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Fundamentals of Business Statistics

Probability

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Introduction

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Managers will have to cope with uncertainty in many decision situations. Concepts of probability will help you measure uncertainty and perform associated analyses that are essential in making effective business decisions.

Probability-Meaning and Concepts

- **Probability** refers to chance or likelihood of a particular event-taking place.
- An **event** is an outcome of an experiment.
- An **experiment** is a process that is performed to understand and observe possible outcomes.
- Set of all outcomes of an experiment is called the **sample space.**

Example

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In a manufacturing unit three parts from the assembly are selected. You are observing whether they are defective or non-defective. Determine

a) The sample space.

b) The event of getting at least two defective parts.

Solution

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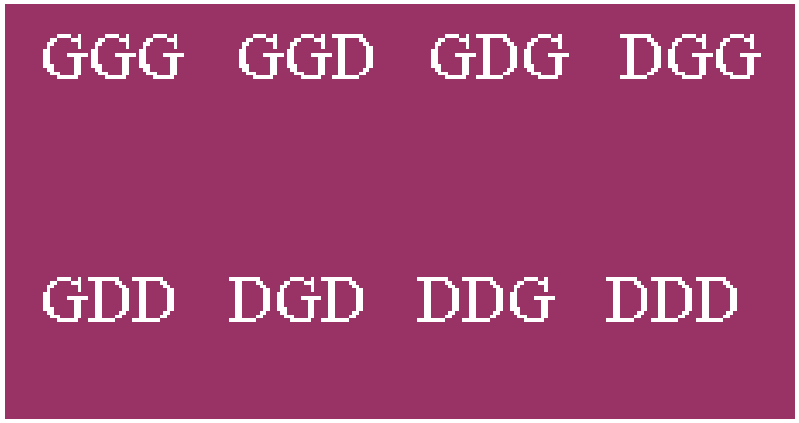
a) Let S = Sample Space. It is pictured as under:



D = Defective

G = Non-Defective

b) Let E denote the event of getting at least two defective parts. This implies that E will contain two defectives, and three defectives. Looking at the sample space diagram above, E ={GDD, DGD, DDG, DDD}. It is easy to see that E is a part of S and commonly called as a subset of S. Hence an event is always a subset of the sample space.

Definition of Probability

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Probability of an event A is defined as the ratio of two numbers m and n. In symbols

$$P(A) = \frac{m}{n}$$

where m= number of ways that are favorable to the occurrence of A and n= the total number of outcomes of the experiment (all possible outcomes)

Please note that P (A) is always > = 0 and always < = 1.

P (A) is a pure number.

Diagram Explaining Three Extreme Values of Probability

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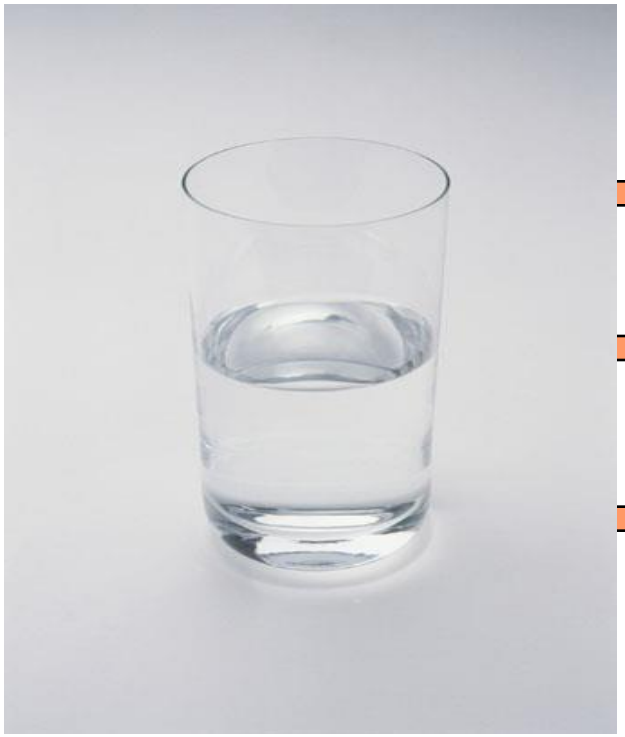
The range with in which probability of an event lies can be best understood by the following diagram. The glass shows three stages-Empty, half-full, and full to explain the properties of probability.



100% Chance or Certainty

(50% Chance) Equally Likely

(0% Chance) Impossibility

Types of Probability

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- A Priori Classical Probability
- Empirical Probability
- Subjective Probability

Mutually Exclusive Events

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Two events A and B are said to be mutually exclusive if the occurrence of A precludes the occurrence of B. For example, from a well shuffled pack of cards, if you pick up one card at random and would like to know whether it is a King or a Queen. The selected card will be either a King or a Queen. It cannot be both a King and a Queen. If King occurs, Queen will not occur and Queen occurs, King will not occur.