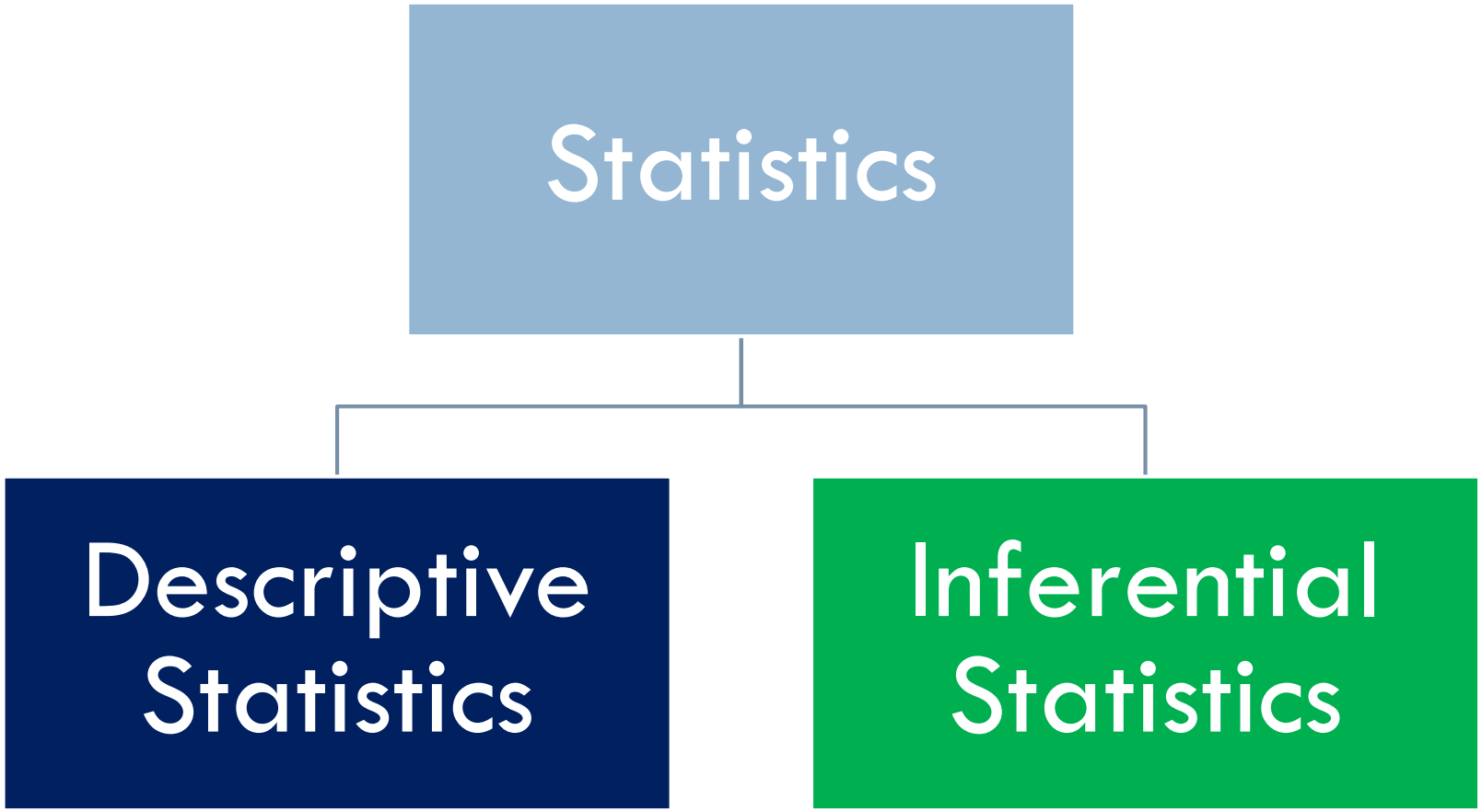
Descriptive and Inferential Statistics



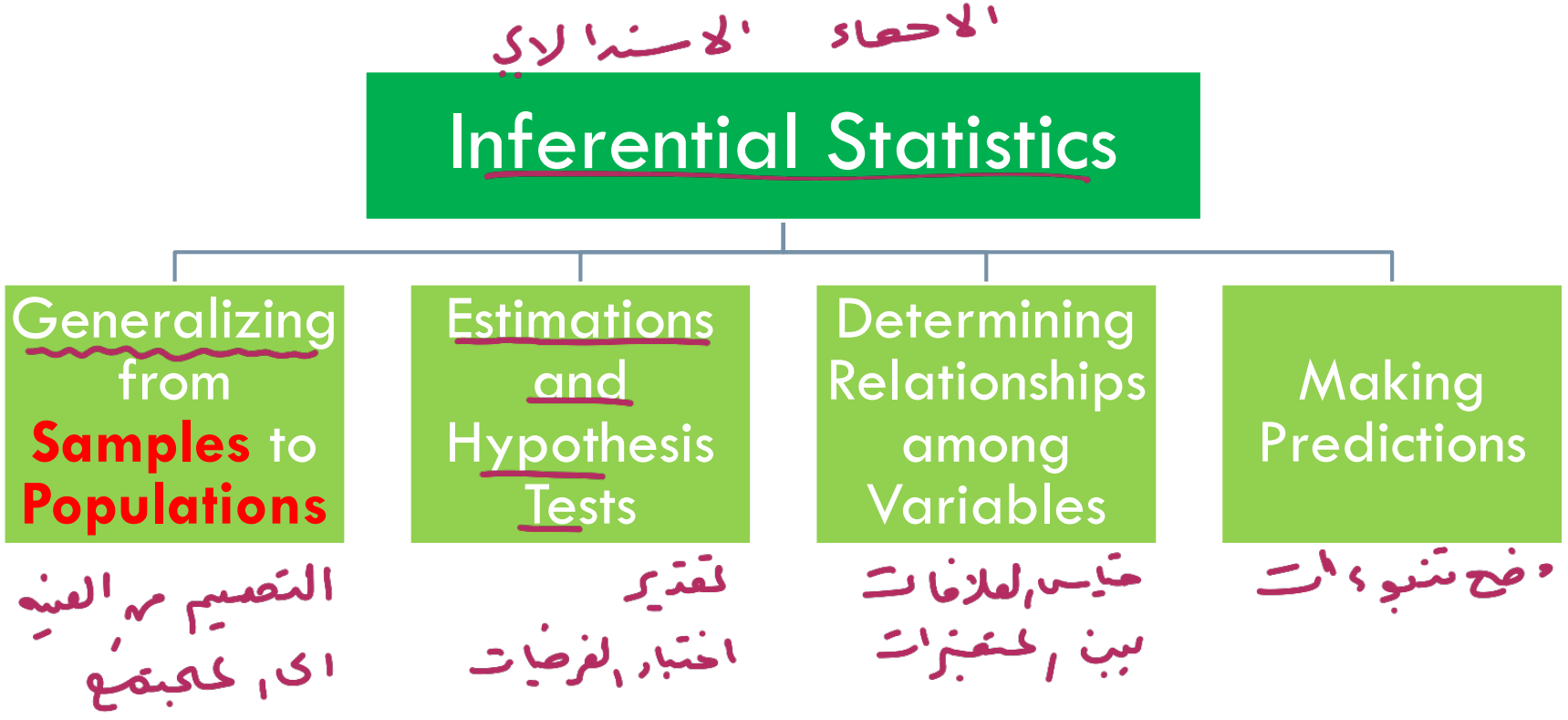
Descriptive Statistics



Descriptive and Inferential Statistics



Inferential Statistics

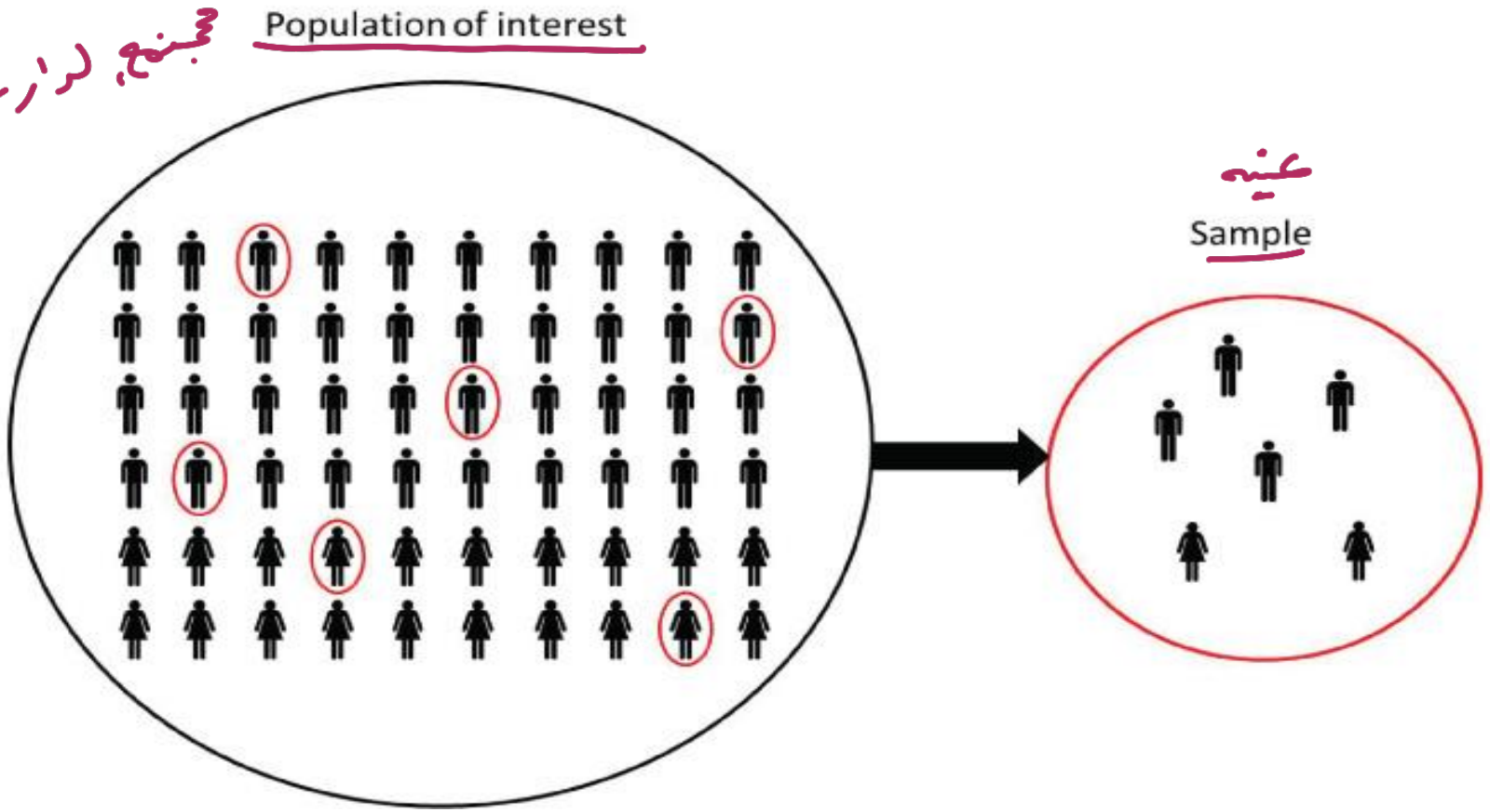


1 – 1: Descriptive and Inferential Statistics (cont.)

- A **population** consists of all subjects (human or otherwise) that are being studied.

- A **sample** is a group of subjects selected from a population.

1 – 1: Descriptive and Inferential Statistics (cont.)



Source: NCES Blog | Statistical concepts in brief: How and why does NCES use sample surveys?

Part of Example 1 – 1 (page 4)

هل تم استخدام احصاء وصفي ام استدلالي في هذه العبارة

- Determine whether descriptive of inferential statistics were used:
  - The average jackpot for the top five lottery winners was $367.6 million.

المتوسط

متوسط اكبر جائزة الكبرى للفائزين = 367.6

Descriptive

  - A study done by the American Academy of Neurology suggests that older people who had a high caloric diet more than doubled their risk of memory loss.

هذه الدراسة تتضمن تعميم النتيجة على كل المجتمع

Inferential

Part of Example 1 – 1 (page 4)

- Determine whether descriptive of inferential statistics were used:
  - The **average** jackpot for the top five lottery winners was **$367.6 million**. **(Descriptive statistics)**
  - A study done by the American Academy of Neurology suggests that **older people who had a high caloric diet more than doubled their risk of memory loss**. **(Inferential statistics)**

Group Activity!

Why using a sample? (5 min.)

- *Write down your thoughts.*
- *Discuss your thoughts with nearby students.*

Why using a sample?

الباحثون يستخدمون العينات بدل دراسة المجتمع كامل لماذا ؟

- In general, researchers consider studying a sample rather than the population due to the following reasons:

اقل كلفه , نتائج اقل زمن

  - Studying a sample is less costly and less time consuming than studying the whole population.

دراسة المجتمع كامل يؤثر (بدمر العينه)

