EX - 33.1

**Q1**

Since one coin is tossed, so there are two possibility either head turned up or tail.

SO, the sample space will be

$$S = \{H, T\}$$

Where, $H$ – if head turned up.

$T$ – if tail turned up.

**Q2**

Since two coins are tossed, so the possibilities are either both coin shows head, or tail, or one shows head and other shows tail or vice-versa.

Let $H$ represent head and

$T$ represent tail

Thus, the sample space is given by,

$$S = \{HT, TH, HH, TT\}$$

**Q3**

Since three coins are tossed. So, we have these possibilities.

(i) All coins shows head.

(ii) All coins shows tail.

(iii) First two coins shows head and last coin shows tail.

(iv) First and third coins shows, head and second coin shows tail.

(v) Last two coins shows head and first coin shows tail.

(vi) First coin shows head and last two coins shows tail.

(vii) First and third coin shows tail and second coin shows head.

(viii) Third coin shows head and first two coins shows tail.

So, the number of element in sample space = $2^3 = 8$

Thus, the sample will be,

$$S = \{HHH, TTT, HHT, HTH, THH, HTT, THT, TTH\}$$

## Q4

Since four coins are tossed, so the possibilities are either

$HHHH$ or $TTTT$ or $HHHT$ or $HHTH$ or $HTHH$ or $THHH$ or $HHTT$ or $HTTH$ or $HTHT$ or $THHT$ or $THTH$ or $TTHH$ or $HTTT$ or $THTT$ or $TTHT$ or $TTTH$

It means nos of elements in sample space = $2^4 = 16$

$$S = \begin{Bmatrix} HHHH, & TTTT, & HHHT, & HHTH, & HTHH, & THHH, & HHTT, & HTTH \\ HTHT, & THHT, & THTH, & TTHH, & HTTT, & THTT, & TTHT, & TTTH \end{Bmatrix}$$

## Q5

In a dice there are six faces with numbers 1, 2, 3, 4, 5, 6

So, when two dice are thrown, then we have two faces of dice (one of each) show any two combination of numbers from 1, 2, 3, 4, 5, 6

Thus, the nos of element in sample space = $6^2 = 36$

$$S = \begin{Bmatrix} (1,1), & (1,2), & (1,3), & (1,4), & (1,5), & (1,6), & (2,1), & (2,2), & (2,3), & (2,4), & (2,5), & (2,6), \\ (3,1), & (3,2), & (3,3), & (3,4), & (3,5), & (3,6), & (4,1), & (4,2), & (4,3), & (4,4), & (4,5), & (4,6), \\ (5,1), & (5,2), & (5,3), & (5,4), & (5,5), & (5,6), & (6,1), & (6,2), & (6,3), & (6,4), & (6,5), & (6,6) \end{Bmatrix}$$

## Q6

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Since three dice are thrown together, so each of the three dice will show one face with number 1, 2, 3, 4, 5 or 6.

So, the total number of elementary events associated is $6 \times 6 \times 6 = 216$.

## Q7

$\because$ When a coin is tossed, either tail or head will turn up, where as when a dice is thrown, we have one face with either of 1, 2, 3, 4, 5 or 6.

So, the total number of elementary events associated with this experiment is $2 \times 6 = 12$ and the sample space will be

$$S = \{(H,1), (H,2), (H,3), (H,4), (H,5), (H,6), (T,1), (T,2), (T,3), (T,4), (T,5), (T,6)\}$$

## Q8

When a coin is tossed either head or tail will turn up. And, when head turns up then a dice is rolled otherwise not.

So, the total number of elementary events associated with this experiment is $1 + 6 \times 1 = 7$

Thus, the sample space will be

$$S = \{T,\ (H,1),\ (H,2),\ (H,3),\ (H,4),\ (H,5),\ (H,6)\}$$

## Q9

When a coin is tossed two times, then we have the following possibilities

$HH$, $TT$, $TH$ and $TT$

Now, according to the question, when we have tail in 2nd throw, then a dice is thrown.

So, the total number of elementary events associated with this experiment are

$2 + 2 \times 614$

and the sample space will be

$$S = \begin{Bmatrix} HH,\ TH,\ (HT,1),\ (HT,2),\ (HT,3),\ (HT,4),\ (HT,5),\ (HT,6) \\ (TT,1),\ (TT,2),\ (TT,3),\ (TT,4),\ (TT,5),\ (TT,6) \end{Bmatrix}$$

## Q10

In this experiment, a coin is tossed and if the outcome is tail then a die is tossed once.

