RD Sharma Solutions Class 11 Maths Chapter 33 Ex 33.3

Probability Ex 33.3 Q1

(i) It is valid as each $P(w_1)$ lies between 0 to 1 and sum of $P(w_1) = 1$

(ii) It is valid as each $P(w_i)$ lies between 0 to 1 and sum of $P(w_i) = 1$

(iii) It is not valid as sum of $P(w_i) = 2.8 \neq 1$

(iv) It is not valid as $P(w_7) = \frac{15}{14} > 1$

Which is impossible

(i), (ii)

Probability Ex 33.3 Q2

(i) $\because$ a die is thrown

$\therefore \quad n(S) = 6$

Let E be the event of getting prime number

$\therefore \quad E = \{2, 3, 5\}$

$n(E) = 3$

$\therefore \quad P(E) = \frac{n(E)}{n(S)} = \frac{3}{6} = \frac{1}{2}$

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

(ii) $E = \{2, 4\} \quad \therefore n(E) = 2$

$\therefore \quad P(E) = \frac{2}{6} = \frac{1}{3}$

$\therefore \quad P(E) = \frac{1}{3}$

(iii) $E = \{2, 4, 6, 3\}$

$\Rightarrow \quad n(E) = 4$

$\therefore \quad P(E) = \frac{4}{6} = \frac{2}{3}$

$\therefore \quad P(E) = \frac{2}{3}$

Probability Ex 33.3 Q3

Since a pair of dice have been thrown

$\therefore$ Numbers of elementary events in sample space is $6^2 = 36$

(i) Let E be the event that the sum 8 appear on the faces of dice

$\therefore \quad E = \{(2,6),\ (3,5),\ (4,9),\ (5,3),\ (6,2)\}$

$\therefore \quad n(E) = 5$

$\therefore \quad P(E) = \frac{5}{36}$

(ii) a doublet

Let E be the event that a doublet appears on the faces of dice

$\therefore \quad E = \{(1,1,),\ (2,2),\ (3,3),\ (4,4),\ (5,5),\ (6,6)\}$

$\Rightarrow \quad n(E) = 6$

$\therefore \quad P(E) = \frac{6}{36} = \frac{1}{6}$

(iii) a doublet of prime numbers

Let E be the event that a doublet of prime number appear.

$\therefore \quad E = \{(2,2),\ (3,3),\ (5,5)\}$

$n(E) = 3$

$\therefore \quad P(E) = \frac{3}{36} = \frac{1}{12}$

(iv) a doublet of odd numbers

Let E be the event that a doublet of odd numbers appear.

$\therefore \quad E = \{(11),\ (3,3),\ (5,5)\}$

$\Rightarrow \quad n(E) = 3$

$\therefore \quad P(E) = \frac{3}{36} = \frac{1}{12}$

(v) a sum greater than 9

Let E be the event that a sum greater than appear

$\therefore \quad E = \{(4,6),\ (5,5),\ (5,6),\ (6,4),\ (6,5),\ (6,6)\}$

$\therefore \quad n(E) = 6$

$\therefore \quad P(E) = \frac{6}{36} = \frac{1}{6}$

(vi) an even number on first

Let E be the event that an even number on the first dice appear

Which means any number can be appear on second dice,

$$\therefore \quad E = \begin{Bmatrix} (2,1),\ (2,2),\ (2,3),\ (2,4),\ (2,5),\ (2,6),\ (4,1),\ (4,2),\ (4,3), \\ (4,4),\ (4,5),\ (4,6),\ (6,1),\ (6,2),\ (6,3),\ (6,4),\ (6,5),\ (6,6) \end{Bmatrix}$$

$\therefore \quad n(E) = 18$

$P(E) = \frac{18}{36} = \frac{1}{2}$

(vii) an even number on one and a multiple of 3 on the other.

Let E be the event that an even number on one and multiple of 3 on the other appears.

$\therefore \quad E = \{(2,3),\ (2,6),\ (4,3),\ (4,6),\ (6,3),\ (6,6),\ (3,2),\ (3,4),\ (3,6),\ (6,2),\ (6,4)\}$

$n(E) = 11$

$\therefore \quad P(E) = \dfrac{11}{36}$

(viii) neither 9 or 11 as the sum of the numbers on the faces.

Let E be the event that neither 9 or 11 as the sum of number appear on the faces of dice.

$\therefore \quad \tilde{E}$ be the event that either 9 or 11 as the sum of number appear on the faces of dice.

$\therefore \quad \tilde{E} = \{(3,6),\ (4,5),\ (5,4),\ (5,6),\ (6,3),\ (6,5)\}$

$\therefore \quad n(\tilde{E}) = 6$

$P(\tilde{E}) = \dfrac{6}{36} = \dfrac{1}{6}$

$\therefore \quad P(E) = 1 - P(\tilde{E})$

$= 1 - \dfrac{1}{6} = \dfrac{5}{6}$

(ix) a sum less than 6.

Let E be the event that less than 6 as a sum offer on the faces of dice.

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

$\therefore \quad n(E) = 10$

$\therefore \quad P(E) = \dfrac{10}{36} = \dfrac{5}{18}$

(x) a sum less than 7.

Let E be the event that less than 7 as a sum appears on the faces of dice.

$$\therefore \quad E = \left\{ \begin{matrix} (1,1), & (1,2), & (1,3), & (1,4), & (1,5), & (2,1), & (2,2), & (2,3), \\ (2,4), & (3,1), & (3,2), & (3,3), & (4,1), & (4,2), & (5,1) & \end{matrix} \right\}$$

$$n(E) = 15$$

$$P(E) = \frac{15}{36} = \frac{5}{12}$$

(xi) a sum more than 7.

Let E be the event that a sum more than 7 appear on the faces of dice.

$$\therefore \quad E = \left\{ \begin{matrix} (2,6), & (3,5), & (3,6), & (4,4), & (4,5), & (4,6), & (5,3), & (5,4), \\ (5,5), & (5,6), & (6,2), & (6,3), & (6,4), & (6,5), & (6,6) & \end{matrix} \right\}$$

$$\Rightarrow \quad n(E) = 15$$

$$P(E) = \frac{15}{36} = \frac{5}{12}$$

(xii) neither a doublet nor a total of 10.

