Chapter 11

Probability

Exercise 11.1

1. **a)** **If $P(B) = 0.60$, $P(A \cap B) = 0.48$, find $P(A/B)$.**

   b) **If $P(A) = 0.56$, $P(A \cap B) = 0.21$, find $P(B/A)$.**

   c) **If $P(A) = \frac{5}{12}$, $P(B) = \frac{1}{4}$ and $P(A \cap B) = \frac{1}{6}$, find $P(A/B)$ and $P(B/A)$.**

   d) **If $P(A) = 0.42$, $P(B) = 0.30$, $P(A \cup B) = 0.48$, find $P(A/B)$, $P(B/A)$.**

Sol^n: a) Here, $P(B) = 0.60$, $P(A \cap B) = 0.48$, $P(A/B) = ?$

Now, $P(A \cap B) = P(B) \times P(A/B)$

$\Rightarrow \quad 0.48 = 0.60 \times P(A/B)$

$\Rightarrow \quad \frac{0.48}{0.60} = P(A/B)$

$\Rightarrow \quad P(A/B) = 0.8 = \frac{4}{5}$.

b) Here, $P(A) = 0.56$, $P(A \cap B) = 0.21$, $P(B/A) = ?$

Now, $P(A \cap B) = P(A) \times P(B/A)$

$\Rightarrow \quad 0.21 = 0.56 \times P(B/A)$

$\Rightarrow \quad \frac{0.21}{0.56} = P(B/A)$

$\Rightarrow \quad P(B/A) = 0.375 = \frac{3}{8}$.

c) Here, $P(A) = \frac{5}{12}$, $P(B) = \frac{1}{4}$, $P(A \cap B) = \frac{1}{6}$, $P(A/B) = ?$, $P(B/A) = ?$

Now, $P(A \cap B) = P(B) \times P(A/B)$

$\Rightarrow \quad \frac{1}{6} = \frac{1}{4} \times P(A/B)$

$\Rightarrow \quad P(A/B) = \frac{4}{6} = \frac{2}{3}$.

Again, $P(A \cap B) = P(A) \times P(B/A)$

$\Rightarrow \quad \frac{1}{6} = \frac{5}{12} \times P(B/A)$

$\Rightarrow \quad P(B/A) = \frac{2}{5}$.

d) Here, $P(A) = 0.42$, $P(B) = 0.30$, $P(A \cup B) = 0.48$, $P(A/B) = ?$, $P(B/A) = ?$

Now, $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$\Rightarrow \quad P(A \cup B) = P(A) + P(B) - P(A) \times P(B/A)$

$\Rightarrow\ 0.48 = 0.42 + 0.30 - 0.42 \times P(B/A)$

$\Rightarrow\ 0.42 \times P(B/A) = 0.72 - 0.48$

$\Rightarrow\ P(B/A) = \frac{0.24}{0.42} = \frac{4}{7}$

$\therefore\ P(A \cap B) = P(A) \times P(B/A) = 0.42 \times \frac{4}{7} = 0.24$

Also, $P(A \cap B) = P(B) \times P(A/B)$

$\Rightarrow\ 0.24 = 0.30 \times P(A/B)$

$\Rightarrow\ P(A/B) = \frac{0.24}{0.30} = \frac{4}{5}$.

2. a) If P(A) = 0.5, P(B) = 0.8 and P(B/A) = 0.4, find P(A/B).

b) If P(A) = 0.36, P(B) = 0.5 and P(A/B) = 0.60, find P(B/A).