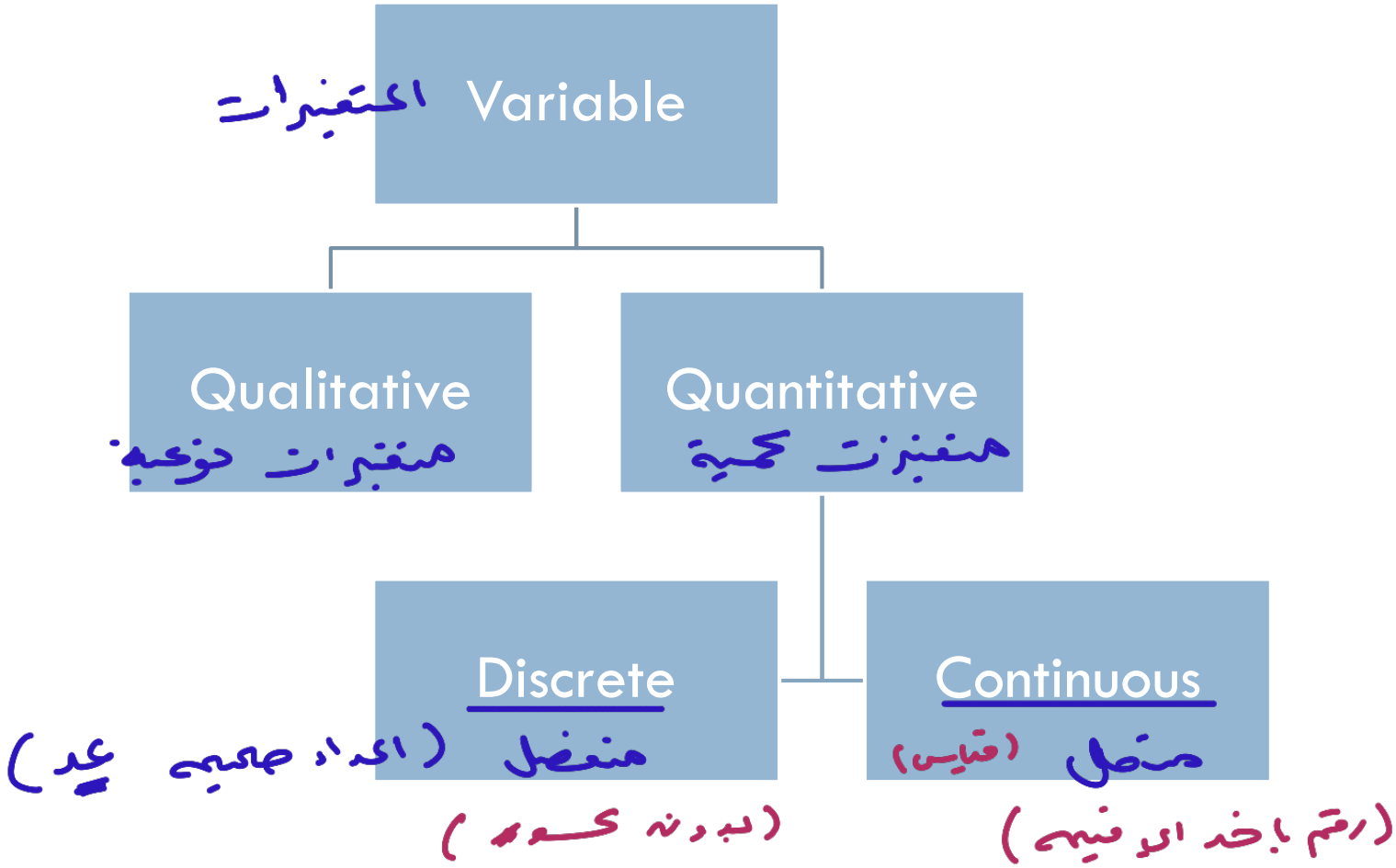
  - Measuring the variable(s) of interest may involve the destruction of the population unit **(e.g. blood sample)**.

  - A population may be **infinite**.

ممكن ان يكون المجتمع لانهائي

1 – 2: Variables and Types of Data

- **General classification:**



Part of Example 1 – 2 (page 7)

- Classify each of the following variables as discrete or continuous:

(a) The highest wind speed of a hurricane.

اعلى سرعه رياح في الاعصار

Ans. Continuous

(b) The weight of baggage on airplane.

وزن الشنطة في الطياره

Ans. Continuous

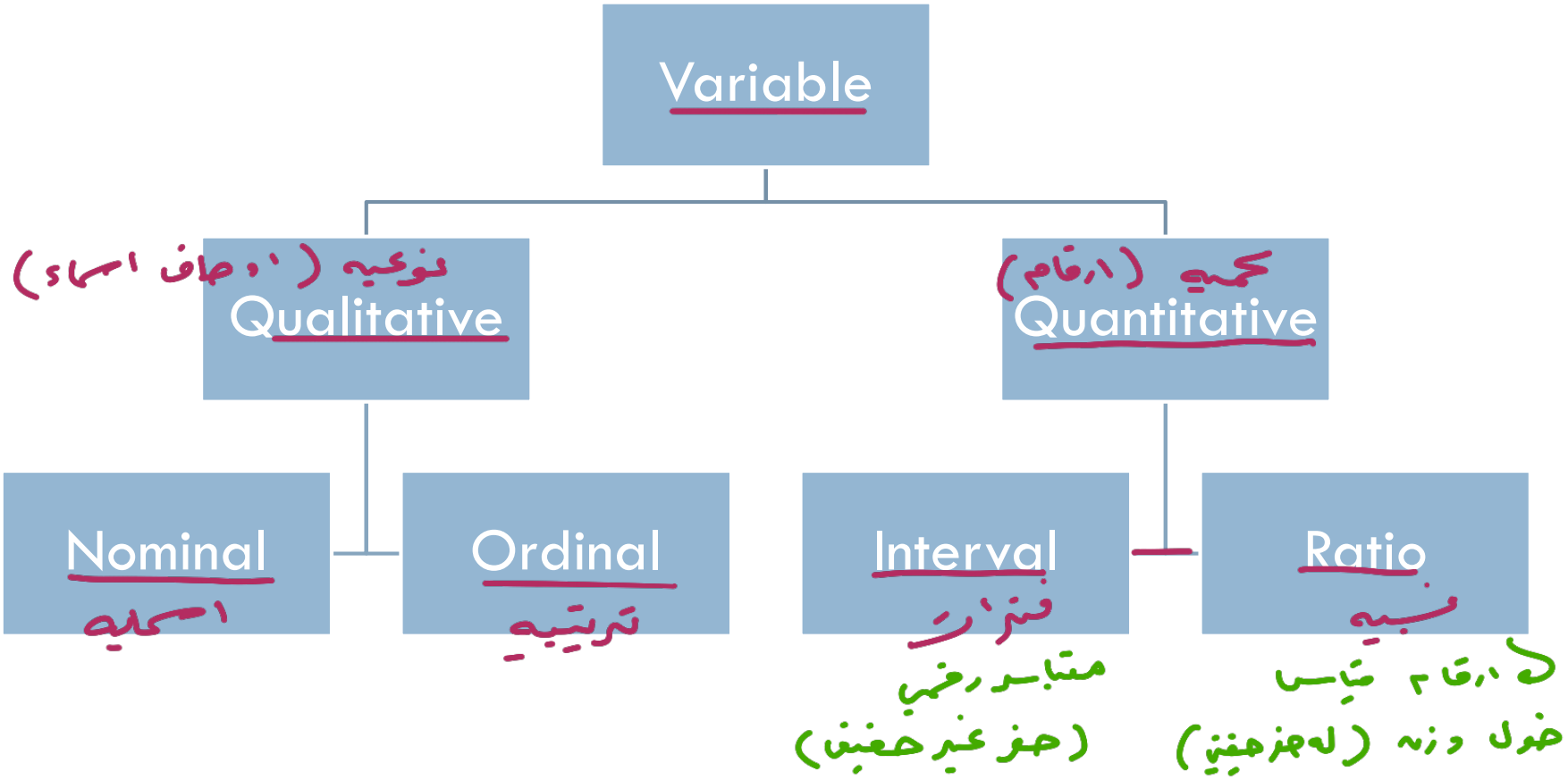
(c) The number of pages in a statistics textbook.