Let E be the event that neither a doublet nor a sum of 10 appear on the fraces of dice.

$\therefore$ $\tilde{E}$ be the event that either a doublet or a sum of 10 appear on the faces of dice.

$$\therefore \quad \tilde{E} = \{(1,1), (2,2), (3,3), (4,6), (5,5), (6,4), (6,6)\}$$

$$n(\tilde{E}) = 8$$

$$P(\tilde{E}) = \frac{8}{36} = \frac{2}{9}$$

$$\therefore \quad P(E) = 1 - P(\tilde{E})$$

$$= 1 - \frac{2}{9} = \frac{7}{9}$$

(xiii) odd number on the first and 6 on the second.

Let E be the event that an odd number on the first and 6 on the second appear on the faces of dice.

$\therefore \quad E = \{(1,6),\ (3,6),\ (5,6)\}$

$n(E) = 3$

$\therefore \quad P(E) = \frac{3}{36} = \frac{1}{12}$

(xiv) a number greater than 4 on each die.

Let E be the event that a number greater than 4 appear on each dice

$\therefore \quad E = \{(5,5),\ (5,6),\ (6,5),\ (6,6)\}$

$\Rightarrow \quad n(E) = 4$

$\therefore \quad P(E) = \frac{4}{36} = \frac{1}{9}$

(xv) a total of 9 or 11.

Let E be the event that a total of 9 or 11 appear on faces of dice.

$\therefore \quad E = \{(3,6),\ (4,5),\ (5,4),\ (5,6),\ (6,3),\ (6,5)\}$

$\Rightarrow \quad n(E) = 6$

$\therefore \quad P(E) = \frac{6}{36} = \frac{1}{6}$

(xvi) a total greater than 8.

Let E be the event that sum greater than 8 appear.

$\therefore \quad E = \{(3,6),\ (4,5),\ (4,6),\ (5,4),\ (5,5),\ (5,6),\ (6,3),\ (6,4),\ (6,5),\ (6,6)\}$

$\therefore \quad n(E) = 10$

$\therefore \quad P(E) = \frac{10}{36} = \frac{5}{18}$

Probability Ex 33.3 Q4

$\because$ Three dice are thrown

$\therefore \quad n(S) = 6^3 = 216$

Let E be the event of getting total of if 17 or 18

$\therefore \quad E = \{(6,6,5),\ (6,5,6),\ (5,6,6),\ (6,6,6)\}$

$\Rightarrow \quad n(E) = 4$

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

$$= \frac{4}{216}$$

$$= \frac{1}{54}$$

$\therefore \ P(E) = \frac{1}{54}$

Probability Ex 33.3 Q5

Three coins are tossed

$\therefore \quad n(S) = 2^3 = 8$

(i) E be the event of getting exactly two heads

$\therefore \quad E = \{HHT, HTH, THH\}$

$\therefore \quad n(E) = 3$

$\therefore \quad P(E) = \frac{3}{8}$

(ii) E at least two heads (two or 3 heads)

$\therefore \quad E = \{HHH, HHT, THH, HTH\}$

$n(E) = 4$

$\therefore \quad P(E) = \frac{4}{8} = \frac{1}{2}$

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

(iii) at least one head and one tail

$\therefore \quad E = \{HTT, THT, TTH, HHT, HTH, THH\}$

$\therefore \quad n(E) = 6$

$\therefore \quad P(E) = \frac{6}{8} = \frac{3}{4}$

$P(E) = \frac{3}{4}$

Probability Ex 33.3 Q6

Since in an ordinary year there are 52 weeks and one day.

So, we have to determine the probability of that one day being sunday.

$S = \{M, T, W, TH, F, S, SU\}$

$\therefore \quad P(E) = \frac{1}{7}$

Probability Ex 33.3 Q7

Since in a leap year, there are 52 weeks and two days.

The sample space for the two days will be

$S = \{(M, T), (T, W), (W, TH), (TH, F), (F, S), (S, SU), (SU, M)\}$

$\therefore \quad n(S) = 7$

$E = \{SU, M\}$

$\Rightarrow \quad n(E) = 1$

$P(E) = \frac{1}{7}$

Probability Ex 33.3 Q8

8R 5W

(i) All are white

$= \frac{^5C_3}{^{13}C_3} = \frac{5}{143}$

(ii) All are red

$= \frac{^8C_3}{^{13}C_3} = \frac{28}{143}$

(iii) 1R 2W

$= \frac{^8C_1 \times {^5C_2}}{^{13}C_3} = \frac{40}{143}$

Probability Ex 33.3 Q9

Three dice are rolled then,

$n(S) = 6^3 = 216$

E be the event of getting same numbers on all the three dice

$E = \{(1,1,1), (2,2,2), (3,3,3), (4,4,4), (5,5,5), (6,6,6)\}$

$\therefore \quad n(E) = 6$

$\therefore \quad P(E) = \frac{6}{216} = \frac{1}{36}$

$P(E) = \frac{1}{36}$

Probability Ex 33.3 Q10

$\because$ Two dice are thrown

$\therefore \quad n(S) = 6^2 = 36$

Let E be the event of getting total of the numbers on the dice is greater than 10.

$\therefore \quad E = \{(5,6), (6,5), (6,6)\}$

$\therefore \quad n(E) = 3$

$\therefore \quad P(E) = \frac{3}{36} = \frac{1}{12}$

$\therefore \quad P(E) = \frac{1}{12}$

Probability Ex 33.3 Q11

Since a card is drawn from a pack of 52 cards.

