

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

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

Let E be the event of getting prime number

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

$$n(E) = 3$$

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

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

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

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

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

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

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

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

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

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

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

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

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

(ii) a doublet

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

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

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

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

(iii) a doublet of prime numbers

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

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

$$n(E) = 3$$

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

(iv) a doublet of odd numbers

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

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

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

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

(v) a sum greater than 9

Let E be the event that a sum greater than 9 appear

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

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

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

(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,

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

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

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

(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.

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

$$n(E) = 11$$

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

(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.

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

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

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

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

$$\begin{aligned}\therefore P(E) &= 1 - P(\tilde{E}) \\ &= 1 - \frac{1}{6} = \frac{5}{6}\end{aligned}$$

(ix) a sum less than 6.

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

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

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

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

(x) a sum less than 7.

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

$$\therefore E = \left\{ (1,1), (1,2), (1,3), (1,4), (1,5), (2,1), (2,2), (2,3), \right. \\ \left. (2,4), (3,1), (3,2), (3,3), (4,1), (4,2), (5,1) \right\}$$

$$n(E) = 15$$

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

(xi) a sum more than 7.

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

$$\therefore E = \left\{ (2,6), (3,5), (3,6), (4,4), (4,5), (4,6), (5,3), (5,4), \right. \\ \left. (5,5), (5,6), (6,2), (6,3), (6,4), (6,5), (6,6) \right\}$$

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

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

(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 faces of dice.

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

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

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

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

$$\therefore P(E) = 1 - P(\tilde{E}) \\ = 1 - \frac{2}{9} = \frac{7}{9}$$

(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.

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

$$n(E) = 3$$

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

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

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

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

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

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

(xv) a total of 9 or 11.

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

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

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

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

(xvi) a total greater than 8.

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

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

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

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

Probability Ex 33.3 Q4

v. Three dice are thrown

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

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

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

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

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

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

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

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

Probability Ex 33.3 Q5

Three coins are tossed

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

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

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

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

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

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

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

$$n(E) = 4$$

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

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

(iii) at least one head and one tail

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

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

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

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

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.

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

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

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

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

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

$$E = \{SU, M\}$$

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

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

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

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

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

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

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

Probability Ex 33.3 Q10

v. Two dice are thrown

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

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

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

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

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

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

Probability Ex 33.3 Q11

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

∴ 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

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

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

(ii) either a black card or a king

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

$$\begin{aligned} \therefore n(E) &= {}^{26}C_1 + {}^4C_1 - {}^2C_1 \\ &= 26 + 4 - 2 \\ &= 28 \end{aligned} \quad [\because \text{There are two black kings so we subtract in total}]$$

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

(iii) a black and a king

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

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

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

(iv) a jack, queen or a king

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

$$\begin{aligned} n(E) &= {}^4C_1 + {}^4C_1 + {}^4C_1 \\ &= 4 + 4 + 4 \\ &= 12 \end{aligned}$$

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

(v) neither a heart nor a king.

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

∴ \tilde{E} be the event that either a heart or a king appears

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

$$= 13 + 4 - 1$$

[∵ There is a heart king so, is deducted]

$$= 16$$

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

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

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

(vi) spade or a king

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

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

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

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

(vii) neither an ace nor a king

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

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

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

$$= 4 + 4 = 8$$

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

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

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

(viii) a diamond card.

Let E be the event that a diamond card appears

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

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

(ix) not a diamond card.

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

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

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

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

$$\begin{aligned}\therefore P(E) &= 1 - P(\tilde{E}) \\ &= 1 - \frac{1}{4} = \frac{3}{4}\end{aligned}$$

(x) a black card.

Let E be the event that a black card appears

\therefore There are 26 black cards (spade and club)

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

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

(xi) not an ace

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

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

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

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

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

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

(xii) not a black card.

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

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

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

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

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

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

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

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

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

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

Probability Ex 33.3 Q13

Since from a deck of cards, four cards are drawn

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

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

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

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

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

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

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

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

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

Probability Ex 33.3 Q14

Since one ticket is drawn from a mixed numbers (1 to 20) tickets.

