- A process is a series of actions of operations that transforms inputs to outputs
 - A process produces or generates output over time Ο
 - A manufacturing process uses a series of operations performed by people Ο and machines to convert inputs, such as raw materials and parts, to finished products (the outputs)
- A process whose operations or actions are unknown or unspecified is called a black box
 - 0 The entire focus, therefore, is on the output of the process
 - If the output is numerical, the characteristic, or property, represented by Ο the numbers (e.g. sales, GDP, or stock prices) is typically the variable of interest
 - A process whose output is already in numerical form necessarily includes a measurement process as one of its subprocesses
 - If the output is not numeric, we use measurement processes to assign Ο numerical values to variables
 - Processes generate or create their output over time Ο
- Any set of output (object or numbers) produced by a process is also called a

Types of Data

- Sample
 Ex. The next 10 cars, every fifth car
 S of Data
 Quantitative data are measurement. We are recorded on a naturally occurring frO numerical scale
 - rical scale Ex. The tensor ature (in degrees delsius) at which each unit in a sample of Procees of heat-resistant plastic bags melt
- Qualitative data are measurements that cannot be measured on a natural numerical scale; they can only be classified into one of a group of categories
 - Ex. The political party affiliation (Democrat, Republican, or Independent) 0 in a sample of 50 CEOs
 - Sometimes we will assign arbitrary numerical values to qualitative data Ο for ease of computer entry and analysis, but they are simply codes and cannot be meaningfully added, subtracted, etc.

Collecting Data: Sampling and Related Issues

- Data is normally collected from a published source, a designed experiment, or an observational study (e.g. a survey)
- A representative sample exhibits characteristics typical of those possessed by the population of interest
- A simple random sample of *n* experimental units is a sample selected from the ٠ population in such a way that every different sample of size *n* has an equal chance of selection
 - Usually relies on a random number generator
- Stratified random sampling is typically used when the experimental units • associated with the population can be separated into two or more groups of units, called strata, where the characteristics of the experimental units are more