$\therefore$ Numbers of elementary events in the sample space

$$n(E) = {}^{52}C_1 = 52$$

(i) a black king

Let E be the event that a black king appears

$\therefore$ $n(E) = {}^{2}C_1 = 2$ [$\because$ There are two black kings spade and club kings]

$\therefore$ $P(E) = \frac{2}{52} = \frac{1}{26}$

(ii) either a black card or a king

Let E be the event that either a black card or a king

$\therefore$ $n(E) = {}^{26}C_1 + {}^{4}C_1 - {}^{2}C_1$

$= 26 + 4 - 2$

$= 28$ [$\because$ There are two black kings so we subtract in total]

$\therefore$ $P(E) = \frac{28}{52} = \frac{7}{13}$

(iii) a black and a king

Let E be the event that a black and a king appear

$\therefore$ $n(E) = {}^{2}C_1 = 2$

$\therefore$ $P(E) = \frac{2}{52} = \frac{1}{26}$

(iv) a jack, queen or a king

Let E be the event that a jack, queen or a king appear

$n(E) = {}^{4}C_1 + {}^{4}C_1 + {}^{4}C_1$

$= 4 + 4 + 4$

$= 12$

$\therefore$ $P(E) = \frac{12}{52} = \frac{3}{13}$

(v) neither a heart nor a king.

Let E be the event that neither a heart nor a king appears

$\therefore \quad \tilde{E}$ be the event that either a heart or a king appears

$$\therefore \quad n\left(\tilde{E}\right) = {}^{6}C_1 + {}^{4}C_1 - {}^{1}C_1$$

$$= 13 + 4 - 1 \qquad \left[\because \text{There is a heart king so, is deducted}\right]$$

$$= 16$$

$$\therefore \quad P\left(\tilde{E}\right) = \frac{16}{52} = \frac{4}{13}$$

$$\therefore \quad P\left(E\right) = 1 - P\left(\tilde{E}\right)$$

$$= 1 - \frac{4}{13} = \frac{9}{13}$$

(vi) spade or a king

Let E be the event that either a spade or an ace appears

$$n\left(E\right) = {}^{13}C_1 + {}^{4}C_1 - {}^{1}C_1$$

$$= 13 + 4 - 1 = 16$$

$$\therefore \quad P\left(E\right) = \frac{16}{52} = \frac{4}{13}$$

(vii) neither an ace nor a king

Let E be the event that neither an ace nor a king appears

$\therefore \quad \tilde{E}$ be the event that either an ace or a king appears

$$\therefore \quad n\left(\tilde{E}\right) = {}^{4}C_1 + {}^{4}C_1$$

$$= 4 + 4 = 8$$

$$\therefore \quad P\left(\tilde{E}\right) = \frac{8}{52} = \frac{2}{13}$$

$$\therefore \quad P\left(E\right) = 1 - P\left(\tilde{E}\right)$$

$$= 1 - \frac{2}{13} = \frac{11}{13}$$

(viii) a diamond card.

Let E be the event that a diamond card appears

$\therefore \quad n(E) = {}^{13}C_1 = 13$

$\therefore \quad P(E) = \frac{13}{52} = \frac{1}{4}$

(ix) not a diamond card.

Let E be the event that a diamond card does not appear.

$\therefore \quad \tilde{E}$ be the event that a diamond card appears

$\therefore \quad n(\tilde{E}) = {}^{13}C_1 = 13$

$\therefore \quad P(\tilde{E}) = \frac{13}{52} = \frac{1}{4}$

$\therefore \quad P(E) = 1 - P(\tilde{E})$

$= 1 - \frac{1}{4} = \frac{3}{4}$

(x) a black card.

Let E be the event that a black card appears

$\because$ There are 26 black cards (spade and club)

$\therefore \quad n(E) = {}^{26}C_1 = 26$

$P(E) = \frac{26}{52} = \frac{1}{2}$

(xi) not an ace

Let E be the event that an ace card does not appear

$\therefore \quad \tilde{E}$ be the event that an ace appears

$\therefore \quad n(\tilde{E}) = {}^{4}C_1 = 4$

$\Rightarrow \quad P(\tilde{E}) = \frac{4}{52} = \frac{1}{13}$

$\therefore \quad P(\tilde{E}) = \frac{1}{13}$

$P(E) = 1 - \frac{1}{13} = \frac{12}{13}$

(xii) not a black card.

Let E be the event that a black card does not appear which are 26 in numbers (Heart & Diamond)

$\therefore \quad n(E) = {}^{26}C_1 = 26$

$\therefore \quad P(E) = \frac{26}{52} = \frac{1}{2}$

Probability Ex 33.3 Q12

Since from well-shuffled pack of cards, 4 cards missed out

$\therefore \quad n(S) = {}^{52}C_4$

Let E be the event that four missing cards are from each suit

$\therefore \quad n(E) = {}^{13}C_1 \times {}^{13}C_1 \times {}^{13}C_1 \times {}^{13}C_1$

$$\therefore \quad P(E) = \frac{{}^{13}C_1 \times {}^{13}C_1 \times {}^{13}C_1 \times {}^{13}C_1}{{}^{52}C_4}$$

$$= \frac{13 \times 13 \times 13 \times 13}{\frac{52 \times 51 \times 50 \times 49}{4 \times 3 \times 2 \times 1}}$$

$$= \frac{2197}{20825}$$

Probability Ex 33.3 Q13

Since from a deck of cards, four cards are drawn

$\therefore \quad n(S) = {}^{52}C_4$

Let E be the event of that all the four cards drawn are honour cards from same suit.

($\because$ hounour cards means king, queen, Jack & Ace)

$\therefore \quad E = {}^4C_4$ or ${}^4C_4$ or ${}^4C_4$ or ${}^4C_4$

$\Rightarrow \quad n(E) = 4 \times {}^4C_4$

$= 4$

$$\therefore \quad P(E) = \frac{4}{{}^{52}C_4}$$

$$= \frac{4 \times 4 \times 3 \times 2 \times 1}{52 \times 51 \times 50 \times 49}$$

$$= \frac{96}{6497400}$$

$$= \frac{4}{270725}$$

Probability Ex 33.3 Q14

Since one ticket is drawn from a mixed numbers $(1 \text{ to } 20)$ tickets.

$\therefore \quad n(S) = {}^{20}C_1 = 20$

Let E be the event of getting ticket which has number that is multiple of 3 or 7.

$\therefore \quad E = \{3, 6, 7, 9, 12, 14, 15, 18\}$

$\therefore \quad n(E) = 8$

$$\therefore \quad P(E) = \frac{8}{20} = \frac{2}{5}$$

$$\therefore \quad P(E) = \frac{2}{5}$$

Probability Ex 33.3 Q15

BAG:

6-Red ball

4-White ball

8-blue ball

$\because$ Three balls are drawn at random

$\therefore \quad n(S) = {}^{18}C_3$

Let E be the event that one red ball, one white ball and one blue ball was drawn.