Sol^n: a) Here, $P(A) = 0.5$, $P(B) = 0.8$, $P(B/A) = 0.4$, $P(A/B) = ?$

Now, $P(A \cap B) = P(A) \times P(B/A) = 0.5 \times 0.4 = 0.2$

Again, $P(A \cap B) = P(B) \times P(A/B)$

$\Rightarrow\ 0.2 = 0.8 \times P(A/B)$

$\Rightarrow\ \frac{0.2}{0.8} = P(A/B)$

$\Rightarrow\ P(A/B) = \frac{1}{4}$.

b) Here, $P(A) = 0.36$, $P(B) = 0.5$, $P(A/B) = 0.60$, $P(B/A) = ?$

$P(A \cap B) = P(B) \times P(A/B) = 0.5 \times 0.6 = 0.3$

Again, $P(A \cap B) = P(A) \times P(B/A)$

$\Rightarrow\ 0.3 = 0.36 \times P(B/A)$

$\Rightarrow\ \frac{0.3}{0.36} = P(B/A)$

$\Rightarrow\ P(B/A) = \frac{5}{6}$.

3. a) The probability that a person uses NTC mobile is $\frac{5}{8}$ and the probability that a person uses both Ncell and NTC mobile is $\frac{1}{4}$. What is the probability that a person uses Ncell given that he/she has used NTC mobile?

Sol^n: a) Probability that a person uses NTC mobile = $P(A) = \frac{5}{8}$,

Probability that a person uses both Ncell and NTC mobile = $P(B \cap A) = \frac{1}{4}$,

Probability that a person uses Ncell given that he/she has used NTC mobile = $P(B/A) = ?$

Now, $P(B \cap A) = P(A) \times P(B/A)$

$\Rightarrow\ \frac{1}{4} = \frac{5}{8} \times P(B/A)$

$\Rightarrow\ P(B/A) = \frac{2}{5}$.

b) In a certain college, 75% of the students passed in Marketing, 60% of the students passed in Account and 45% of the students passed in both Marketing and Account. A student is selected at random. Find the probability that;

i) he/she passes in Marketing given that he/she passes in Account.

ii) he/she passes in Account if he/she passes in Marketing.

Sol^n: Probability of the students passed in Marketing = $P(M) = 75\% = \frac{75}{100} = \frac{3}{4}$

Probability of the students passed in Account = $P(A) = 60\% = \frac{60}{100} = \frac{3}{5}$,

Probability of the students passed in both Marketing and Account = $P(M \cap A) = 45\% = \frac{45}{100} = \frac{9}{20}$

i) Probability that he/she passes in Marketing given that he/she passes in Account = $P(M/A) = ?$

Now, $P(M \cap A) = P(A) \times P(M/A)$

$\Rightarrow \frac{9}{20} = \frac{3}{5} \times P(M/A)$

$\Rightarrow P(M/A) = \frac{3}{4}$.

ii) Probability that he/she passes in Account if he/she passes in Marketing = $P(A/M) = ?$

Now, $P(M \cap A) = P(M) \times P(A/M)$

$\Rightarrow \frac{9}{20} = \frac{3}{4} \times P(A/M)$

$\Rightarrow P(A/M) = \frac{3}{5}$.

c) The probability that a man likes badminton is 0.60, the probability that a man likes table tennis is 0.5 and he likes both badminton and table tennis is 0.25. Find the probability that;

i) he likes badminton given that he liked table tennis.

ii) he likes table tennis if he liked badminton.

Sol^n: Probability that a man likes badminton = $P(B) = 0.60$,

Probability that a man likes table tennis = $P(T) = 0.5$

Probability that he likes both badminton and table tennis = $P(B \cap T) = 0.25$

i) Probability that he likes badminton given that he liked table tennis = $P(B/T) = ?$

Now, $P(B \cap T) = P(T) \times P(B/T)$

$\Rightarrow 0.25 = 0.5 \times P(B/T)$

$\Rightarrow P(B/T) = \frac{0.25}{0.5} = \frac{1}{2}$.

ii) Probability that he likes table tennis if he liked badminton = $P(T/B) = ?$

Now, $P(B \cap T) = P(B) \times P(T/B)$

$\Rightarrow 0.25 = 0.6 \times P(T/B)$

$\Rightarrow P(T/B) = \frac{0.25}{0.6} = \frac{5}{12}$.