عدد صفحات كتاب الاحصاء

Ans. Discrete

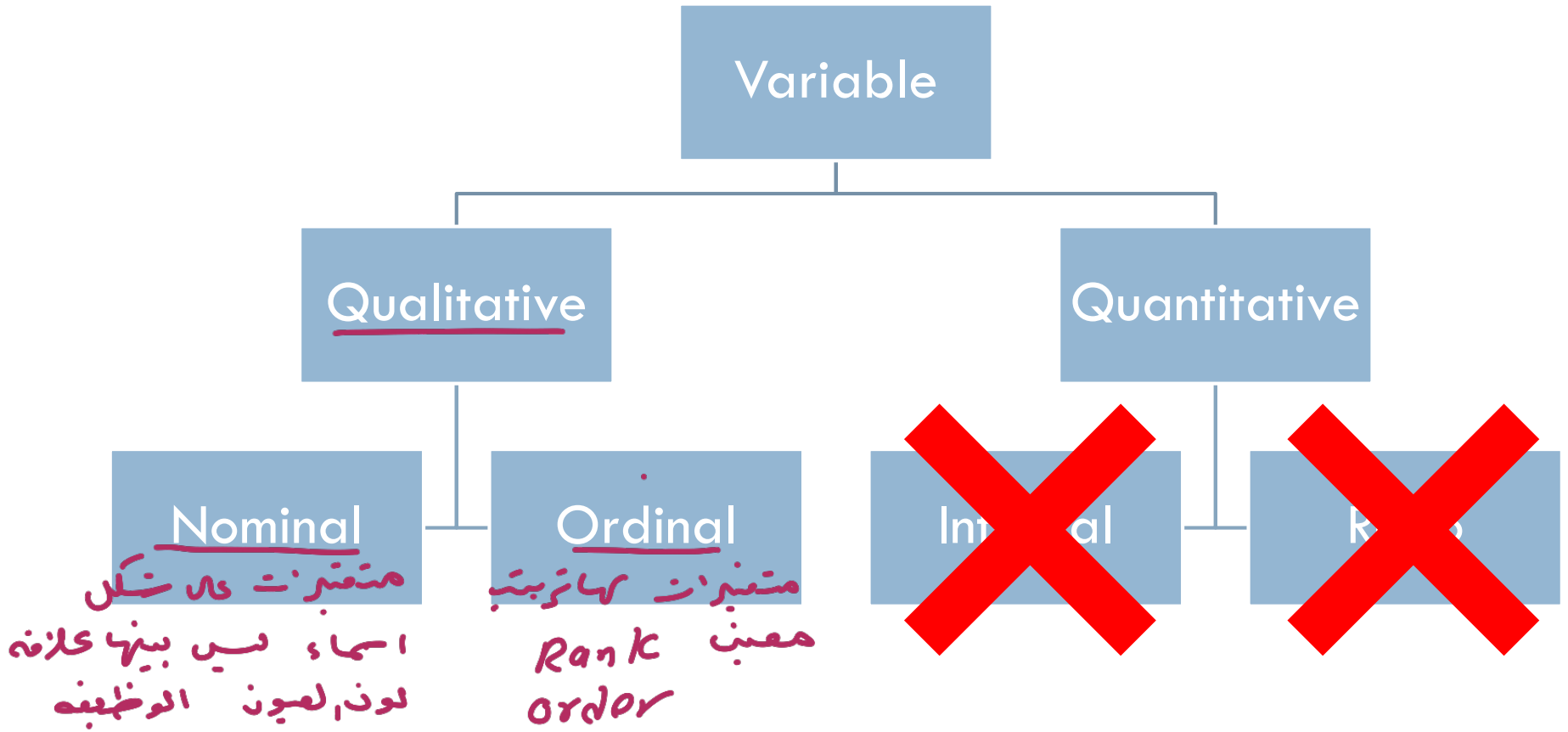
1 – 2: Variables and Types of Data

- **Measurement scale classification:**



1 – 2: Variables and Types of Data

- **Measurement scale classification:**



Part of Example 1 – 4 (page 9)

- What level of measurement would be used to each variable?

ترتيب

(a) The ranking of movies released this month.

Ans. Ordinal ✓

(b) Color of athletic shirts sold by Oak Park Health Club.

Ans. Nominal ✓

TABLE 1–2 Examples of Measurement Scales

Nominal-level data	Ordinal-level data	Interval-level data	Ratio-level data
Zip code Gender (male, female) Eye color (blue, brown, green, hazel) Political affiliation Religious affiliation Major field (mathematics, computers, etc.) Nationality	Grade (A, B, C, D, F) Judging (first place, second place, etc.) Rating scale (poor, good, excellent) Ranking of tennis players	SAT score IQ Temperature	Height Weight Time Salary Age

1. Nominal Level

Blue White

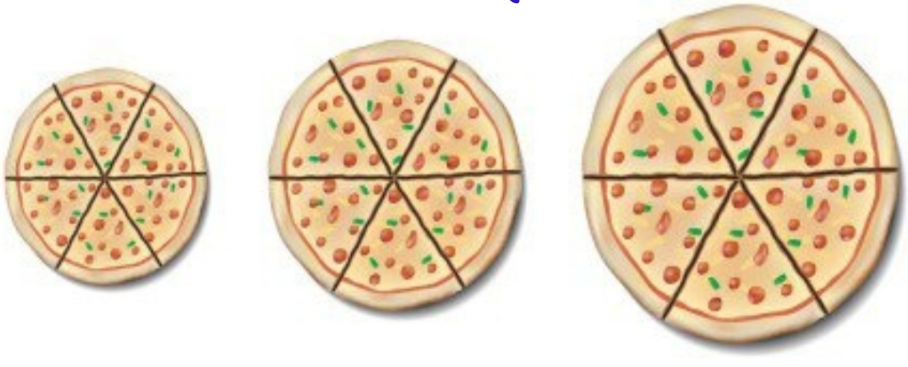
Red Black

Automobile color

3. Interval Level

Temperature

2. Ordinal Level



Small Medium Large

Pizza size

4. Ratio Level

Height

1 – 3: Data Collection and Sampling Techniques

- One common way to collect data is via **surveys**.
  الاستبانات

- **Methods of survey:**
  - Telephone surveys. الهاتف
  - Mailed (emailed) questionnaire surveys. الايميل
  - Personal interview surveys. مقابلة شخصية
  - Surveying records. استطلاعات السجلات
  - Direct observation of situations. الملاحظة المباشرة

Sampling Techniques

طرق اختيار العينات

- There are **four** main sampling techniques:
  - **Random sampling.** العينه العشوائيه
  - **Systematic sampling.** العينه المنتظمة
  - **Stratified sampling.** العينه الطبقيه
  - **Cluster sampling.** العينه العنقوديه

Sampling Techniques (cont.)