$\therefore \quad n(E) = {}^{6}C_1 \times {}^{4}C_1 \times {}^{8}C_1$

$$\therefore \quad P(E) = \frac{{}^{6}C_1 \times {}^{4}C_1 \times {}^{8}C_1}{{}^{18}C_1}$$

$$= \frac{6 \times 4 \times 8 \times 3 \times 2}{18 \times 17 \times 16}$$

$$= \frac{7}{17}$$

$$\therefore P(E) = \frac{4}{17}$$

Probability Ex 33.3 Q16

BAG 7-white ball

5-black ball

4-blue ball

$\because$ Two balls are drawn

$\therefore \quad n(S) = {}^{16}C_2$

(i) Let E be the event that both the balls are white

$\therefore \quad n(E) = {}^{7}C_2$

$$\therefore \quad P(E) = \frac{{}^{7}C_2}{{}^{16}C_2} = \frac{7 \times 6}{16 \times 15} = \frac{7}{40}$$

$$\therefore P(E) = \frac{7}{40}$$

(ii) Let E be the event that, one black ball and one red ball is drawn

$\therefore \quad n(E) = {}^{5}C_1 \times {}^{4}C_1$

$$\therefore \quad P(E) = \frac{{}^{5}C_1 \times {}^{4}C_1}{{}^{16}C_1} = \frac{5 \times 4 \times 2}{16 \times 15} = \frac{1}{6}$$

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

(iii) Let E be the event that both the balls are of the same colour.

$\therefore \quad n(E) = {}^{7}C_2$ or ${}^{5}C_2$ or ${}^{4}C_2$

$$\therefore \quad P(E) = \frac{{}^{7}C_2 + {}^{5}C_2 + {}^{4}C_2}{{}^{16}C_2}$$

$$= \frac{7 \times 6 + 5 \times 4 + 4 \times 2}{16 \times 15} = \frac{70}{240} = \frac{7}{24}$$

BAG 7-white ball

5-black ball

4-blue ball

$\because$ Two balls are drawn

$\therefore \quad n(S) = {}^{16}C_2$

(i) Let E be the event that both the balls are white

$\therefore \quad n(E) = {}^{7}C_2$

$\therefore \quad P(E) = \dfrac{{}^{7}C_2}{{}^{16}C_2} = \dfrac{7 \times 6}{16 \times 15} = \dfrac{7}{40}$

$\therefore \; P(E) = \dfrac{7}{40}$

(ii) Let E be the event that, one black ball and one red ball is drawn

$\therefore \quad n(E) = {}^{5}C_1 \times {}^{4}C_1$

$\therefore \quad P(E) = \dfrac{{}^{5}C_1 \times {}^{4}C_1}{{}^{16}C_1} = \dfrac{5 \times 4 \times 2}{16 \times 15} = \dfrac{1}{6}$

$\therefore \; P(E) = \dfrac{1}{6}$

(iii) Let E be the event that both the balls are of the same colour.

$\therefore \quad n(E) = {}^{7}C_2 \text{ or } {}^{5}C_2 \text{ or } {}^{4}C_2$

$\therefore \quad P(E) = \dfrac{{}^{7}C_2 + {}^{5}C_2 + {}^{4}C_2}{{}^{16}C_2}$

$= \dfrac{7 \times 6 + 5 \times 4 + 4 \times 2}{16 \times 15} = \dfrac{74}{240} = \dfrac{37}{120}$

Probability Ex 33.3 Q17

BAG 6-Red ball

4-White ball

8-Blue ball

Since three ball are drawn

$\therefore \quad n(S) = {}^{18}C_3$

(i) Let E be the event that one red and two white ball are drawn.

$\therefore \quad n(E) = {}^{6}C_1 \times {}^{4}C_2$

$$\therefore \quad P(E) = \frac{{}^{6}C_1 \times {}^{4}C_2}{{}^{18}C_3} = \frac{6 \times 4 \times 3}{2} \times \frac{3 \times 2}{18 \times 17 \times 16}$$

$$P(E) = \frac{3}{68}$$

(ii) Let E be the event that two blue and one red ball was drawn.

$\therefore \quad n(E) = {}^{8}C_2 \times {}^{6}C_1$

$$\therefore \quad P(E) = \frac{{}^{8}C_2 \times {}^{6}C_1}{{}^{18}C_3} = \frac{8 \times 7}{2} \times 6 \times \frac{3 \times 2 \times 1}{18 \times 17 \times 16} = \frac{7}{34}$$

$$P(E) = \frac{7}{34}$$

(iii) Let E be the event that one of the ball must be red.

$\therefore \quad E = \{(R, W, B) \text{ or } (R, W, W) \text{ or } (R, B, B)\}$

$\therefore \quad n(E) = {}^{6}C_1 \times {}^{4}C_1 \times {}^{8}C_1 + {}^{6}C_1 \times {}^{4}C_2 + {}^{6}C_1 \times {}^{8}C_2$

$$\therefore \quad P(E) = \frac{{}^{6}C_1 \times {}^{4}C_1 \times {}^{8}C_1 + {}^{6}C_1 \times {}^{4}C_2 + {}^{6}C_1 \times {}^{8}C_2}{{}^{18}C_3}$$

$$= \frac{396}{816} = \frac{33}{68}$$

Probability Ex 33.3 Q18

Since five cards are drawn from a pack to 52 cards

$$= {}^{52}C_5$$

(i) Let E be the event that those five cards contain exactly one ace.