Otherwise, the coin is tossed again.

The possible outcome for coin is either head or tail.

The possible outcome for die is 1,2,3,4,5,6.

If the outcome for the coin is tail then sample space is S1={(T,1),(T,2),(T,3),(T,4),(T,5),(T,6)}

If the outcome is head then the sample space is S2={(H,H),(H,T)}

Therefore the required sample space is S={(T,1),(T,2),(T,3),(T,4),(T,5),(T,6),(H,H),(H,T)}

## Q11

$\because$ A coin is tossed, then we have either heads ($H$) or tails ($T$).

If tail turned up, then a ball is drawn from a box which has 2 red and 3 black balls.

So, $S_1 = \{(T, R_1),\ (T, R_2),\ (T, B_1),\ (T, B_2),\ (T, B_3)\}$

If head turned up, then die is rolled

So, $S_2 = \{(H, 1),\ (H, 2),\ (H, 3),\ (H, 4),\ (H, 5),\ (H, 6)\}$

Thus, the elementary events associated with this experiment is

$S = \{S_1 \cup S_2\}$

$= \{(T, R_1),\ (T, R_2),\ (T, B_1),\ (T, B_2),\ (T, B_3),\ (H, 1),\ (H, 2),\ (H, 3),\ (H, 4),\ (H, 5),\ (H, 6)\}$

## Q12

In this experiment, a coin is tossed and if the outcome is tail the experiment is over.

Otherwise, the coin is tossed again.

In the second toss also if the outcome is tail the experiment is over, otherwise tossed again.

In the third toss, if the outcome is tail, the experiment is over, otherwise tossed again.

This process continues indefinitely.

Hence, the sample space $S$ associated to this random experiment is

$S = \{T,\ HT,\ HHT,\ HHHT,\ HHHHT, \ldots\}$

## Q13

In a box 1 Red ball
3 Black ball

Since two balls are drawn without replacement then the elementary event associated with this experiment is

$$S = \left\{\begin{matrix}(R, B_1),\ (R, B_2),\ (R, B_3),\ (B_1, B_2),\ (B_1, B_3),\ (B_1, R), \\ (B_2, R),\ (B_2, B_1),\ (B_2, B_3),\ (B_3, R),\ (B_3, B_1),\ (B_3, B_2)\end{matrix}\right\}$$

## Q14

Since a pair of dice is rolled, so total number of elementary events = $6^2 = 36$

Again, if the doublet is outcomes i.e., we have either $(1,1)$, $(2,2)$, $(3,3)$, $(4,4)$, $(5,5)$, $(6,6)$ then a coin is tossed, then we have $H$ or $T$.

$\therefore$ Total number of elementary events = $6 \times 2 = 12$

Thus, the total number of elementary events = $30 + 12 = 42$

Note: The doublet $(1,1)$, $(2,2)$, $(3,3)$, $(4,4)$, $(5,5)$, $(6,6)$ was also included in 36. So we look 30 in final conclusion.

## Q15

A coin is tossed twice. So, the elementary events are

$$S_1 = \{HH, HT, TH, TT\}$$

Now,

if the second drawn results is head, then a die is rolled then the elementary events is

$$S_2 = \begin{Bmatrix} (HH,1), & (HH,2), & (HH,3), & (HH,4), & (HH,5), & (HH,6), \\ (TH,1), & (TH,2), & (TH,3), & (TH,4), & (TH,5), & (TH,6) \end{Bmatrix}$$

Thus, sample space associated with this experiment is

$$S = S_1 \cup S_2$$

$$S = \begin{Bmatrix} (HH,1), & (HH,2), & (HH,3), & (HH,4), & (HH,5), & (HH,6), & (HT), \\ (TH,1), & (TH,2), & (TH,3), & (TH,4), & (TH,5), & (TH,6), & (TT) \end{Bmatrix}$$

**Q16**

Bag 4 red balls (identical)

3 black ball (identical)

$\because$ A ball is drawn in first attempt, so elementary events is

$$S_1 = \{R,\ B\}$$

Now, the ball will put into the bag and draw are again

$$S_2 = \{R,\ B\}$$

Thus, the sample space associated is

$$S = S_1 S_2 = \{RR,\ RB,\ BR,\ BB\}$$

**Q17**

In a random sampling, three items are selected so it could be any of the following:

a) All defective or

b) All non-defective or

c) Combination of defective and non defective.

