Chapter 1: Introduction to Statistics(part 2):

Variable & Data

Learning Outcomes

After completing this chapter, you will be able to-

- Understand about data.
- Identify several types of variables with their levels to store data in.

Contents

From this lecture, you are going to learn…

- ❑ Variable and types of variable
- ❑ Data and types of data
- ❑ Levels of measurements
- ❑ Applications Of Statistics In Engineering

Variable & Types

- **Variable** : Any characteristic which may vary either in magnitude or in quality is called variable.

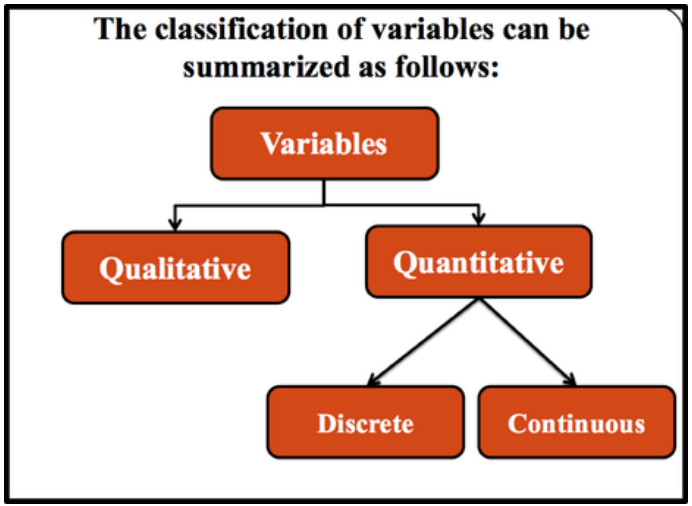
Your height:?
No. of Family members: ?

What is your Gender?

- Female
- Male

What Is Your Educational Background?

- 1 - Elementary
- 2 - High School
- 3 - Undegraduate
- 4 - Graduate



Types of Quantitative variable

- **Qualitative or attribute variable:** Numerical measurement is not possible and may have several mutually exclusive categories.

Where is your Home District?

Your Religion?

- Muslim
- Hindu
- Christian
- Others

- **Quantitative variable:** Numerical measurement is possible.

What is your Height?

No of cars passing a road per minutes.

Types of Quantitative variable

Discrete variable: Assume *isolated values* which are *countable*.

No. of sibling in your family

Example: The number of students in 20 classes, number of cars passing a certain road per minute (1, 2, 3, etc).

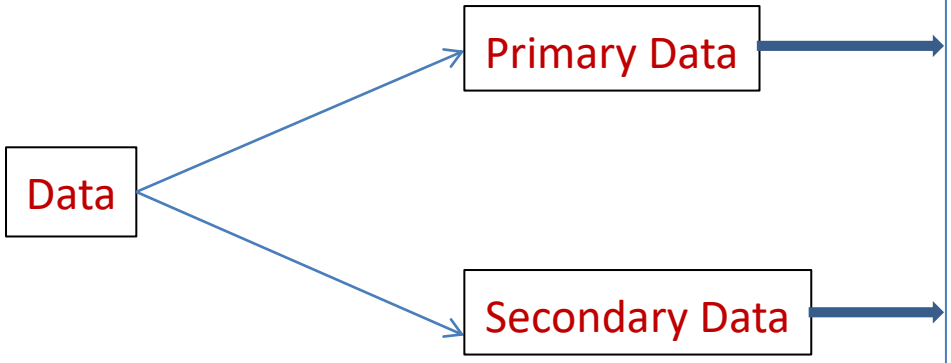
Continuous variable: Assume any value within a specified range.

Your Blood Pressure

Example: The distance of students home from University, Temperature etc.