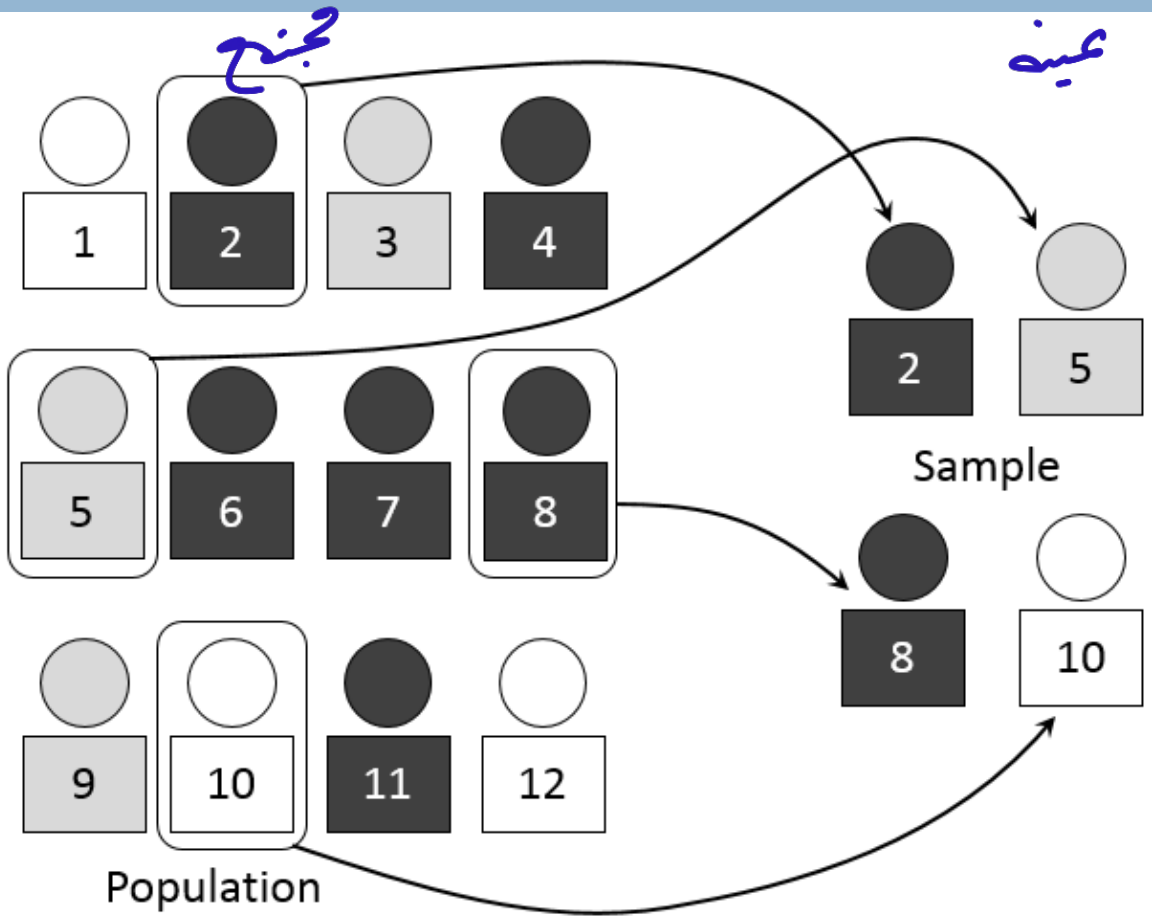
عينه عشوائيه

- A **random sample** is a sample in which all members of the population have **an equal chance** to be selected.

عينه يتم اختيارها من المجتمع وتكون كل الافراد
لديهم فرص متساويه للاختيار

مثلاً : ضع ارقام الطلاب جميعاً في جدول ، ثم اختيار
بشكل عشوائي لعدد محدد

Random Sample



Source: Sampling (statistics) - Wikipedia

Sampling Techniques (cont.)

عينة منتظمة

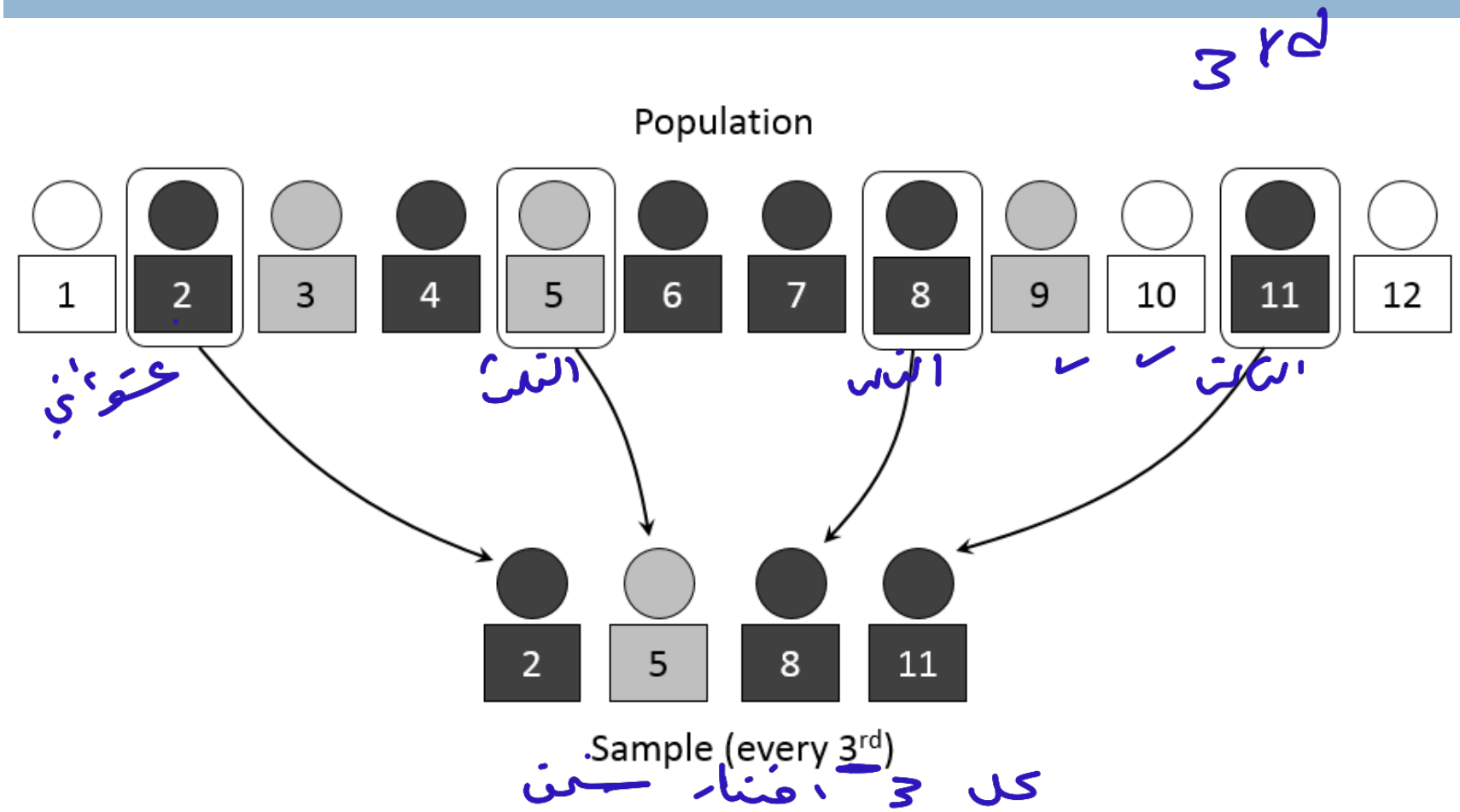
- A **systematic sample** is a sample obtained by **selecting every k^{th} member** of the population where **k is a counting number**.