Sample space associated with this experiment is

S={DDD, NDN, DND, DNN, NDD, DDN, NND, NNN}

## Q18

Since a family has two children

i) Then the sample space may be

$$S = \{(B_1, B_2),\ (B_1, G_2),\ (G_1, B_2),\ (G_1, G_2)\}$$

when subscript 1 and 2 represent elder and younger children.

ii) Since the family has two children so, the following possibility of boys in the family

i) No boys only girls

ii) One boy and one girl

iii) Two boys only

$\therefore\ S = \{0, 1, 2\}$

$S = \{0, 1, 2\}$

## Q19

Since we have 3 coloured dice

1 – red dice

1 – white dice and

1 – black dice

Now, one of the dice is drawn and rolled and the number of the face is noted.

So, in case red dice is drawn then the sample space will be

$$S_1 = \{(R,1),\ (R,2),\ (R,3),\ (R,4),\ (R,5),\ (R,6)\}$$

Similar argument for black dice

$$S_2 = \{(B,1),\ (B,2),\ (B,3),\ (B,4),\ (B,5),\ (B,6)\}$$

and for white dice

$$S_3 = \{(W,1),\ (W,2),\ (W,3),\ (W,4),\ (W,5),\ (W,6)\}$$

Thus, the sample space associated with this experiment is

$$S = S_1 \cup S_2 \cup S_3$$

$$= \begin{Bmatrix} (R,1), & (R,2), & (R,3), & (R,4), & (R,5), & (R,6), \\ (B,1), & (B,2), & (B,3), & (B,4), & (B,5), & (B,6), \\ (W,1), & (W,2), & (W,3), & (W,4), & (W,5), & (W,6) \end{Bmatrix}$$

## Q20

Total number of rooms =2

| Room | Boys | Girls |
|---|---|---|
| P | 2 | 2 |
| Q | 1 | 3 |

Selecting a particular room can be done in 2 ways

Selecting a person from a particular room can be done in

P - 4

Q - 4

Elements in sample space are

$\{(P, \text{Boy1}); (P, \text{Boy2}); (P, \text{Girl1})$

$(P, \text{Girl2}); (Q, \text{Boy3}); (Q, \text{Girl3}); (Q, \text{Girl4}); (Q, \text{Girl5})\}$

So number of elements in required sample space is 8

## Q21

When one ball is drawn then it will be either white (W) or red (R)

Now, if white ball is drawn then it is replaced and a ball is drawn

$$\therefore\ S \supset \{(W,W),\ (W,R)\}$$

Also, if red ball is drawn then a die is rolled

$$\therefore\ S \supset \{(R,1),\ (R,2),\ (R,3),\ (R,4),\ (R,5),\ (R,6)\}$$

$\therefore$ The sample space is

$$S = \{(W,W),\ (W,R),\ (R,1),\ (R,2),\ (R,3),\ (R,4),\ (R,5),\ (R,6)\}$$

## Q22

Box

1 white ball

3 identical black ball

$\therefore$ Two balls are drawn at random without replacement then,

Sample space associated with this experiment is

$$S = \{(W,B),\ (B,W),\ (B,B)\}$$

## Q23

When a die is rolled then

$$S_1 = \{1, 2, 3, 4, 5, 6\}$$

When even number is turns up on the face then a coin is tossed

$$\therefore S_2 = \{(2,H),\ (2,T),\ (4,H),\ (4,T),\ (6,H),\ (6,T)\}$$

Where as when odd number turns up then coin is tossed two times

$$\therefore S_3 = \begin{Bmatrix} (1,HH), & (1,HT), & (1,TH), & (1,TT), & (3,HH), & (3,HT), \\ (3,TH), & (3,TT), & (5,HH), & (5,HT), & (5,TH), & (5,TT) \end{Bmatrix}$$

$\therefore$ Sample space associated with this experiment is

$$S = [S_2 \cup S_3]$$

$$S = \begin{Bmatrix} (2,H), & (2,T), & (4,H), & (4,T), & (6,H), & (6,T), & (1,HH), \\ (1,HT), & (1,TH), & (1,TT), & (3,HH), & (3,HT), & (3,TH), & \\ (3,TT), & (5,HH), & (5,HT), & (5,TH), & (5,TT) & & \end{Bmatrix}$$

## Q24

In this experiment, a die is rolled. If the outcome is 6 then experiment is over. Otherwise, die will be rolled again and again.