$$\therefore \quad n(E) = {}^{4}C_1 \times {}^{48}C_4$$

$$\therefore \quad P(E) = \frac{{}^{4}C_1 \times {}^{48}C_4}{{}^{52}C_5}$$

$$= \frac{4 \times 48 \times 47 \times 46 \times 45}{\frac{52 \times 51 \times 50 \times 49 \times 48}{5}}$$

$$= \frac{3243}{10829}$$

(ii) Let E be the event that five cards contain atleast one ace

$$\therefore \quad E = \{1 \text{ or } 2 \text{ or } 3 \text{ or } 4\}$$

$$\therefore \quad n(E) = \frac{{}^{4}C_1 \times {}^{48}C_4 + {}^{4}C_2 \times {}^{48}C_3 + {}^{4}C_3 \times {}^{48}C_2 + {}^{4}C_4 \times {}^{48}C_1}{{}^{52}C_5}$$

$$= \frac{4 \times \frac{48 \times 47 \times 46 \times 45}{4 \times 3 \times 2 \times 1} + \frac{4 \times 3}{2} \times \frac{48 \times 47 \times 46}{3 \times 2 \times 1} + 4 \times \frac{48 \times 47}{2} + 48}{\frac{52 \times 51 \times 50 \times 49 \times 48}{5 \times 4 \times 3 \times 2 \times 1}}$$

$$= \frac{18472}{54145}$$

Probability Ex 33.3 Q19

Since face cards are removed so each suit has 10 cards each.

Now,

four cards are drawn

$$\therefore \quad n(S) = {}^{40}C_4$$

Let E be the event that 4 cards belongs to different suit

$$\therefore \quad n(E) = {}^{10}C_1 \times {}^{10}C_1 \times {}^{10}C_1 \times {}^{10}C_1$$

$$\therefore \quad P(E) = \frac{{}^{10}C_1 \times {}^{10}C_1 \times {}^{10}C_1 \times {}^{10}C_1}{{}^{40}C_4}$$

$$= \frac{1000}{9139}$$

Probability Ex 33.3 Q20

There are 4 men and 6 women on the city council.

$\because$ once council member is selected for a committe.

$$\therefore \quad n(S) = {}^{10}C_1 = 10$$

Let E be the event that it is a women

$$\therefore \quad n(E) = {}^{6}C_1 = 6$$

$$\therefore \quad P(E) = \frac{6}{10} = \frac{3}{5}$$

Probability Ex 33.3 Q21

We have,

A box containing 100 bulbs, out of which 20 are defective

$\therefore$ Number of good bulbs 100 – 20 = 80

Now,

10 balls are selected for inspection

$\therefore$ Numbers of elementary events in sample space

$n(S) = {}^{100}C_{10}$

(i) Let E be the event that all 10 bulbs selected are defective

$n(E) = {}^{20}C_{10}$

$\therefore$ $P(E) = \frac{{}^{20}C_{10}}{{}^{100}C_{10}}$

$= \frac{{}^{20}C_{10}}{{}^{100}C_{10}}$

(ii) Let E be the event that all 10 good bulbs are selected

$\therefore$ $n(E) = {}^{80}C_{10}$

$\therefore$ $P(E) = \frac{{}^{80}C_{10}}{{}^{100}C_{10}}$

(iii) Let E be the event that atleast one bulbs is defective

$E = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$

where,

1, 2, 3, 4, 5, 6, 7, 8, 9, 10 are numbers of defective bulbs

$\because$ $\bar{E}$ be the event that none of the bulbs are defective

$\therefore$ $n(\bar{E}) = {}^{80}C_{10}$

$\therefore$ $P(\bar{E}) = \frac{{}^{80}C_{10}}{{}^{100}C_{10}}$

$\therefore$ $P(E) = 1 - P(\bar{E})$

$= 1 - \frac{{}^{80}C_{10}}{{}^{100}C_{10}}$

(iv) Let E be the event that none of the selected bulbs is defective, that is all bulbs are good

So,

$n(E) = {}^{80}C_{10}$

$P(E) = \frac{{}^{80}C_{10}}{{}^{100}C_{10}}$

Probability Ex 33.3 Q22

Number of Vowels in word SOCIAL are A, I, O

Number of ways we can arrange SOCIAL word with vowels together is S C L (A I O) = 4! × 3!

Total number of arrangements are 6!

$$\text{Probability} = \frac{4! \times 3!}{6!} = \frac{1}{5}$$

Probability Ex 33.3 Q23

As the word CLIFTON has 7 letters

So, $n(S) = 7!$

Now E be the event that in the arrangement two vowels come together.

$\therefore \quad n(E) = 2 \times 6!$

$\therefore \quad P(E) = \frac{2 \times 6!}{7!}$

$= \frac{2}{7}$

Probability Ex 33.3 Q24

'FORTUNATES' 7 there are 10 letters

$\therefore \quad n(S) = 10!$

Let E be the event that both 'T' come together

$\therefore \quad n(E) = 2 \times 9!$

$P(E) = \frac{2 \times 9!}{10!}$

$= \frac{2}{10} = \frac{1}{5}$

Probability Ex 33.3 Q25

We have,

Two men ad two women

Now, a committee of two persons is selected

$\therefore \quad n(S) = {}^4C_2 = \frac{4 \times 3}{2} = 6$

(i) Let E be the event that no man is to be in the committee

$\therefore \quad n(E) = {}^2C_2 = 1$ [only woman will be in the committee]

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

(ii) Let E be the event that one man is in the committee

$\therefore \quad E = (m, 10)$

$\therefore \quad n(E) = {}^2C_1 \times {}^2C_1$

$= 2 \times 2 = 4$

$\therefore \quad P(E) = \frac{4}{6} = \frac{2}{3}$

(iii) Let E be the event that two men in the committe

$\therefore \quad n(E) = {}^2C_2 - 1$

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

Probability Ex 33.3 Q26

Since odd in favour of an event is 2:3

$n(S) = 2k + 3k$

$= 5k$

and, $n(E) = 2k$

$\therefore$ Probability of occurance of this event $= \frac{2k}{2k + 3k} = \frac{2}{5}$

Probability Ex 33.3 Q27

Since odd against an event is 7:9

$\therefore \quad n(S) = 7k + 9k = 16k$

Let E be the event that the event will occur

and $\quad n(E) = 9k$

$\therefore \quad P(E) = \frac{9}{16}$

$\therefore$ Probability of non-occurance of the event is

$P(\bar{E}) = 1 - P(E)$

$= 1 - \frac{9}{16}$

$= \frac{7}{16}$

Probability Ex 33.3 Q28

2-white
3-red
5-green
4-black

$\because$ Two balls are drawn

$\therefore \quad n(S) = {}^{14}C_2$

Let E be the event that all balls are of the same colour

$E = \{WW, RR, GG, BB\}$

$\therefore \quad n(E) = {}^{2}C_2 + {}^{3}C_2 + {}^{5}C_2 + {}^{4}C_2$

$P(E) = \frac{{}^{2}C_2 + {}^{3}C_2 + {}^{5}C_2 + {}^{4}C_2}{{}^{14}C_2}$

$= \frac{40}{182}$

$= \frac{20}{91}$

$\therefore$ Probability that both are of different colour

$P(\bar{E}) = 1 - P(E)$

$= 1 - \frac{20}{91}$

$= \frac{71}{91}$

$= 0.78$

Probability Ex 33.3 Q29

Since two unbiased dice are thrown

$\therefore \quad n(S) = 6^2 = 36$

(i) Let E be the event that neither a doublet nor a total of 8 will appear.

