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Theoretical and Experimental Probability

Unit 12 Lesson 7

Students will be able to:

Understand the and solve problem involving probability of an event

Key Vocabulary:

- Sample space
- Combinations
- Event
- Probability

Probability Theory

Probability is a branch of mathematics that deals with the study of the possible outcomes of an event or set of events, together with the outcomes relatively likelihood and distributions.

Probability Theory

For example, in an experiment of tossing a coin once there are two possible outcomes: either head or tail will come out. The probability that hear occur is 1 out of 2, or 1/2, 0.5 or 50%.

Probabilities can be given in fraction form, in decimals, or in percent. It is denoted by the symbol P(Event). Example P(H) = 1/2.

Probability Theory

Sample Space

In an experiment, the set of all possible outcomes is called the sample space, denoted by *S*.

Event

An event is any subset of a sample space.

Probability Theory

Example: Toss a dies once. The sample space S consists of 6 members which represent the numbers on the 6 faces of a die. Hence, S = {1, 2, 3, 4, 5, 6}. Let A be the event that an even number will occur. Then A = {2, 4, 6}.

The Probability of the Occurrence of an Event

The probability of the occurrence of an event E is given by the formula

$$P(E) = \frac{n(E)}{n(S)}$$

Sample Problem 1. Solve Problem involving theoretical and experimental probability

1. A box contains one red ball, one white ball, and one blue ball. If the experiment is to remove one ball at random from the box, what is the probability that it is red?

Solution:

S ={R,W,B}; E = {R}; n(S) = 3, and n(E) = 1.

Form the formula, P(E) =1/3

Sample Problem 1. Solve Problem involving theoretical and experimental probability

2. Let two dice be tossed once. Find the probability that the sum of the numbers shown on the two top faces is six.

Solution:

$S = \{(1, 1),(1,2),.....,(6,6)\}$ $n(S) = 36$ from 6^2

$E = \{(1, 5), (5, 1), (3, 3), (2, 4),(4, 2)\}$ $n(E) = 5$

$P(E) = 5/36$

Sample Problem 1. Solve Problem involving theoretical and experimental probability

3. From a deck of cards, four cards are drawn at random. What is the probability that:
A. All four are aces?

Solution:

A. n(S) = total number of ways of drawing four cards out of 52
= $_{52}C_4$
= 270,725 ways

n(ace) = 4 aces

P(ace) = 4/ 270725

Sample Problem 1. Solve Problem involving theoretical and experimental probability

3. From a deck of cards, four cards are drawn at random. What is the probability that:
B. All four hearts?

Solution:

B. n(S) = 270,725

n(heart) = $_{13}C_4$
= 715

P(heart) = 715/ 270725 or 11/4165

Sample Problem 1. Solve Problem involving theoretical and experimental probability

4. If a pair of dice is tossed, find the probability that the sum of the numbers that will appear is 5.

Solution:

$n(S) = 36$

$E = \{(1, 4),(4, 1),(2,3),(3,2)\} = 4$

$P(E) = 4/36 = 1/9$ ways