4. a) A coin is tossed two times and the possible outcomes are assumed to be equally likely. If E represents the events that both head and tail have occurred and F represents the events that at least one tail is observed, find P(E), P(F), P(E/F) and P(F/E).

Sol^n: Here, a coin is tossed two times then

∴ Sample space (S) = {HH, HT, TH, TT}

E = Events that both head and tail have occurred = {HH, TT}

∴ $P(E) = \frac{n(E)}{n(S)} = \frac{2}{4} = \frac{1}{2}$

F = Events that at least one tail is observed = {HT, TH, TT}

∴ $P(F) = \frac{n(F)}{n(S)} = \frac{3}{4}$

Again, $E \cap F$ = Events common to both E and F = {TT}

∴ $P(E \cap F) = \frac{n(E \cap F)}{n(S)} = \frac{1}{4}$

Now, $P(E \cap F) = P(F) \times P(E/F)$

$\Rightarrow \frac{1}{4} = \frac{3}{4} \times P(E/F)$

$\Rightarrow P(E/F) = \frac{1}{3}$

Again, $P(E \cap F) = P(E) \times P(F/E)$

$\Rightarrow \frac{1}{4} = \frac{1}{2} \times P(F/E)$

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

b) i) A die is rolled once. What is the conditional probability that face turned up is a prime number given that the outcome is an even number.

Sol^n: Here, a die is rolled once

∴ Sample space (S) = {1, 2, 3, 4 ,5 ,6}

P = Events that face of dice turning up is a prime number = {2, 3, 5}

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

E = Events that face turned up is an even number = {2, 4, 6}

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

$P \cap E$ = Events that face tuning up common to both events P and E = {2}

∴ $P(P \cap E) = \frac{n(P \cap E)}{n(S)} = \frac{1}{6}$

NOW, P(P ∩ E) = P(E) × P(P/E)

$\Rightarrow \frac{1}{6} = \frac{1}{2} \times P(P/E)$

$\Rightarrow P(P/E) = \frac{1}{3}.$

ii) Two dice are thrown once. Find the conditional probability that the numbers in each face show the same number if the sum of the numbers appeared in the faces of the dice is observed to be greater than 9.

Sol^n: Here, two dice are thrown once

∴ The no. of sample points = n(S) = 36

E = EVENTS in each face show the same number = {(1, 1), (2, 2),(3, 3), (4, 4), (5, 5), (6, 6)}

$\therefore \quad P(A) = \frac{n(A)}{n(S)} = \frac{6}{36} = \frac{1}{6}$

B = Events the sum of numbers appeared in the faces is observed to be greater than 9
= {(4, 6), (6, 4), (5, 5), (5, 6), (6, 5), (6, 6)}

$\therefore \quad P(B) = \frac{n(B)}{n(S)} = \frac{6}{36} = \frac{1}{6}$

A ∩ B = Events common to both A and B = {(5, 5), (6, 6)}

$\therefore \quad P(A \cap B) = \frac{n(A \cap B)}{n(S)} = \frac{2}{36} = \frac{1}{18}$

NOW, P(A ∩ B) = P(B) × P(A/B)

$\Rightarrow \frac{1}{18} = \frac{1}{6} \times P(A/B)$

$\Rightarrow P(A/B) = \frac{1}{3}.$

5. a) A lot contains 9 items of which 3 are defective. Two items are chosen from the lot at random one after another without replacement. Find the probability that;

i) both of them are defective **ii) both of them are non-defective**

iii) first is defective and second not

Sol^n: Number of items (n) = 9,

Number of defective items = n(D) = 3

Number of NON-DEFECTIVE items = n(G) = 9 – 3 = 6.