$\therefore \quad \bar{E}$ be the event that a doublet or a total of 8 will appear

$\bar{E} = \{(1,1), (2,2), (3,3), (4,4), (5,5), (6,6), (2,6), (3,5), (5,3), (6,2)\}$

$\therefore \quad n(\bar{E}) = 10$

$\therefore \quad P(\bar{E}) = \frac{10}{36}$

$P(E) = 1 - P(\bar{E})$

$= 1 - \frac{10}{36} = \frac{26}{36} = \frac{13}{18}$

(ii) Let E be the event that the sum of the numbers obtained on the two dice is neither a multiple of 2 nor a multiple of 3.

$\therefore \quad \bar{E}$ be the event that the sum of the number obtained on the two dice is either a multiple of 2 or a multiple of 3, that is total should be 2, 3, 4, 6, 8, 9, 10, 12

$$\therefore \quad \bar{E} = \left\{\begin{matrix}(1,1), (1,2), (2,1), (1,3), (2,2), (3,1), (1,5), (2,4), (3,3), (4,2), (5,1), (2,6), \\ (3,5), (4,4), (5,3), (6,2), (3,6), (4,5), (5,4), (6,3), (4,6), (5,5), (6,4), (6,6)\end{matrix}\right\}$$

$\therefore \quad n(\bar{E}) = 24$

$\therefore \quad P(\bar{E}) = \frac{24}{36}$

$= \frac{4}{6}$

$= \frac{2}{3}$

$\therefore \quad P(E) = 1 - P(\bar{E})$

$= 1 - \frac{2}{3}$

$= \frac{1}{3}$

Probability Ex 33.3 Q30

Bag

8-Red

3-White

9-Blue

Since three balls are drawn

$\therefore n(S) = {}^{20}C_3$

(i) Let E be the event that all the three balls are blue

$\therefore \quad n(E) = {}^{9}C_3$

$\therefore \quad P(E) = \frac{{}^{9}C_3}{{}^{20}C_3}$

$= \frac{9 \times 8 \times 7}{20 \times 19 \times 18}$

$= \frac{7}{95}$

(ii) Let E be the event that all the balls are of different colour.

$\therefore \quad n(E) = {}^{8}C_1 \times {}^{3}C_1 \times {}^{9}C_1$

$\therefore \quad P(E) = \frac{{}^{8}C_1 \times {}^{3}C_1 \times {}^{9}C_1}{{}^{20}C_3}$

$= \frac{8 \times 3 \times 9}{{}^{20}C_3}$

$= \frac{18}{95}$

Probability Ex 33.3 Q31

Bag

5-Red

6-White

7-Black

Since two balls are drawn at random

$\therefore \quad n(S) = {}^{18}C_2$

Let E be the event that both balls are either red or black

$\therefore \quad n(E) = {}^{5}C_2 + {}^{7}C_2$

$$\therefore \quad P(E) = \frac{{}^{5}C_2 + {}^{7}C_2}{{}^{18}C_2}$$

$$= \frac{62}{306}$$

$$= \frac{31}{153}$$

Probability Ex 33.3 Q32

As the letter is choosen from English alphabet

$\therefore \quad n(S) = 26$ [$\because$ there are 26 letters in english alphabet]

(i) Let E be the event that a vowel has been choosen

$\therefore \quad n(E) = {}^{5}C_1$ [$\because$ there are h vowels in english alphabet]

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

(ii) Probability that a consonant is choosen

$$\Rightarrow \quad P(\overline{E}) = 1 - P(E)$$

$$= 1 - \frac{5}{26}$$

$$= \frac{21}{26}$$

Probability Ex 33.3 Q33

As six number has been choosen from 1-20 numbers

$\therefore \quad {}^{20}C_6$

Let E be the event that six number choosen in matched with the given number

$\Rightarrow \quad n(E) = 1$ [As winning number is fixed]

$$\therefore \ P(E) = \frac{1}{{}^{20}C_6}$$

$$= \frac{6 \times 5 \times 4 \times 3 \times 2 \times 1}{20 \times 19 \times 18 \times 17 \times 16 \times 15}$$

$$= \frac{1}{38760}$$

Probability Ex 33.3 Q34

We have 20 cards numbered from 1 to 20, one card is drawn at random

$\therefore \quad n(S) = {}^{20}C_1 = 20$

(i) Let E be the event that the number on the drawn cards is multiple of 4

$\therefore \quad E = \{4, 8, 12, 16, 20\}$

$\therefore \quad n(E) = 5$

$\therefore \quad P(E) = \frac{5}{20} = \frac{1}{4}$

(ii) Let E be the event that the number on the drawn card is not the multiple of 4

$\therefore$ $\tilde{E}$ be the event that the number on the drawn card is the multiple of 4

$\therefore \quad \tilde{E} = \{4, 8, 12, 1620\}$

$\Rightarrow \quad n(\tilde{E}) = 5$

$\therefore \quad P(\tilde{E}) = \frac{5}{20} = \frac{1}{4}$

$\therefore \quad P(E) = 1 - P(\tilde{E})$

$= 1 - \frac{1}{4} = \frac{3}{4}$

(iii) Let E be the event that the number on the drawn card is odd.