Data and Types

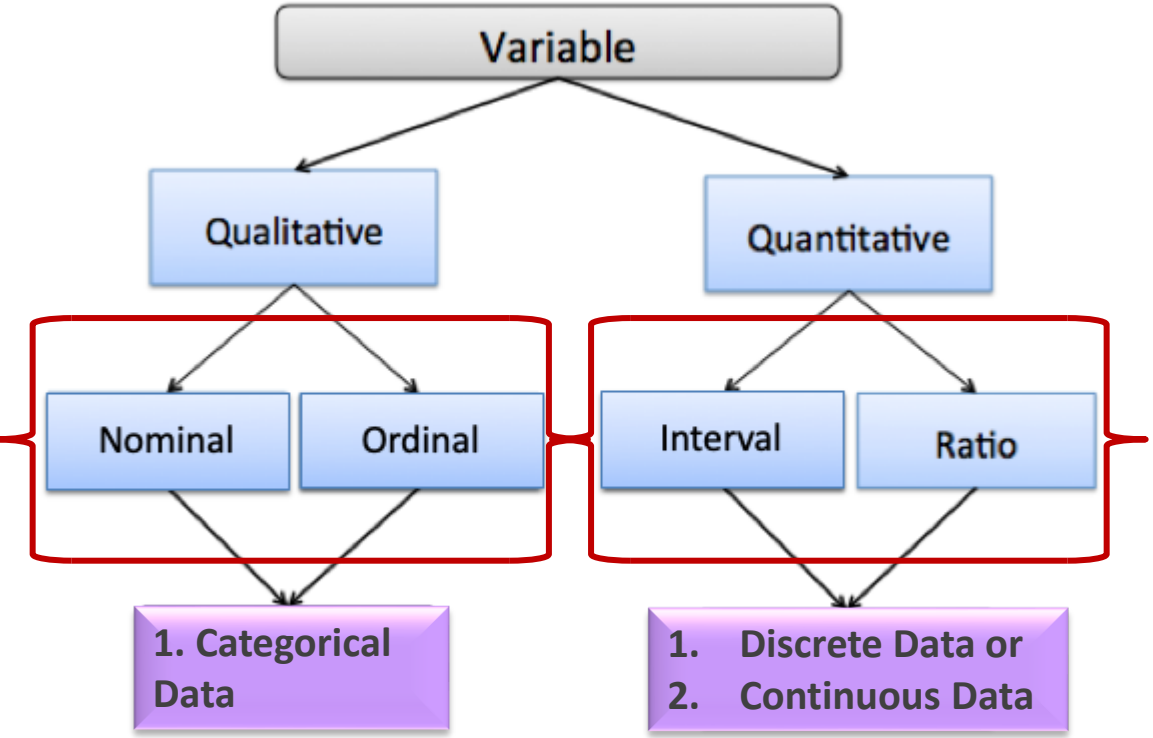
➢ Data are numerical facts and figures collected from any field of investigation.



Obtained by ***Direct observation***. Some methods to collect primary data are **Observation method**
Interview method
Through questionnaires etc.

Obtained from ***published or utilized data***.
Secondary data can be collected from **publications newspapers, reports etc.**

Types of variables with Level



So, there are four levels of measurements:

1. Nominal level data.
2. Ordinal level data
3. Interval level data
4. Ratio level data.

Types of variables with Level

- **Nominal level**: data that is classified into categories and cannot be arranged in any Particular order.

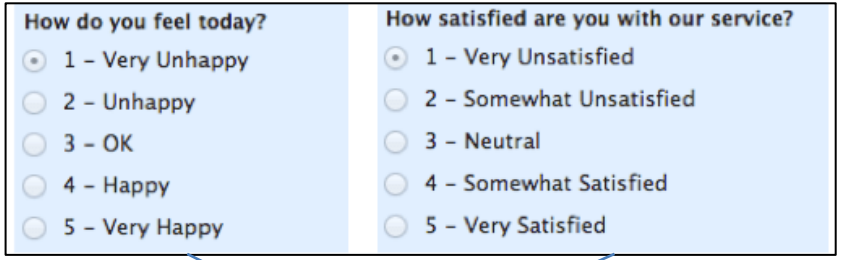
Where is your Home District?

Your Religion?

- Muslim
- Hindu
- Christian
- Others

Phone no., Blood group etc

- **Ordinal level**: involves data arranged in some order, but the differences between data values cannot be determined or are meaningless.

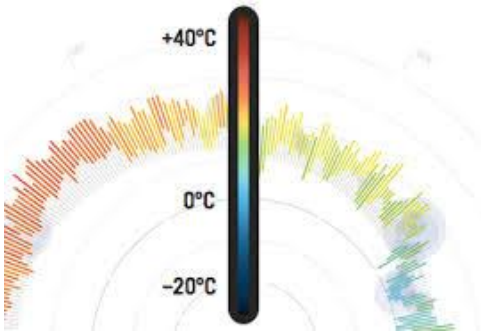


Exam Grade.
Position in a competition etc

Types of variables with Level

Interval level: Numerical measurement is possible with meaningful amount of differences between data values. There is no natural zero point. (meaningless zero).

Temperature



Ratio level: Numerical measurement is possible with meaningful amount of differences between data values and natural zero point. (meaningful zero).

Required time to solve a math.