Since the items are chosen one after another without replacement.

i) P(both of them are defective) = $P(D_1D_2) = P(D_1) \times P(D_2/D_1) = \frac{3}{9} \times \frac{2}{8} = \frac{1}{12}$

ii) P(both of them are non-defective) = $P(G_1G_2) = P(G_1) \times P(G_2/G_1) = \frac{6}{9} \times \frac{5}{8} = \frac{5}{12}$

iii) P(first is defective and second not) = $P(D_1G_2) = P(D_1) \times P(G_2/D_1) = \frac{3}{9} \times \frac{6}{8} = \frac{1}{4}$

b) A box contain 4 red and 6 white balls. Two balls are drawn one after another. If first ball is not replaced before the second ball is drawn, find the probability that;

i) both are white **ii) both are red**

iii) first red and second white **iv) one red and one white**

Sol^n: Number of red balls = n(R) = 4

Number of white balls = n(W) = 6

Total no. of balls, n = 4 + 6 = 10

Since the first ball is not replaced before the second ball is draw.

i) P(both are white balls) = $P(W_1W_2) = P(W_1) \times P(W_2/W_1) = \frac{6}{10} \times \frac{5}{9} = \frac{1}{3}$

ii) P(both are red balls) = $P(R_1R_2) = P(R_1) \times P(R_2/R_1) = \frac{4}{10} \times \frac{3}{9} = \frac{2}{15}$

iii) P(first is red and second white balls) = $P(W_1R_2) = P(W_1) \times P(R_2/W_1) = \frac{6}{10} \times \frac{4}{9} = \frac{4}{15}$

i) P(one red and one white balls) $= P(W_1R_2 \text{ OR } R_1W_2)$

$$= P(W_1) \times P(R_2/W_1) + P(R_1) \times P(W_2/R_1)$$

$$= \frac{6}{10} \times \frac{4}{9} + \frac{4}{10} \times \frac{6}{9} = \frac{4}{15} + \frac{4}{15} = \frac{8}{15}$$

c) A box contains 3 red, 4 white and 5 blue balls. From this box 3 balls are drawn in succession (i.e. one by one). Find the probability that they are drawn in order red, white and blue if each ball is not replaced before other ball is drawn.

Sol^n: Number of red balls = n(R) = 3

Number of white balls = n(W) = 4

Number of blue balls = n(B) = 5

∴ Total no. of balls = 3 + 4 + 5 = 12,

Since each ball is not replaced before other ball is drawn so,

P(red, white and blue balls in order) = $P(R_1W_2B_3) = P(R_1) \times P(W_2/R_1) \times P(B_3/R_1 \cap W_2)$

$$= \frac{3}{12} \times \frac{4}{11} \times \frac{5}{10} = \frac{1}{22}$$

d) Two cards are drawn successively one after the other from a well-shuffled pack of 52 cards. If the first card drawn is not replaced, find the probability that;

i) both cards are black **ii) first is black and second red**

iii) both cards are kings.

Sol^n: Total no. of cards in a well-shuffled pack = n(S) = 52,

Here, two balls are drawn successively such that the first ball is not replaced before the second draw.

i) No. of black cards = n(B) = 26

P(both cards are black) = $P(B_1B_2) = P(B_1) \times P(B_2/B_1) = \frac{26}{52} \times \frac{25}{51} = \frac{25}{102}$

ii) No. of red cards = n(R) = 26

P(first is black and second red) = $P(B_1R_2) = P(B_1) \times P(R_2/B_1) = \frac{26}{52} \times \frac{26}{51} = \frac{13}{51}$

iii) No. of king cards = n(K) = 4

P(both cards are kings) = $P(K_1K_2) = P(K_1) \times P(K_2/K_1) = \frac{4}{52} \times \frac{3}{51} = \frac{1}{221}$.

e) A bag contains 15 tickets numbered from 1 to 15. Two tickets are drawn one by one without replacement. Find the probability that i) both tickets have even numbers ii) the first tickets have even number and the second ticket the odd number.

