Probability

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1. **Probability:** Probability is the quantitative measure of the degree of certainty of the occurrence of an event.

2. **The probability of a sure event is 1**

3. **The probability of an impossible event is 0.**

4. **The probability of an event E is a number P (e) such that** $0 \le P(E) \le 1$

5. **A random experiment:** An operation which produces some well-defined outcome such that all possible outcomes are known but the exact outcome is unpredictable is called a random experiment.

6. **Event**: The collection of all or some of the possible outcomes of a random experiment is called an event.

7. **Probability of occurrence of an event:** The probability of occurrence of a event E is given by:

$$P(E) = \frac{Number\ of\ outcomes\ favourable\ to\ event\ E}{Total\ number\ of\ possible\ outcomes}$$

8. **Elementary Event**: An event having only one outcome is called an elementary event.
The sum of the probabilities of all the elementary events of an experiment is 1

9. **For any event E, $P(E) + \bar{E} = 1$, where stands for 'not E'. E and $\bar{E}$ are called complementary events.**

10. **Probability of an event cannot be negative and lies between 0 and 1.**

11. **In a pack of 52 cards we have:**
(i) 4 suits - spades, hearts, clubs and diamonds having 13 cards each.
(ii) Each suit has one ace, one king, one queen, one jack and 9 other cards from 2 to 10.
(iii) King, queen and jack are called face cards or picture cards.
(iv) Hearts and diamonds are red coloured cards while spades and clubs are black coloured cards.

Snap Test

1. **1000 tickets of a lottery were sold and there are 5 prizes on these tickets. If Mahir has purchased one lottery ticket, what is the probability of winning a prize?**

(a) $\frac{2}{200}$ (b) $\frac{1}{200}$

(c) $\frac{1}{100}$ (d) $\frac{2}{100}$

(e) None of these

Ans. (b)

Explanation: Total number of all possible outcomes = number of tickets = 1000
Number of favourable outcomes for winning a prize = number of tickets bearing prizes = 5

$\therefore$ Probability of winning a prize $= \frac{5}{1000} = \frac{1}{200}$

2. A card is drawn from an ordinary pack and a gambler bets that it is a spade or an ace. What are the odds against his winning this bet?

(a) $\frac{4}{9}$ (b) $\frac{9}{5}$

(c) $\frac{9}{4}$ (d) $\frac{9}{2}$

(e) None of these

Ans. (c)

Explanation: Total number of all possible outcomes = Total number of cards in the pack = 52.

Let E be the event of the gambler winning the bet i.e. getting a spade or an ace.

There are 13 cards of spades and 3 more aces.

$\therefore$ Number of outcomes favourable to the event $E = 13 + 3 = 16$ and the number of outcomes not favourable to the event $E = 52 - 16 = 32$.

So, the odds against the gambler winning the bet $= \frac{36}{16} = \frac{9}{4}$.

3. One card is drawn from a well-shuffled deck of 52 cards. Calculate the probability that the card drawn is not an ace.

(a) $\frac{4}{13}$ (b) $\frac{1}{13}$

(c) $\frac{3}{26}$ (d) $\frac{12}{13}$

(e) None of these

Ans. (d)

Explanation: P (card drawn is not an ace)

= 1 - P (card drawn is an ace)

$= 1 - \frac{4}{52} = \frac{48}{52} = \frac{12}{13}$.

4. In a simultaneous throw of two coins, the probability of getting at least one head is:

(a) $\frac{3}{4}$ (b) $\frac{1}{3}$

(c) $\frac{2}{3}$ (d) $\frac{1}{2}$

(e) None of these

Ans. (a)

Explanation: All possible outcomes are HH, HT, TH asd TT.

Let E be the event of getting at least one head.

The outcomes favourable to the event E are HH, HT and TH.

Number of favourable outcomes = 3.

$\therefore$ P (getting at least one head) $= P(E) = \frac{3}{4}$

5. What is the probability of getting a sum 9 from two throws of a dice?

(a) $\frac{1}{6}$ (b) $\frac{1}{8}$

(c) $\frac{1}{9}$ (d) $\frac{1}{12}$

(e) None of these

Ans. (c)

Explanation: Total number of outcomes when a dice is thrown twice = 36.

$\therefore$ Total number of all possible outcomes = 36.

Let E be the event of getting a sum 9.

The outcomes favourable to the event E are $(3, 6), (4, 5), (5, 4)$ *and* $(6, 3)$.

Number of favourable outcomes = 4.

$\therefore$ $P(\textit{getting a sum } 9) = P(E) = \frac{4}{36} = \frac{1}{9}$.