Data and Variables at a glance…

	A	B	C
1	Month	Rainfall (mm)	Umbrellas sold
2	Jan	82	15
3	Feb	92.5	25
4	Mar	83.2	17
5	Apr	97.7	28
6	May	131.9	41
7	Jun	141.3	47
8	Jul	165.4	50
9	Aug	140	46
10	Sep	126.7	37

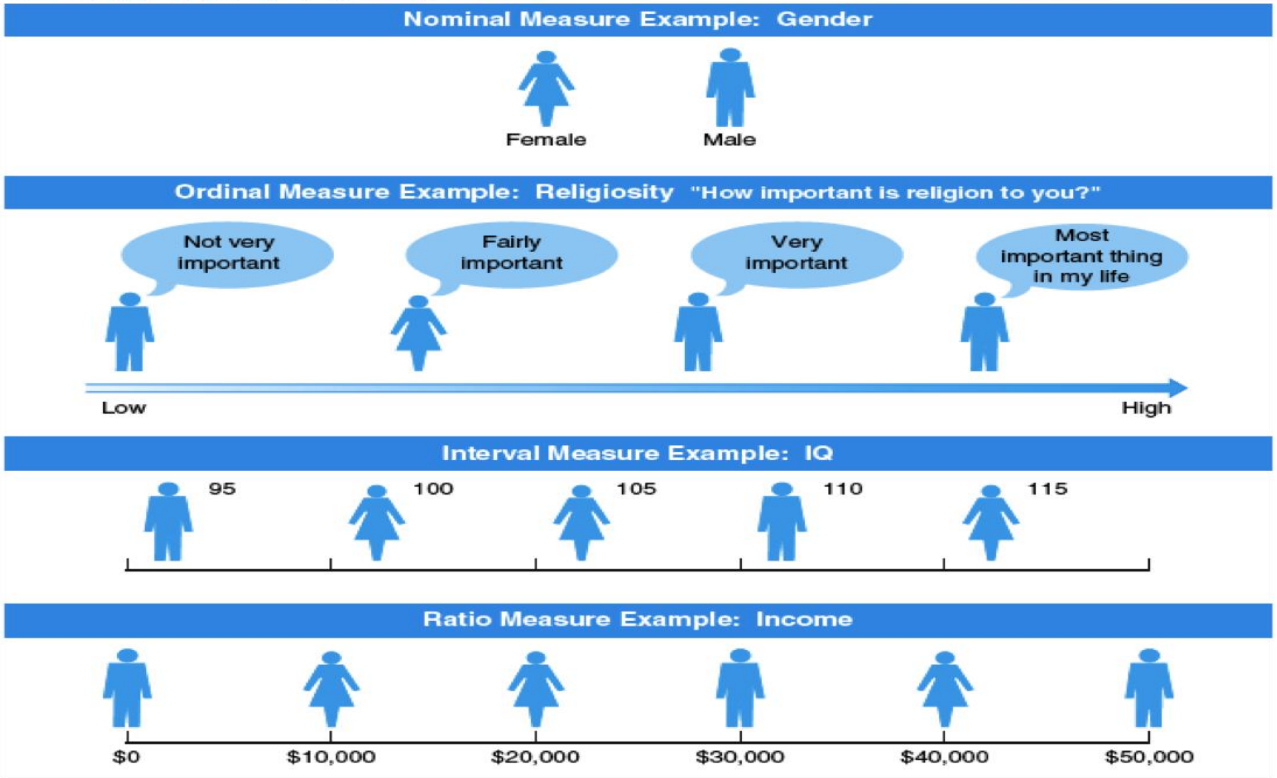
Qualitative or attribute variable (Nominal)

Quantitative variable (continuous) (Ratio)

Quantitative variable (Discrete) (Ratio)

Data

Types of variables with Level



CLASS EXERCISE

Classify the following as quantitative (discrete or continuous) or qualitative. Also mention the levels:

- Color of the eye
- Number of typewriters in a room
- Address
- Telephone numbers
- Rank of students
- Speed of a car
- Birth rates
- Score in mathematics examination

CLASS EXERCISE

Identify each of the following as continuous or discrete also find there levels:

- Weight for airlines baggage
- Length of arc
- Number of patients in each of the rooms of a hospital.
- Number of passengers in a plane
- Amount of sales in a business firm
- Speed of light
- Area of a land
- Lifetime of television tubes and batteries
- Life span of a person.

Why Study Statistics in Engineering?

Application of Statistics in Engineering:

- Simulation is based on the statistical description of the behavior of objects
- Many machine learning algorithms are basically applied statistics
- Any kind of prediction usually uses some statistics (weather, stocks, …)
- Item Response Theory is a computational/statistical technique used to grade answers to tests, such as GRE and GMAT.
- If you work in an SQA (Software Quality Assurance) team, Good SQA teams use statistical analysis techniques to analyze such things as defect (bug) trends, arrival rates, resolution rates, density etc; test scripts code coverage, data coverage etc.

Why Study Statistics in Engineering?

Application of Statistics in Engineering:

- NETFLIX, Facebook, YouTube and many other platforms use Statistics to predict what show we might to watch next.
- Researchers from any field use Statistics to make conclusions from the data based on their inquiry.
- Now a day Data mining, Data Science, Artificial Intelligence, Machine Learning are in great interest. All these great courses need the basic knowledge of Statistics to deal with the data.
- There are some text retrieval algorithms based on probability and statistics
- Many games use statistics for deciding if some events happen or not


Thank
You