Sol^n: Total no. of tickets = n(S) = 15,

Here, two balls are drawn successively such that the first tickets is not replaced before the second draw.

i) No. of even tickets = n(E) = 7

P(both are even number tickets) = $P(E_1E_2) = P(E_1) \times P(E_2/E_1) = \frac{7}{15} \times \frac{6}{14} = \frac{1}{5}$

ii) No. of even tickets = n(E) = 7 and No. of odd tickets = n(O) = 8

P(first is even and second is odd) = $P(E_1O_2) = P(E_1) \times P(O_2/E_1) = \frac{7}{15} \times \frac{8}{14} = \frac{4}{15}$

6. a) The following table gives the information about the skilled and unskilled workers of a factory.

Workers	**Male**	**Female**	**Total**
Skilled	**75**	**50**	**125**
Unskilled	**50**	**25**	**75**
Total	**125**	**75**	**200**

A worker is selected at random. Find the probability that the selected worker is a;

i) male given that he is skilled. **ii) female given that she is unskilled.**

Sol^n: From the information given in the table,

i) No. of skilled male = $n(S \cap M)$ = 75, Total no. of skilled workers = n(S) = 125

∴ Probability that the selected worker is a male given that he is skilled

$$= P(M/S) = \frac{n(M \cap S)}{n(S)} = \frac{75}{125} = \frac{3}{5}.$$

ii) No. of unskilled female $n(U \cap F)$ = 25, Total no. of unskilled workers = n(U) = 75

∴ Probability that the selected worker is a female given that she is unskilled

$$= P(F/U) = \frac{n(F \cap U)}{n(U)} = \frac{25}{75} = \frac{1}{3}.$$

b) A factory has some automatic and some mechanical machines. Some of these machines are new and some old.

Machine	**Automatic**	**Mechanical**	**Total**
New	**40**	**30**	**70**
Old	**20**	**10**	**30**
Total	**60**	**40**	**100**

A machine is selected. Find the probability that;

i) the machine is new given that it is automatic.

ii) the machine is old given that it is mechanical.

Sol^n: From the information given in the table,

i) No. of new automatic machines = $n(N \cap A) = 40$

Total no. of automatic machines = n(A) = 60

$\therefore$ Probability that the machine is new given that it is automatic = $P(N/A) = \frac{n(N \cap A)}{n(A)} = \frac{40}{60} = \frac{2}{3}$.

ii) No. of old mechanical machines = $n(O \cap M) = 10$

Total no. of mechanical machines = n(M) = 40

$\therefore$ Probability that the machine is old given that it is mechanical = $\frac{n(O \cap M)}{n(M)} = \frac{10}{40} = \frac{1}{4}$.

7. a) An urn contains 6 green and 4 blue marbles . Two successive drawing of 2 marbles are made such that the two marbles drawn in first trial are not replaced before the second trial of drawing 2 marbles. Find the probability that i) first draw gives 2 green and second draw giving two blue marbles ii) both trial give green marble.

Sol^n: No of green balls = 6, No. of blue balls = 4

Total no. of balls = 6 + 4 = 10, No. of balls drawn at a time = 2

Two successive drawing of 2 marbles are made such that the two marbles drawn in first trial are not replaced before the second trial of drawing 2 marbles

a) G1: event getting 2 green balls in first draw

B2: event getting 2 blue balls in second draw

For first draw: Total no of balls = 6 + 4 = 10 and No. of green balls = 6

No. of possible cases for first draw= $C(10, 2) = \frac{10 \times 9 \times 8!}{8!\,2!} = 45$

No. of favorable cases for first draw = $C(6, 2) = \frac{6 \times 5 \times 4!}{4!\,2!} = 15$

For second draw: Total no of balls = 10 - 2 = 8 and No. of blue balls = 4

Again, No. of possible cases for second draw = $C(8, 2) = \frac{8 \times 7 \times 6!}{6!\,2!} = 28$

No. of favorable cases for first draw = $C(4, 2) = \frac{4 \times 3 \times 2!}{2!\,2!} = 6$