عينة يتم منها اختيار كل عدد معين k (k رقم الصفر)

- ***Note:*** *This type of sampling involves a random start and then proceeds with the selection process mentioned above.*

البداية تكون عشوائية

Systematic Sample

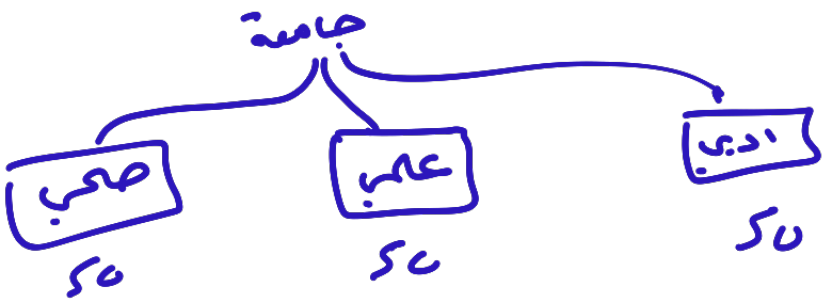


Source: Sampling (statistics) - Wikipedia

Sampling Techniques (cont.)

العينه الطبقيه

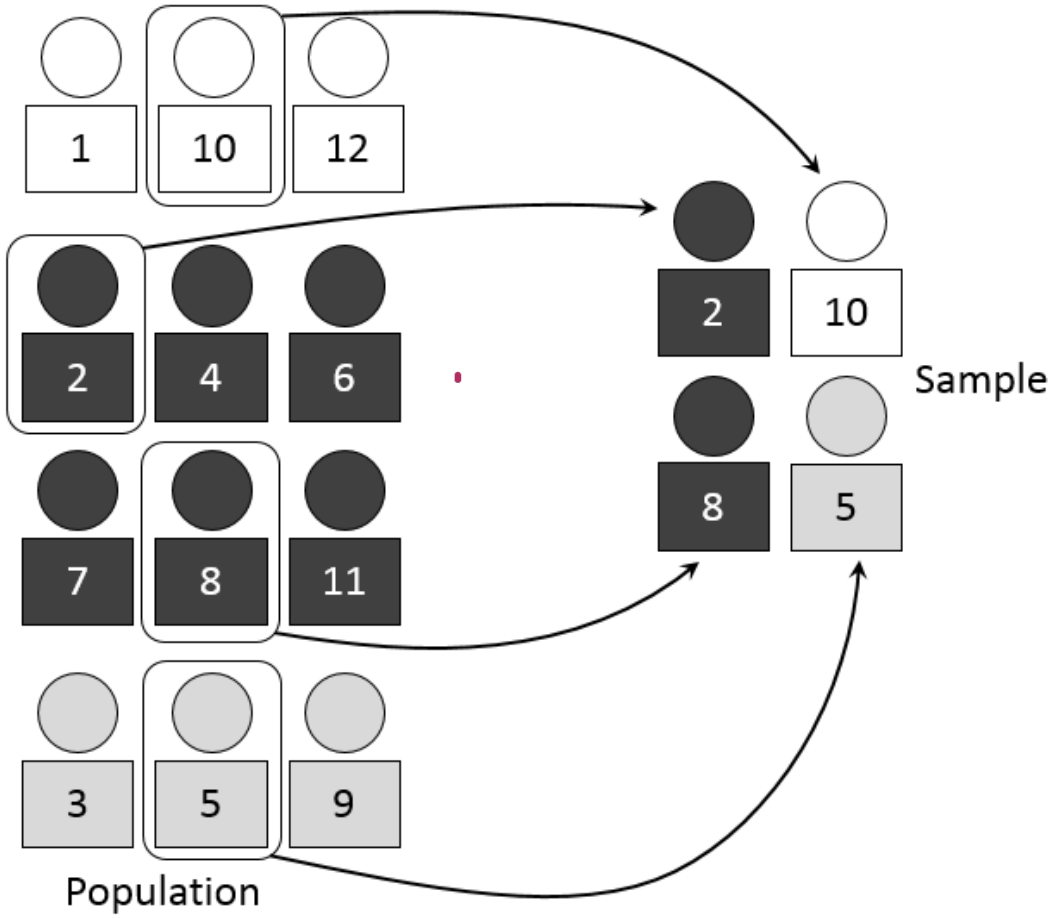
- A **stratified sample** is a sample obtained by dividing the population into **strata** طبقات according to some characteristic relevant to the study. **Then subjects are randomly selected from each stratum.** طبقه



يتم تقسيم المجتمع الى طبقات ذات خصائص محدده
لها علاقه بالدراسة ثم
من كل طبقة يتم الاختيار منها
بشكل عشوائي