$\therefore \quad E = \{1, 3, 5, 7, 9, 11, 13, 15, 17, 19\}$

$\therefore \quad n(E) = 10$

$\therefore \quad P(E) = \frac{10}{20} = \frac{1}{2}$

(iv) Let E be the event that number on the drawn card is greater that 12.

$\therefore \quad E = \{13, 14, 15, 16, 17, 18, 19, 20\}$

$\therefore \quad n(E) = 8$

$\Rightarrow \quad P(E) = \frac{8}{20} = \frac{2}{5}$

(v) Let E be the event that number on the drawn card is divisible by 5.

$E = \{5, 10, 15, 20\}$

$n(E) = 4$

$\therefore \quad P(E) = \frac{4}{20} = \frac{1}{5}$

(vi) Let E be the event that number on the drawn card is not divisible by 6.

$\therefore$ $\tilde{E}$ be the event that number on the drawn card is divisible by 6

$\therefore \quad \tilde{E} = \{6, 12, 18\}$

$\Rightarrow \quad n(\tilde{E}) = 3$

$\therefore \quad P(\tilde{E}) = \frac{3}{20}$

$P(E) = 1 - P(\tilde{E})$

$= 1 - \frac{3}{20} = \frac{17}{20}$

Probability Ex 33.3 Q35

Two dice are thrown

$\therefore \quad n(S) = 6^2 = 36$

(i) E be the event that total sum is 4 on two dice

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

$\Rightarrow \quad n(E) = 3$

$\therefore \quad P(E) = \frac{3}{36} = \frac{1}{12}$

Also, $P(\overline{E}) = 1 - P(E)$

$= 1 - \frac{1}{12}$

$= \frac{11}{12}$

Odds in favour of getting sum as 4 is $P(E) : P(\overline{E}) = 1:11$

(ii) E be the event of getting sum as 5 is

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

$\Rightarrow \quad n(E) = 4$

$\therefore \quad P(E) = \frac{4}{36} = \frac{1}{9}$

$P(\overline{E}) = 1 - P(E)$

$= \frac{8}{9}$

$\therefore$ Odd in favour of getting sum as 5 is

$P(E) : P(\overline{E}) = 1:8$

(iii) E be the event of getting sum 6

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

$\Rightarrow \quad n(E) = 5$

$\therefore \quad P(E) = \frac{5}{36}$

$P(\overline{E}) = 1 - P(E)$

$= \frac{31}{36}$

$\therefore$ Odds against getting sum as 6 in

$P(\overline{E}) : P(E) = 31:5$

Probability Ex 33.3 Q36

Let E be event of getting a spade from a

a) will shuffled deck of card

$\therefore \quad P(E) = \frac{13}{52} = \frac{1}{4}$

$\Rightarrow \quad P(\overline{E}) = \frac{3}{4}$

$\therefore$ Odd in favour of getting a spade from a pack of cards is

$P(E) : P(\overline{E}) = 1:3$

b) Let E be the event of getting a king from a pack of cards.

$\therefore \quad P(E) = \frac{4}{52} = \frac{1}{13}$

$\Rightarrow \quad P(\overline{E}) = \frac{12}{13}$

$\therefore$ Odd in favour of getting a king is

$P(E) : P(\overline{E}) = 1:12$

Probability Ex 33.3 Q37

10 Red, 20 Blue, 30 Green

(i) All 5 are blue

$$= \frac{{}^{20}C_5 \times {}^{40}C_0}{{}^{60}C_5} = \frac{34}{11977}$$

(ii)atleast one green = 1 − no green

Different combinations possible for no green case are

5B, 1R 4B, 2R 3B, 3R 2B, 4R 1B, 5R

$5B = {}^{20}C_5$

$1R\ 4B = {}^{10}C_1 \times {}^{20}C_4$

$2R\ 3B = {}^{10}C_2 \times {}^{20}C_3$

$3R\ 2B = {}^{10}C_3 \times {}^{20}C_2$

$4R\ 1B = {}^{10}C_4 \times {}^{20}C_1$

$5R = {}^{10}C_5$

atleast one green = 1 − no green

$$= 1 - \frac{{}^{20}C_5 + {}^{10}C_1 \times {}^{20}C_4 + {}^{10}C_2 \times {}^{20}C_3 + {}^{10}C_3 \times {}^{20}C_2 + {}^{10}C_4 \times {}^{20}C_1 + {}^{10}C_5}{{}^{60}C_5}$$

$$= \frac{4367}{4484}$$

Probability Ex 33.3 Q38

We have 6 red marbles numbered 1-6 and we have 4 white marbles numbered 12-15 one marble is tobe drawn

$\therefore \quad n(S) = {}^{10}C_1$

i) E be event of getting white marble

$\therefore \quad n(E) = {}^{4}C_1$

$\therefore \quad P(E) = \frac{{}^{4}C_1}{{}^{10}C_1} = \frac{4}{10} = \frac{2}{5}$

ii) E be the event of getting white marble with odd numbered marble.