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

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

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

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

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

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

Probability Ex 33.3 Q15

BAG:

6-Red ball

4-White ball

8-blue ball

∴ Three balls are drawn at random

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

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

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

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

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

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

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

Probability Ex 33.3 Q16

BAG 7-white ball

5-black ball

4-blue ball

∴ Two balls are drawn

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

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

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

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

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

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

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

$$\therefore P(E) = \frac{{}^5C_1 \times {}^4C_1}{{}^{16}C_2} = \frac{5 \times 4 \times 2}{16 \times 15} = \frac{1}{6}$$

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

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

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

$$\begin{aligned} \therefore P(E) &= \frac{{}^7C_2 + {}^5C_2 + {}^4C_2}{{}^{16}C_2} \\ &= \frac{7 \times 6 + 5 \times 4 + 4 \times 2}{16 \times 15} = \frac{70}{240} = \frac{7}{24} \end{aligned}$$

BAG 7-white ball
 5-black ball
 4-blue ball

∴ Two balls are drawn

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

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

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

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

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

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

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

$$\therefore P(E) = \frac{{}^5C_1 \times {}^4C_1}{{}^{16}C_2} = \frac{5 \times 4 \times 2}{16 \times 15} = \frac{1}{6}$$

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

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

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

$$\begin{aligned} \therefore P(E) &= \frac{{}^7C_2 + {}^5C_2 + {}^4C_2}{{}^{16}C_2} \\ &= \frac{7 \times 6 + 5 \times 4 + 4 \times 2}{16 \times 15} = \frac{74}{240} = \frac{37}{120} \end{aligned}$$

BAG 6-Red ball
 4-White ball
 8-Blue ball

Since three ball are drawn

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

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

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

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

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

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

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

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

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

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

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

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

$$\begin{aligned} \therefore P(E) &= \frac{{}^6C_1 \times {}^4C_1 \times {}^8C_1 + {}^6C_1 \times {}^4C_2 + {}^6C_1 \times {}^8C_2}{{}^{18}C_3} \\ &= \frac{396}{816} = \frac{33}{68} \end{aligned}$$

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.

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

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

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

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

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

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

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

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

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

Probability Ex 33.3 Q19

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

Now,

four cards are drawn

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

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

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

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

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

Probability Ex 33.3 Q20

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

v. once council member is selected for a committee.

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

Let E be the event that it is a women

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

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

Probability Ex 33.3 Q21

We have,

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

∴ Number of good bulbs $100 - 20 = 80$

Now,

10 balls are selected for inspection

∴ 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

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

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

(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

∴ \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,

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

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

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

$$\text{So, } n(S) = 7!$$

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

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

$$\begin{aligned}\therefore P(E) &= \frac{2 \times 6!}{7!} \\ &= \frac{2}{7}\end{aligned}$$

Probability Ex 33.3 Q24

'FORTUNATES' 7 there are 10 letters

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

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

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

$$\begin{aligned}P(E) &= \frac{2 \times 9!}{10!} \\ &= \frac{2}{10} = \frac{1}{5}\end{aligned}$$

Probability Ex 33.3 Q25

We have,

Two men and two women

Now, a committee of two persons is selected

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

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

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

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

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

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

$$\begin{aligned}\therefore n(E) &= {}^2C_1 \times {}^2C_1 \\ &= 2 \times 2 = 4\end{aligned}$$

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

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

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

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

Probability Ex 33.3 Q26

Since odd in favour of an event is 2:3

$$\begin{aligned}n(S) &= 2k + 3k \\ &= 5k\end{aligned}$$

and, $n(E) = 2k$

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

Probability Ex 33.3 Q27

Since odd against an event is 7:9

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

Let E be the event that the event will occur

and $n(E) = 9k$

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

\therefore Probability of non-occurrence of the event is

$$\begin{aligned}P(\bar{E}) &= 1 - P(E) \\ &= 1 - \frac{9}{16} \\ &= \frac{7}{16}\end{aligned}$$