Stratified Sample

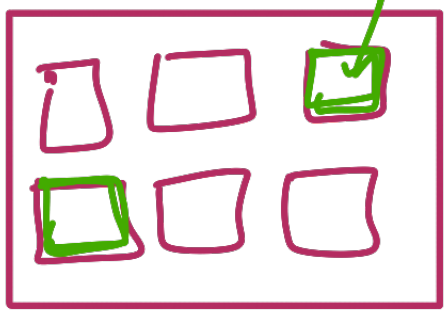
Strata
طبقات



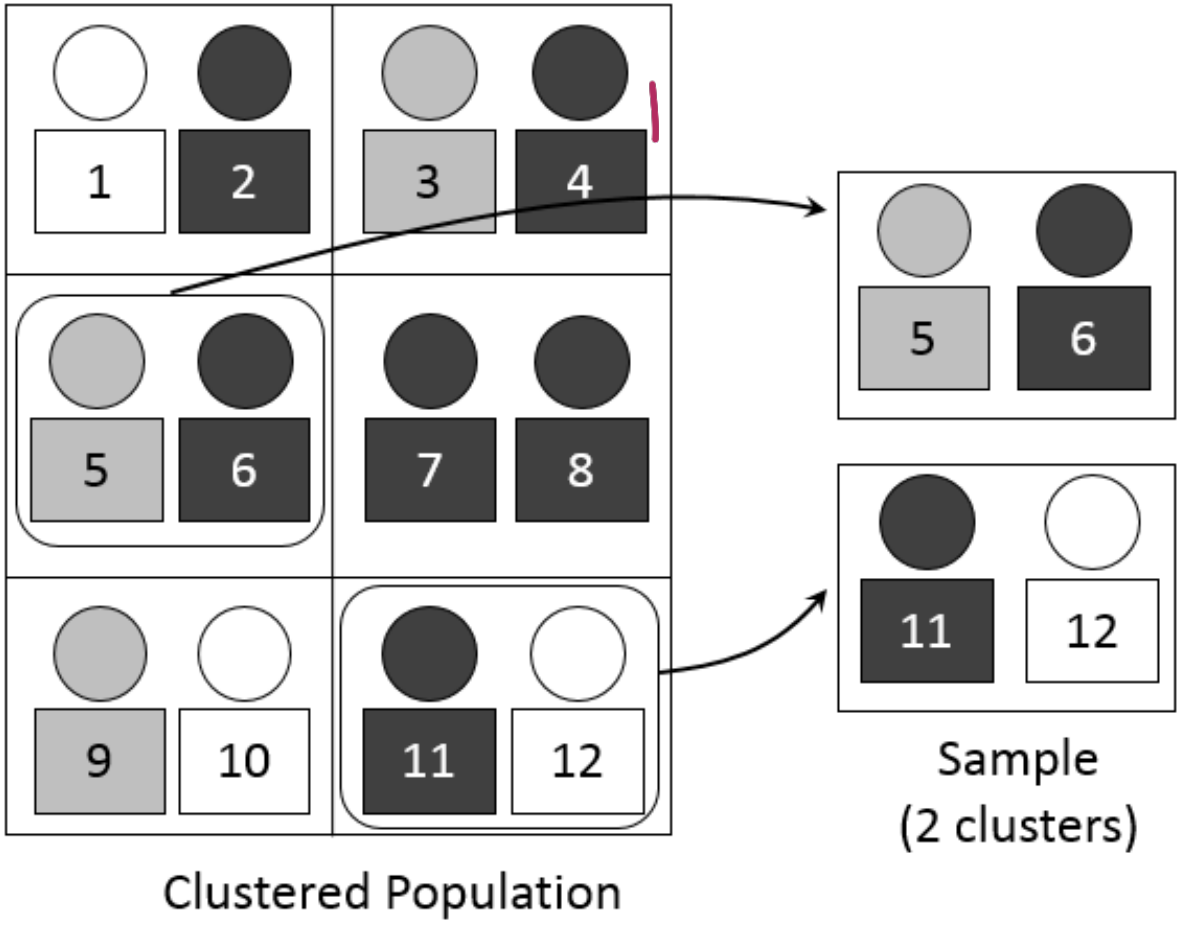
Source: Sampling (statistics) - Wikipedia

Sampling Techniques (cont.)

- A **cluster sample** is obtained by dividing the population into **clusters** and then **selecting one or more cluster** and using all members in the cluster(s) as the members of the sample.



Cluster Sample



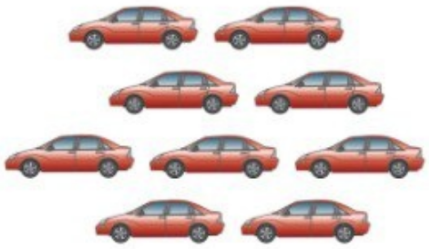
Source: Sampling (statistics) - Wikipedia

Sampling Techniques (cont.)

- For similar details see **Figure 1 – 3** in **page 15**, and **Table 1 – 4** in **page 16**.

FIGURE 1–3 Sampling Methods

1. Random

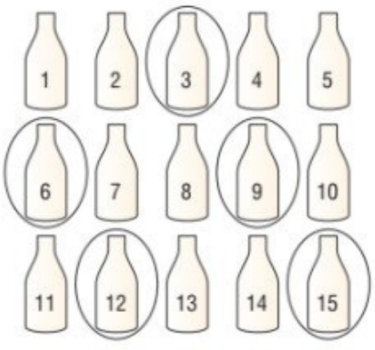


Population

Table D	Random Numbers			
10480	15011	01536	02011	81647
22368	46573	25595	85393	30995
24130	48360	22527	97265	76393
42167	93093	06243	61680	07856
37570	39975	81837	16656	06121
77921	06907	11008	42751	27750
99562	72905	56420	69994	98872
96301	91977	05463	07972	18876
89579	14342	63661	10281	17453
85475	36857	43342	53988	
28918	69578	88321		
63553	40961			

Sample

2. Systematic

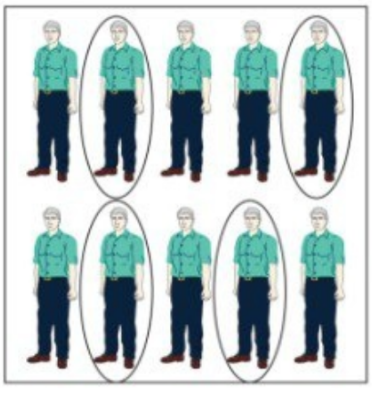


Population

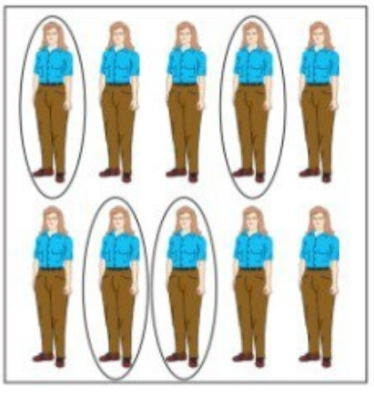
Sample

حل تمارین کتبوه

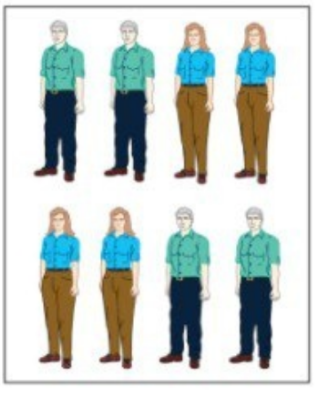
3. Stratified



Men



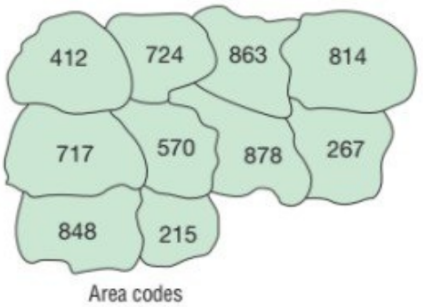
Women



Sample

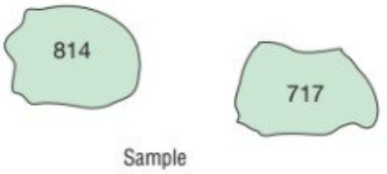
Population

4. Cluster



Area codes

Population



Sample

Example 1 – 5: Sampling Method (page 16)

- **State which sampling method was used.**

(a) Out of 10 hospital in a municipality, a researcher selects one and collects records for a 24-hour period on the types of emergences that were treated there.

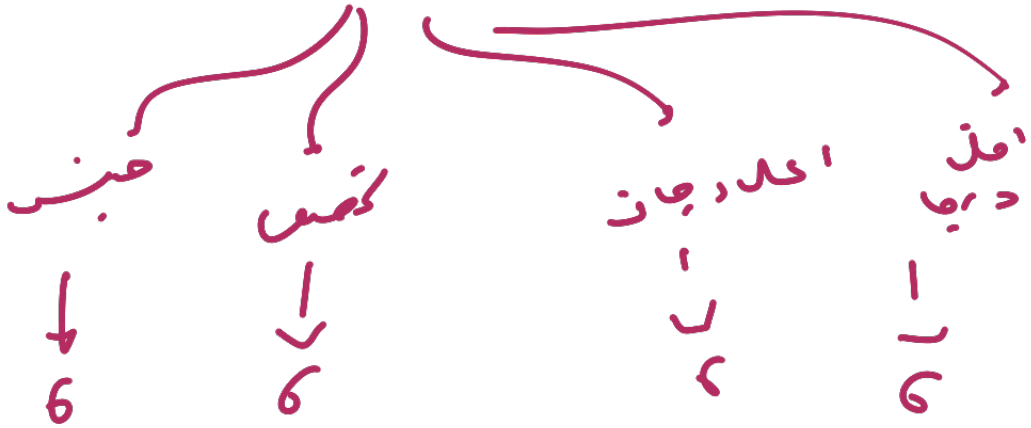
في منطقة يوجد ١٥ مستشفيات
يتم اختيار مستشفى واحد و يتم تسجيل
كل حالات الطوارئ خلال 24 ساعة

Ans. Cluster.