$\therefore$ P (first draw gives 2 green and second draw giving 2 blue marbles)

$= P(G1).P(B2/G1)) = \frac{15}{45} \times \frac{6}{28} = \frac{1}{14}$

b) G1: event getting 2 green balls in first draw

G2: event getting 2 green balls in second draw

For first draw: No. of Total balls = 10 and No. of green balls = 6

No of possible cases for first draw= $C(10, 2) = \frac{10 \times 9 \times 8!}{8!\,2!} = 45$

No. of favorable cases for first draw = $C(6, 2) = \frac{6 \times 5 \times 4!}{4!\,2!} = 15$

For second draw: No. of Total balls = 10 – 2 = 8 and No. of green balls = 6 – 2 = 4

Total no. of possible cases for second draw = $C(8, 2) = \frac{8 \times 7 \times 6!}{6!\,2!} = 28$

No. of favorable cases for second draw = $C(4, 2) = \frac{4 \times 3 \times 2!}{2!\,2!} = 6$

$\therefore$ P(both trials gives green marbles) = P(G1).P(G2/G1) = $\frac{15}{45} \times \frac{6}{28} = \frac{1}{14}$

b) From the pack of well shuffled deck of cards, two successive drawn of 2 cards at a time is made without replacing the two cards drawn in the first draw before the second of 2 cards. Find the probability that i) first draw gives 2 red cards and second draw the two black cards ii) the first draw will give 2 hearts and the second draw the two spades.

Sol^n: No of redcards = 26, No. of black = 26

Total no. of cards = 52

No. of cards drawn at a time = 2

Two successive drawing of 2 cards at a time is made without replacing the two cards drawn in the first draw before the second 2 cards

a) R1: event getting 2 redcards in first draw

B2: event getting 2 black cards in second draw

For first draw: Total no of cards = 52and No. of red cards = 26

No. of possible cases for first draw= $C(52, 2) = \frac{52 \times 51 \times 50!}{50!\,2!} = 1326$

No. of favorable cases for first draw = $C(26, 2) = \frac{26 \times 25 \times 24!}{24!\,2!} = 325$

For second draw: Total no of cards = 52 - 2 = 50 and No. of black cards = 26

No. of possible cases for second draw = $C(50, 2) = \frac{50 \times 49 \times 48!}{48!!\,2!} = 1225$

No. of favorable cases for first draw = $C(26, 2) = \frac{26 \times 25 \times 24!}{24!\,2!} = 325$

P (first draw gives 2 red cards and second draw the two black cards)

= P(R1).P(B2/R1)) = $\frac{325}{1326} \times \frac{325}{1225} = \frac{325}{4998}$

b) H1: event getting 2 heart in first draw

S2: event getting 2 spades in second draw

For first draw: No. of cards = 52 and No. of hearts = 13, No of spades = 13

No of possible cases for first draw= $C(52, 2) = \dfrac{52 \times 51 \times 50!}{50!\,2!} = 1326$

No. of favorable cases for first draw = $C(13, 2) = \dfrac{13 \times 12 \times 11!}{11!\,2!} = 78$

For second draw: No. of cards = 52 – 2 = 50 and No. spades = 13

Total no. of possible cases for second draw = $C(50, 2) = \dfrac{50 \times 49 \times 48!}{48!!\,2!} = 1225$

No. of favorable cases for second draw = $C(13, 2) = \dfrac{13 \times 12 \times 11!}{11!\,2!} = 78$

P(the first draw will give 2 hearts and the second draw the two spades)

$= P(G1).P(G2/G1) = \dfrac{78}{1326} \times \dfrac{78}{1225} = \dfrac{78}{20825}$

