

LESSON 4:

INTRODUCTION TO PROBABILITY

TOPICS

- Basic Terms in Probability
- Fundamental Concepts of Probability
- Probability of Two Events using Union and Intersection
- Venn & Tree Diagram

PROBABILITY

- It is the measure of how likely an event is or the relative frequency with which we can expect an event will occur.
- It is a numerical index of the likelihood that a certain event will occur.
- It can be written as *FRACTION*, *DECIMAL*, *PERCENTAGE* or *RATIO*.
- The sum of the probability outcomes will always be between 0 and 1.
 - 1 or 100% - **CERTAIN PROBABILITY**
 - .5 or 50% - **50/50 PROBABILITY**
 - 0 or 0% - **IMPOSSIBLE PROBABILITY**

PROBABILITY TERMS

■ Probability Experiment

- is an action through which specific or well – defined results (*counts, measurements, or responses*) are obtained.
- is a pre – planned process for the sake of producing data that can reveal the purpose of the process application that can result in only one of several possible outcomes.
- *Rolling a die, Tossing a coin, Picking a ball from the box*

PROBABILITY TERMS

- **Outcome**
 - the result of the probability experiment
 - the result of single trial of an experiment
- **Sample Space**
 - the set of all possible outcomes of a probability experiment

PROBABILITY TERMS

- **Event**

- **a collection of one or more outcomes of an experiment**
- **a subset of the sample space**
- **Simple / Elementary Event – any event which consists of a single outcome in the sample space.**
- **Compound Event – events which consist of more than one outcomes**
 - **Union of Events – is an event that has happened and is always associated with an experiment**
 - **Intersection of Events – means that all the events are occurring together.**

PROBABILITY TERMS

- **Event Outcomes**
 - subset of the sample space
 - Outputs are based on the given event

PROBABILITY TERMS

■ In rolling a six – sided die:

- What is an experiment?
- What is an outcomes?
- What is an event?
- What is a sample space?
- What is the event outcomes?

■ In rolling a six – sided die:

- Rolling a die once
- (1, 2, 3, 4, 5, or 6)
- Getting an ODD number
- $S = \{1, 2, 3, 4, 5, 6\}$
- $eoS = \{1, 3, 5\}$

PROBABILITY TERMS

■ In tossing a two coins:

- What is an experiment?
- What is an outcomes?
- What is an event?
- What is a sample space?
- What is the event outcome?

■ In tossing a two coins:

- Tossing two coins once
- (H, H), (H, T), (T, H), or (T, T)
- Getting two heads
- $S = \{(H, H), (H, T), (T, H), (T, T)\}$
- $eoS = \{HH\}$

PROBABILITY OF SIMPLE EVENT

- if each of the outcomes in a sample space is equally likely to occur
- denoted as **P(E)** is given by

$$P(E) = \frac{\text{Number of Event outcomes}}{\text{Total Number of Possible Outcomes in S}}$$

PROBABILITY OF SIMPLE EVENT

- In rolling a six sided die, what are the possible outcomes? 1, 2, 3, 4, 5 and 6

- What is the sample space? $S = \{1, 2, 3, 4, 5, 6\}$

- What is the probability of each outcome? (each and every number)

$$P(E) = \frac{\text{Number of Event outcomes}}{\text{Total Number of Possible Outcomes in } S}$$

$$eoS = \{1\} / eoS = \{2\} / eoS = \{3\}$$

$$P(E) = \frac{1}{6}$$

$$P(E) = 0.17$$

$$P(E) = 17\%$$

PROBABILITY OF SIMPLE EVENT

- In rolling a six sided die, what are the possible outcomes? 1, 2, 3, 4, 5 and 6
- What is the sample space? $S = \{1, 2, 3, 4, 5, 6\}$
- What is the probability of getting an even number? $eoS = \{2, 4, 6\}$

$$P(E) = \frac{\text{Number of Event outcomes}}{\text{Total Number of Possible Outcomes in } S}$$

$$P(E) = \frac{3}{6}$$

$$P(E) = \frac{1}{2}$$

$$P(E) = 0.5$$

$$P(E) = 50\%$$

50/50 PROBABILITY

PROBABILITY OF SIMPLE EVENT

- In a box of crayon, there are 3 red crayons, 5 yellow crayons and 2 blue crayons. If a crayon is picked at random from the box,
 - what is the probability that a crayon picked is yellow?

$S = \{ r, r, r, y, y, y, y, y, b \ \& \ b \}$

$eoS = \{ y, y, y, y, y \}$

$$P(E) = \frac{5}{10}$$

$$P(E) = \frac{1}{2}$$

$$P(E) = 0.5$$

$$P(E) = 50\%$$

50/50 PROBABILITY

$$P(E) = \frac{\text{Number of Event outcomes}}{\text{Total Number of Possible Outcomes in } S}$$

PROBABILITY OF SIMPLE EVENT

- In a box of crayon, there are 3 red crayons, 5 yellow crayons and 2 blue crayons. If a crayon is picked at random from the box,
- what is the probability that a crayon picked is blue?

$S = \{ r, r, r, y, y, y, y, y, b \text{ \& } b \}$

$eoS = \{b,b\}$

$$P(E) = \frac{\text{Number of Event outcomes}}{\text{Total Number of Possible Outcomes in } S}$$

$$P(E) = \frac{2}{10}$$

$$P(E) = \frac{1}{5}$$

$$P(E) = 0.2$$

$$P(E) = 20\%$$

PROBABILITY OF SIMPLE EVENT

- **What is the probability of choosing a vowel from the English alphabet?**

$S = \{A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z\}$

$$P(E) = \frac{\text{Number of Event outcomes}}{\text{Total Number of Possible Outcomes in } S}$$

$e \in S = \{A, E, I, O, U\}$

$$P(E) = \frac{5}{26}$$

$$P(E) = 0.19$$

$$P(E) = 19\%$$

REFERENCES

- Render, Barry, Stair Jr., Ralph M., Hale, Hanna, Michael E., Trevor S. (2018), Quantitative Analysis for Management, Thirteenth Edition, Pearson Education Limited.
- Taja, Ramdy A., (2017), Operations Research An Introduction, Tenth Edition, Pearson Education Limited

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Thank you and God bless!