Example 1 – 5 (cont.)

(b) A researcher divided a group of students according to gender, major field, and low, average, high grade point average (GPA). Then she randomly selects six students from each group to answer questions in a survey.

Ans. Stratified.



Example 1 – 5 (cont.)

(c) The subscribers to a magazine are numbered. Then a sample of these people is selected using random numbers.

تم ترقيم المشتركين ثم
تم الاختيار بشكل عشوائي

Ans. Random.

Example 1 – 5 (cont.)

(d) Every 10^{th} bottle of Cola is selected, and the amount of liquid in the bottle is measured. The purpose is to see if the machines that fill the bottles are working properly.

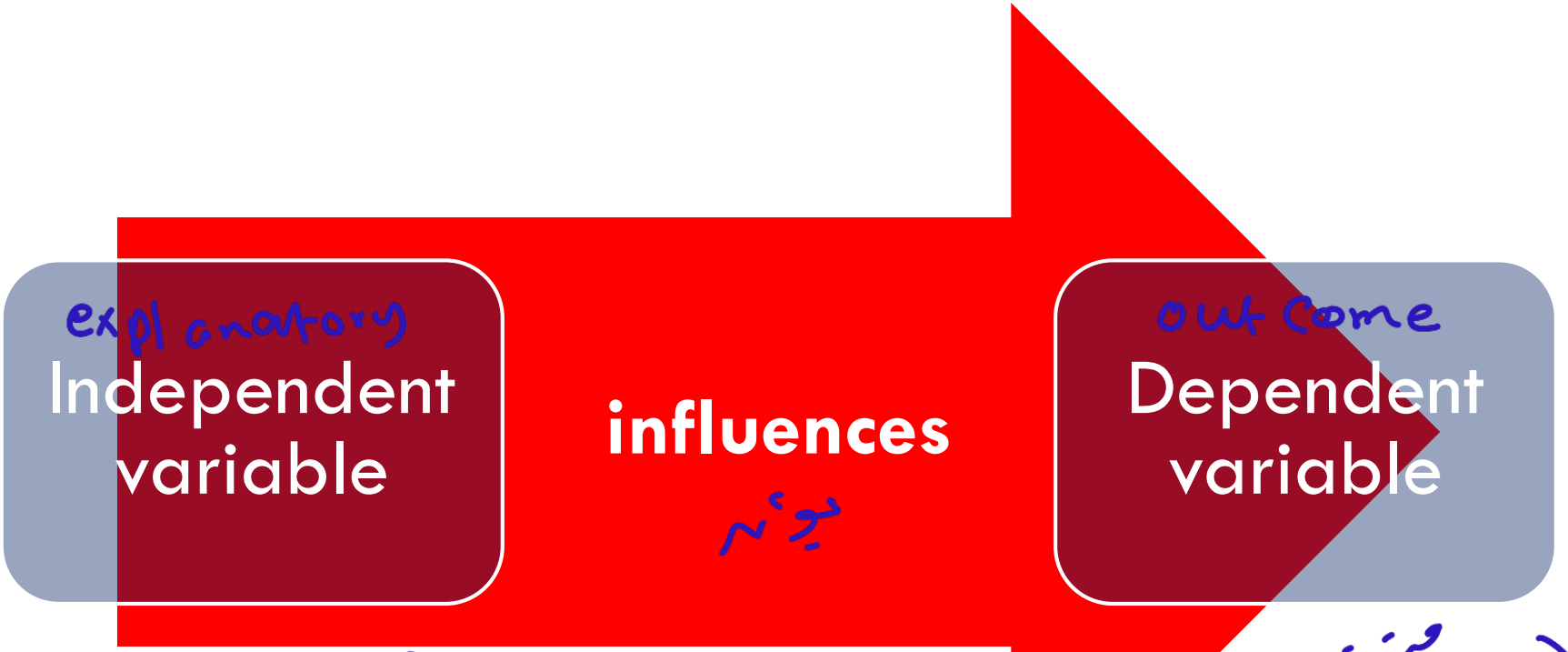
Ans. Systematic.

1 – 4: Experimental Designs

- In an **observational study**, the researcher **merely observes** what is happening or what has happened in the past and tries to draw conclusions based on these observations.

- In an **experimental study**, the researcher **manipulates** one of the variables and tries to determine how the manipulation influences other variables.

Types of variables in experimental designs



متغير مستقل (المتغير الذي نتلاعب به)

متغير تابع (المتغير الذي تقع عليه النتيجة)

Independent variable vs. dependent variable

الدراسة تحتوي كل متغير واحد او اكثر مستقل وايضا متغير تابع واحد او اكثر

- Statistical studies usually include one or more **independent variables** and one or, sometimes, more than one **dependent variable**.

متغير مستقل

- The **independent variable** in an experimental study is the one that is being manipulated by the researcher. The independent variable is also called the **explanatory variable**.

المتغير الذي يتلاعب به الباحث

متغير المنتج

متغير تابع

- The **resultant variable** is also called the **dependent variable** or the **outcome variable**.

متغير مخرج

Group Activity!

Experimental Designs (7.5 min.)

- *Think about a study and write it down.*
- *Discuss the type of the study, and determine the independent and dependent variables with nearby students.*

An observational study

دراسة مبنية على الملاحظة

- Researchers want to study the influence of drinking at least one cup of tea on sleeping habits. They took a random sample of adults and **asked them** about the **daily amount of tea** they consume and **the time at which they sleep**.

اراد الباحثون معرفة العلاقة بين تحديد كمية الشاي وكمية النوم
اخذ عينة عشوائية وسألهم عن كمية الشاي و كم ينامون

- ***Independent variable:*** ***daily amount of tea.***
- ***Dependent variable:*** ***the time at which they sleep.***

المتغير المستقل :- كمية الشاي باليوم
المتغير التابع :- زمن النوم

An experimental study

دراسة تجريبية

- Researchers want to study the influence of drinking at least one cup of tea on sleeping habits. They took a random sample of adults and divided them into three groups. **The first group are told to drink tea less than usual, the second group are told to drink tea as usual, and the third group are told to drink tea more than usual.** After a while, the people are asked about the **daily amount of tea** they consumed and **the time at which they slept**.

مجموعة ١ يشربوا اقل
مجموعة ٢ يشربوا عادي
مجموعة ٣ يشربوا اكثر من العادي

- ***Independent variable:*** ***daily amount of tea.***
- ***Dependent variable:*** ***the time at which they sleep.***

المتغير المستقل :- كمية الشاي
المتغير التابع :- زمن النوم