Probability

Case Study Based Questions

Read the following passages and answer the questions that follow:

1. One card is drawn from a well shuffled deck of 52 cards. Each outcome is equally likely.

(A) The probability that the card will be a heart is:

(a) $\frac{1}{4}$ (b) $\frac{1}{2}$

(c) $\frac{3}{4}$ (d) $\frac{1}{52}$

(B) The probability that the card will be a black card is:

(a) $\frac{1}{4}$ (b) $\frac{1}{2}$

(c) $\frac{3}{4}$ (d) $\frac{1}{52}$

(C) The probability that the card will be an ace of spade is:

(a) $\frac{1}{4}$ (b) $\frac{1}{2}$

(c) $\frac{3}{4}$ (d) $\frac{1}{52}$

(D) The probability that the card will be a king of red color is:

(a) $\frac{1}{52}$ (b) $\frac{1}{26}$

(c) $\frac{1}{13}$ (d) $\frac{1}{39}$

(E) The probability that the card will be a face card is:

(a) $\frac{3}{13}$ (b) $\frac{4}{13}$

(c) $\frac{2}{13}$ (d) none of these

Ans. (A)

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

Explanation: Total number of possible outcomes = 52

Probability of drawing a heart card = $\frac{13}{52}=\frac{1}{4}$

(B)

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

Explanation: Probability of drawing a black

card = $\frac{26}{52}=\frac{1}{2}$

(C)

spade = $\frac{1}{52}$.

Explanation: Probability of drawing an ace of

spade = $\frac{1}{52}$.

(D)

(b) $\frac{1}{26}$

Explanation: Probability of drawing a king of

red color = $\frac{2}{52}=\frac{1}{26}$

(E)

(a) $\frac{3}{13}$

Explanation: Cards of king, queen and jack are called face cards and there are four suits, namely, heart, diamond, club and spade.

Probability of drawing a face card = $\frac{12}{52}=\frac{3}{13}$

2. During the COVID-19 pandemic due to shortage of doctors team of medical students doing their intership were asked to assist senior doctors during surgeries at city hospital. The probabilities of surgeries rated as very complex,
complex routine simple or very simple are respectively. As shown below:

Very Complex	Complex	Routine	Simple	Very Simple
0.15	0.20	0.31	0.26	0.08

Based on the above information answer the following questions.
Find the probability that particular surgery will be:

(A) Complex or very complex

(B) Neither very complex nor very simple.

(C) If P(A) is $\frac{3}{5}$. Find P(not A).

Ans. (A) P(complex or very complex)

$= P(E_1 \text{ or } E_2)$
$= P(E_1 \cup E_2)$
$= P(E_1) + P(E_2) - P(E_1 \cap E_2)$
$= 0.15 + 0.20 - 0 = 0.35$

(B) P(neither very complex nor very simple)

$= P(E'_1 \cap E'_2)$
$= P(E_1 \cup E_5)'$
$= 1 - P(E_1 \cup E_5)$
$= 1 - [P(E_1) + P(E_5)]$
$= 1 - (0.15 + 0.08)$
$= 1 - 0.23$
$= 0.77$

(C)

(C) Given that, $P(A) = \frac{3}{5}$

To find $P(\text{not } A) = 1 - P(A)$

$$P(\text{not } A) = 1 - \frac{3}{5}$$

$$= \frac{(5-3)}{5}$$

$$= \frac{2}{5}$$

Therefore, $P(\text{not } A) = \frac{2}{5}$.

3. On a Diwali's night, four members of a family plan to play a Ludo game. Head of the family is act as an initiator of the game. He throws a coin and a die.

(A) Find the number of sample points and probability of getting a head.
(B) Find the probability of getting and odd number and also find the probability of getting a head and an even number.
(C) One die of red colour, one of white colour and one of blue colour are placed in a bag. One die is selected at random and rolled, its colour and the number on its uppermost face is noted. Describe the sample space.

Ans. (A) When a coin and a die are thrown, the sample space, S, is given by
S = {H1, H2, H3, H4, H5, H6, T1, T2, T3, T4,T5, T6}
The number of sample points is 12.

Probability of getting a head $= \frac{6}{12} = \frac{1}{2}$

(B) Probability of getting an odd number

$= \frac{6}{12} = \frac{1}{2}$

Probability of getting a head and an even

number $= \frac{3}{12} = \frac{1}{4}$

(C) Let us assume that 1, 2, 3, 4, 5 and 6 are the possible numbers that come when the die is thrown.

And also, assume die of red colour be 'R, die of white colour be 'W, die of blue colour be 'B'.

So, the total number of sample space

= (6 × 3) = 18

The sample space of the event is

S = {(R, 1), (R, 2), (R, 3), (R, 4), (R, 5), (R, 6).

(W, 1), (W, 2), (W, 3), (W, 4), (W, 5), (W, 6),

(B, 1), (B, 2), (B, 3), (B, 4), (B, 5), (B, 6)}