Hints and solution of MCQ's

1. For two dependent events A and B, $P(B/A) = \dfrac{P(A \cap B)}{P(A)}$, $P(A) \neq 0$
2. For two independent events A and B, $P(A/B) = \dfrac{P(A \cap B)}{P(B)} = \dfrac{P(A).\,P(B)}{P(B)} = P(A)$.
3. $P(A/B) = \dfrac{P(A \cap B)}{P(B)} = \dfrac{0.25}{0.4} = \dfrac{5}{8}$
4. $P(B/A) = P(B) = 0.56$
5. $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

   $\Rightarrow$ $P(A \cap B) = P(A) + P(B) - P(A \cup B) = 0.57 - 0.45 = 0.12$

   $\therefore$ $P(A/B) = \dfrac{P(A \cap B)}{P(B)} = \dfrac{0.12}{0.32} = \dfrac{3}{8} = 0.375$
6. $P(A/B) = \dfrac{P(A \cap B)}{P(B)} = \dfrac{1/4}{1 - 5/8} = \dfrac{1/4}{3/8} = \dfrac{2}{3}$ $\qquad \left[\because P(B) = 1 - P\left(\overline{B}\right)\right]$
7. In a leap year three are 365 + 1 = 366 days in which 52 weeks + 2 days

   It is obvious there are 52 Friday or Saturday or both. But remaining two days have following combinations:

Sunday	Monday
Monday	Tuesday
Tuesday	Wednesday
Wednesday	Thursday
Thursday	Friday
Friday	Saturday
Saturday	Sunday

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

   Let E be the events getting Friday or Saturday or both

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

   $\therefore$ $P(E) = \dfrac{n(E)}{n(S)} = \dfrac{3}{7}$

8. $P(A \cap B) = 0.20$

$\Rightarrow$ $P(A).\ P(B) = 0.20$

$\Rightarrow$ $P(B) = \frac{0.20}{P(A)} = \frac{0.20}{0.36} = \frac{5}{9}$

$\therefore$ $P(\overline{B}) = 1 - P(B) = 1 - \frac{5}{9} = \frac{4}{9}$.

9. $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$\Rightarrow$ $P(A \cup B) = P(A) + P(B) - P(A).\ P(B)$ [A and B are independent]

$\Rightarrow$ $0.61 = 0.48 + P(B) - 0.48 \times P(B)$

$\Rightarrow$ $0.13 = 0.52 \times P(B)$

$\Rightarrow$ $P(B) = 0.25$

10. Out of 52 cards two cards are drawn without replacement method

$\therefore$ P(both cards are aces) = $P(A1).\ P(A2/A1) = \frac{4}{52} \times \frac{3}{51} = \frac{1}{13} \times \frac{1}{17} = \frac{1}{221}$

11. No. of blue balls = 8

No. of white balls = 5

Total balls = 13

Out of 13 balls, two balls are drawn one by one without replacement method

$\therefore$ P(Second ball is white first ball is also white)

$= P(W1).\ P(W2/W1)\ \frac{5}{13} . \frac{4}{12} = \frac{5}{39}$

12. No. of red balls = 2

No. of blue balls = 3

No. of white balls = 5

Here, There balls are drawn in succession without replacement method

$\therefore$ P(ball is in order of white, blue and red)

$= P(W1).\ P(B2/W1),\ P(R3/W1B2) = \frac{5}{10} \times \frac{3}{9} \times \frac{2}{8} = \frac{1}{24}$

13. The probability of sure event and impossible events are respectively 1 and 0.

14. The probability of even E is such that $0 \leq P(E) \leq 1$.

15. No. of boys = 5, No. of girls = 3, Total = 8

Here, a committee of 4 is to made from so which can be alone by C (8,4) ways.

i.e. n(S) = C (8, 5)

Let E be the events which contains two girls. Then remaining 2 out of 4 must be boy. So, selection of 2 girl and 2 boys can be done by C(3,2) × C (5, 2) ways

i.e. n(E) = C(3, 2) × C (5,2)

$\therefore$ $P(E) = \frac{n(E)}{n(S)} = \frac{C(3,2) \times C(5,\ 2)}{C(8,\ 2)} = \frac{3}{7}$