Probability Ex 33.3 Q28

2-white

3-red

5-green

4-black

\therefore Two balls are drawn

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

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

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

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

$$\begin{aligned}P(E) &= \frac{{}^2C_2 + {}^3C_2 + {}^5C_2 + {}^4C_2}{{}^{14}C_2} \\ &= \frac{40}{182} \\ &= \frac{20}{91}\end{aligned}$$

\therefore Probability that both are of different colour

$$\begin{aligned}P(\bar{E}) &= 1 - P(E) \\ &= 1 - \frac{20}{91} \\ &= \frac{71}{91} \\ &= 0.78\end{aligned}$$

Probability Ex 33.3 Q29

Since two unbiased dice are thrown

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

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

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

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

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

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

$$\begin{aligned} P(E) &= 1 - P(\bar{E}) \\ &= 1 - \frac{10}{36} = \frac{26}{36} = \frac{13}{18} \end{aligned}$$

(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.

$\therefore \bar{E}$ 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

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

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

$$\begin{aligned} \therefore P(\bar{E}) &= \frac{24}{36} \\ &= \frac{4}{6} \\ &= \frac{2}{3} \end{aligned}$$

$$\begin{aligned} \therefore P(E) &= 1 - P(\bar{E}) \\ &= 1 - \frac{2}{3} \\ &= \frac{1}{3} \end{aligned}$$

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

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

$$\begin{aligned} \therefore P(E) &= \frac{{}^9C_3}{{}^{20}C_3} \\ &= \frac{9 \times 8 \times 7}{20 \times 19 \times 18} \\ &= \frac{7}{95} \end{aligned}$$

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

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

$$\begin{aligned} \therefore P(E) &= \frac{{}^8C_1 \times {}^3C_1 \times {}^9C_1}{{}^{20}C_3} \\ &= \frac{8 \times 3 \times 9}{{}^{20}C_3} \\ &= \frac{18}{95} \end{aligned}$$

Probability Ex 33.3 Q31

Bag

5-Red

6-White

7-Black

Since two balls are drawn at random

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

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

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

$$\begin{aligned}\therefore P(E) &= \frac{{}^5C_2 + {}^7C_2}{{}^{18}C_2} \\ &= \frac{62}{306} \\ &= \frac{31}{153}\end{aligned}$$

Probability Ex 33.3 Q32

As the letter is chosen from English alphabet

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

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

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

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

(ii) Probability that a consonant is chosen

$$\begin{aligned}\Rightarrow P(\bar{E}) &= 1 - P(E) \\ &= 1 - \frac{5}{26} \\ &= \frac{21}{26}\end{aligned}$$

Probability Ex 33.3 Q33

As six number has been chosen from 1-20 numbers

$$\therefore n(S) = {}^{20}C_6$$

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

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

$$\begin{aligned}\therefore P(E) &= \frac{1}{{}^{20}C_6} \\ &= \frac{6 \times 5 \times 4 \times 3 \times 2 \times 1}{20 \times 19 \times 18 \times 17 \times 16 \times 15} \\ &= \frac{1}{38760}\end{aligned}$$

Probability Ex 33.3 Q34

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

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

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

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

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

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

(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

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

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

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

$$\begin{aligned}\therefore P(E) &= 1 - P(\tilde{E}) \\ &= 1 - \frac{1}{4} = \frac{3}{4}\end{aligned}$$

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

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

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

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

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

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

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

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

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

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

$$n(E) = 4$$

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

(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

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

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

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

$$\begin{aligned}P(E) &= 1 - P(\tilde{E}) \\ &= 1 - \frac{3}{20} = \frac{17}{20}\end{aligned}$$