$\therefore \quad E = \{13, 15\}$

$\Rightarrow \quad n(E) = 2$

$P(E) = \frac{2}{10} = \frac{1}{5}$

iii) E be the event of getting even numbered marble

$\therefore \quad E = \{2, 4, 6, 12, 24\}$

$\Rightarrow \quad n(E) = 5$

$P(E) = \frac{5}{10} = \frac{1}{2}$

iv) E_1 be the event of getting red marble

$$P(E_1) = \frac{6}{10}$$

E_2 be the event of getting even numbered marble

$\therefore$ $$P(E_2) = \frac{5}{10} \quad \text{[as in (ii)]}$$

$\therefore$ $(E_1 \cap E_2)$ = even numbered marble = $\{2, 4, 6\}$

$\Rightarrow$ $$n(E_1 \cap E_2) = 3$$

$$P(E_1 \cap E_2) = \frac{3}{10}$$

$\therefore$ By law of addition,

$$P(E_1 \cup E_2) = P(E_1) + P(E_2) - P(E_1 \cap E_2)$$

$$= \frac{6}{10} + \frac{5}{10} - \frac{3}{10} = \frac{8}{10}$$

$$= \frac{4}{5}$$

Probability Ex 33.3 Q39

10 boys

8 girls

Three students are selected at random

$$n(S) = {}^{18}C_3$$

(i) E be the event that the group has all boys

$\therefore$ $$n(E) = {}^{10}C_3$$

$\therefore$ $$P(E) = \frac{{}^{10}C_3}{{}^{18}C_3}$$

$$= \frac{10 \times 9 \times 8}{18 \times 17 \times 16}$$

$$= \frac{5}{34}$$

(ii) E be the event that the group has all girls

$\therefore$ $$n(E) = {}^{8}C_3$$

$\therefore$ $$P(E) = \frac{{}^{8}C_3}{{}^{18}C_3}$$

$$= \frac{8 \times 7 \times 6}{18 \times 17 \times 16}$$

$$= \frac{7}{102}$$

(iii) E be the event that the group has one boy and two girls

$\therefore$ $$n(E) = {}^{8}C_1 \times {}^{10}C_2$$

$\therefore$ $$P(E) = \frac{{}^{8}C_1 \times {}^{10}C_2}{{}^{18}C_3}$$

$$= \frac{35}{102}$$

(iv) E be the event that atleast one girls in the group

$\therefore \quad E = \{1,2,3\}$ girls

$\therefore \quad n(E) = {}^8C_1 \times {}^{10}C_2 + {}^8C_2 \times {}^{10}C_1 + {}^8C_3 \times {}^{10}C_0$

$$P(E) = \frac{{}^8C_1 \times {}^{10}C_2 + {}^8C_2 \times {}^{10}C_1 + {}^8C_3}{{}^{18}C_3}$$

$$= \frac{29}{34}$$

(v) E be the event that almost one girl in the group

$\therefore \quad E = \{0,1\}$ girls

$\therefore \quad n(E) = {}^8C_0 \times {}^{10}C_3 + {}^8C_1 \times {}^{10}C_2$

$$P(E) = \frac{{}^{10}C_3 + 8 \times {}^{10}C_2}{{}^{18}C_3}$$

$$= \frac{10}{17}$$

Probability Ex 33.3 Q40

Five cards are drawn from a well schuffled pack of cards

$\therefore \quad n(S) = {}^{52}C_5$

Let E be the event that all the five cards are hearts

$\therefore \quad n(E) = {}^{13}C_5$

$$\therefore \quad P(E) = \frac{{}^{13}C_5}{{}^{52}C_5}$$

$$= \frac{13 \times 12 \times 11 \times 10 \times 9}{52 \times 51 \times 50 \times 49 \times 48}$$

$$= \frac{33}{66640}$$

Probability Ex 33.3 Q41

Bag has tickets numbered from 1 to 20 two tickets are drawn

$\Rightarrow \quad n(S) = {}^{20}C_2$

(i) Let E be the event that both the tickets have prime number on them

$n(E) = {}^8C_2 = 56$ $\left[\begin{array}{l}\text{as there are 8 prime numbers between} \\ \text{1 to 20 as 2,3,5,7,11,13,17,19}\end{array}\right]$

$$\therefore \quad P(E) = \frac{56}{{}^{20}C_2} = \frac{56}{20 \times 19} = \frac{14}{95}$$

(ii) Let E be the event that one tickets has prime numbers and other has multiple of 4.

$\therefore \quad n(E) = 8 \times 5 = 40$

$P(E) = \frac{40}{{}^{20}C_2} = \frac{40 \times 2}{20 \times 19} = \frac{4}{19}$ $[\because \{4,8,12,16,20\}$ are multiples of $4]$

Probability Ex 33.3 Q42

Urn

7-White balls

5-Black balls

3-Red balls

Since two balls are drawn at random

$\therefore \quad n(S) = \frac{15}{2}$

(i) E be the event that both the balls are red

$\therefore \quad n(E) = {}^3C_2$

$\therefore \quad P(E) = \frac{{}^3C_2}{{}^{15}C_2} = \frac{3 \times 2}{15 \times 14} = \frac{1}{35}$

(ii) E be the event that one ball is red and other is black

$\therefore \quad n(E) = {}^3C_1 \times {}^5C_1$

$\therefore \quad P(E) = \frac{{}^3C_1 \times {}^5C_1}{{}^{15}C_2}$

$= \frac{3 \times 5 \times 2}{15 \times 14} = \frac{1}{7}$

(iii) E be the event that one ball is white

$\therefore \quad n(E) = {}^7C_1 \times {}^8C_1$

$\therefore \quad P(E) = \frac{{}^7C_1 \times {}^8C_1}{{}^{15}C_2}$

$= \frac{7 \times 6 \times 2}{14 \times 15} = \frac{8}{15}$

Probability Ex 33.3 Q43

$\because$ A and B throw a pair of dice

$\therefore$ $n(S) = 6^2 = 36$

Let E be the event that A throws 9 and B throws more than 9, that is 10,11,12

$\therefore \quad \{(4,6), (5,5), (5,6), (6,4), (6,5), (6,6)\}$

$\therefore \quad n(E) = 6$

$\therefore \quad P(E) = \frac{6}{36} = \frac{1}{6}$

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

Probability Ex 33.3 Q44

Since in one hand at whist a player has 13 cards

$\therefore \quad n(S) = {}^{52}C_{13}$

Let E be the event that a player has 4 kings

$\therefore \quad n(E) = {}^{4}C_{4} \times {}^{48}C_{9}$

$$\therefore \quad P(E) = \frac{{}^{4}C_{4} \times {}^{48}C_{9}}{{}^{52}C_{13}}$$

$$= \frac{4 \times {}^{48}C_{9}}{{}^{52}C_{13}}$$

$$= \frac{11}{4165}$$

Probability Ex 33.3 Q45

In the word 'UNIVERSITY' there are 10 letters.

$\therefore \quad n(S) = 10!$

Let E be event that both the I's come together

$n(E) = 2 \times 9!$

$$\therefore \quad P(E) = \frac{2 \times 9!}{10!} = \frac{2}{10} = \frac{1}{5}$$

$\therefore$ The probability that two I's do not come together is

$$P(\bar{E}) = 1 - P(E) = 1 - \frac{1}{5} = \frac{4}{5}$$

$$\therefore \quad P(\bar{E}) = \frac{4}{5}$$