Two dice are thrown

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

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

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

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

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

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

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

$$= \frac{11}{12}$$

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

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

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

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

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

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

$$= \frac{8}{9}$$

\therefore Odd in favour of getting sum as 5 is

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

(iii) E be the event of getting sum 6

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

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

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

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

$$= \frac{31}{36}$$

\therefore Odds against getting sum as 6 in

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

Probability Ex 33.3 Q36

Let E be event of getting a spade from a

a) will shuffled deck of card

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

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

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

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

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

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

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

\therefore Odd in favour of getting a king is

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

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) at least one green = 1 - no green

Different combinations possible for no green case are

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

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

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

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

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

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

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

at least 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 to be drawn

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

i) E be event of getting white marble

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

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

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

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

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

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

iii) E be the event of getting even numbered marble

$$\therefore E = \{2, 4, 6, 12, 14\}$$

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

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

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

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

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

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

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

\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

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

$$\begin{aligned} \therefore P(E) &= \frac{{}^{10}C_3}{{}^{18}C_3} \\ &= \frac{10 \times 9 \times 8}{18 \times 17 \times 16} \\ &= \frac{5}{34} \end{aligned}$$

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

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

$$\begin{aligned} \therefore P(E) &= \frac{{}^8C_3}{{}^{18}C_3} \\ &= \frac{8 \times 7 \times 6}{18 \times 17 \times 16} \\ &= \frac{7}{102} \end{aligned}$$

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

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

$$\begin{aligned} \therefore P(E) &= \frac{{}^8C_1 \times {}^{10}C_2}{{}^{18}C_3} \\ &= \frac{35}{102} \end{aligned}$$

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

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

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

$$P(E) = \frac{{}^8C_1 \times {}^{10}C_2 + {}^8C_2 \times {}^{10}C_1 + {}^8C_3}{{}^{18}C_3}$$
$$= \frac{29}{34}$$

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

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

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

$$P(E) = \frac{{}^{10}C_3 + 8 \times {}^{10}C_2}{{}^{18}C_3}$$
$$= \frac{10}{17}$$

Probability Ex 33.3 Q40

Five cards are drawn from a well schuffled pack of cards

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

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

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

$$\therefore P(E) = \frac{{}^{13}C_5}{{}^{52}C_5}$$
$$= \frac{13 \times 12 \times 11 \times 10 \times 9}{52 \times 51 \times 50 \times 49 \times 48}$$
$$= \frac{33}{66640}$$

Probability Ex 33.3 Q41

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

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

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

$$n(E) = {}^8C_2 = 56 \quad \left[\text{as there are 8 prime numbers between } \right]$$

[1 to 20 as 2, 3, 5, 7, 11, 13, 17, 19]

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

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

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

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

Probability Ex 33.3 Q42

Urn

7-White balls

5-Black balls

3-Red balls

Since two balls are drawn at random

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

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

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

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

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

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

$$\begin{aligned}\therefore P(E) &= \frac{{}^3C_1 \times {}^5C_1}{{}^{15}C_2} \\ &= \frac{3 \times 5 \times 2}{15 \times 14} = \frac{1}{7}\end{aligned}$$

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

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

$$\begin{aligned}\therefore P(E) &= \frac{{}^7C_1 \times {}^8C_1}{{}^{15}C_2} \\ &= \frac{7 \times 6 \times 2}{14 \times 15} = \frac{8}{15}\end{aligned}$$

Probability Ex 33.3 Q43

$\therefore A$ 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

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

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

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

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

Probability Ex 33.3 Q44

Since in one hand at whist a player has 13 cards

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

Let E be the event that a player has 4 kings

$$\therefore n(E) = {}^4C_4 \times {}^{48}C_9$$

$$\begin{aligned}\therefore P(E) &= \frac{{}^4C_4 \times {}^{48}C_9}{{}^{52}C_{13}} \\ &= \frac{4 \times {}^{48}C_9}{{}^{52}C_{13}} \\ &= \frac{11}{4165}\end{aligned}$$

Probability Ex 33.3 Q45

In the word 'UNIVERSITY' there are 10 letters.

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

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

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

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

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

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

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