So, the sample space is

$$S = \begin{Bmatrix} 6, & (1,6), & (2,6), & (3,6), & (4,6), & (5,6), & (1,1,6), & (1,2,6), \\ (1,3,6), & (1,4,6), & (1,5,6), & (2,1,6), & (2,2,6), \ldots & & & \end{Bmatrix}$$

**Q1**

Since a coin is tossed, so the total nos of elementary events is

$S = \{H, T\}$

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

Also, the total no. of events

$= \{H\},\ \{T\},\ \{H, T\},\ \{T, H\}$

$= 4$

**Q2**

Since we are tossing two coins so, the all events associated with random experiment are

$\{HH\},\ \{HT\},\ \{TH\},\ \{TT\},\ \{HH, HT\},\ \{HH, TH\},\ \{HH, TT\},\ \{HT, TH\},\ \{HT, TT\},$
$\{TH, TT\}\,\{HH, HT, TH\},\{HH, HT, TT\},\ \{HH, TH, TT\},\ \{HT, TH, TT\},\ \{HH, HT, TH, TT\},$

Total=15

From above the elementory events are $\{HH\},\ \{HT\},\ \{TH\},\ \{TT\}$

Total elementory event=4

**Q3**

$A$ - Getting three heads ={HHH}=1
$B$ - Getting two heads and one tail={HHT,THH,HTH}=3
$C$ - Getting three tails ={TTT}=1
$D$ - Getting a head on the first coin={HHH,HHT,HTH,HTT}=4

i) Which pairs of events are mutually exclusive?

We know that $A$ and $B$ are said to be mutually exlusive if $A \cap B = \phi$

a) A and B b) A and C c) B and C d) C and D are mutually exclusive

ii) Which events are elementary events?

$A$ and $C$ are elementary events.

iii) Which events are compound events?

Clearly B and D are union of three events and 4 events respectively.

$\therefore$ B and D are compound events.

**Q4**

Since a die was thrown. So elementary events are

$\{1\}$, $\{2\}$, $\{3\}$, $\{4\}$, $\{5\}$, $\{6\}$

i) $A = \{1, 2, 3, 4, 5, 6\}$

ii) $B$ = Getting a number greater than 7.

$B = \phi$ $\quad\quad$ $[\because A$ die has 1,2,3,4,5,6 members only$]$

iii) $C$ = Getting a multiple of 3.

$C = \{3, 6\}$

iv) $D$ = Getting a number less than 4.

$D = \{1, 2, 3\}$

v) $E$ = Getting an even number greater than 4.

$E = \{6\}$

vi) $F$ = Getting a number not less than 3.

$F = \{3, 4, 5, 6\}$

Also, $A \cup B = \{1, 2, 3, 4, 5, 6\}$

$A \cap B = \{\phi\}$

$B \cap C = \{\phi\}$

$E \cap F = \{6\}$

$D \cap F = \{3\}$

$\overline{F} = 1 - F = \{1, 2\}$

**Q5**

Sample space associated with given event is

S= { HHH, HHT, THH, HTH, HTT, THT, TTH, TTT}

(i) A={HTT, THT, TTH}, B={HHT, THH, HTH}

A and B are mutually exclusive events

(ii) A={HHH, TTT}, B={HHT, THH, HTH} and

C = {HTT, THT, TTH}

Above events are exhaustive and mutually exclusive events.

Becasue $A \cap B = B \cap C = C \cap A = \varnothing$ and $A \cup B \cup C = S$

(iii) A={HHH, HHT, THH, HTH}

B={HHT, THH, HTH, HTT, THT, TTH, TTT}

A and B are not mutualy exclusive becasue $A \cap B = \varnothing$

($iv$)A={HHH, HHT, THH}, B={THT, TTH, TTT}

A and B are mutually exclusive but not exhaustive

$A \cap B = \varnothing$ and $A \cup B \neq S$

**Q6**

(i)

A=both numbers are odd

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

(ii)

B=both numbers are even

$=\{(2,2), (2, 4), (2,6), (4,2), (4, 4), (4,6), (6,2), (6, 4), (6,6)\}$

(iii)

C=Sum of numbers is less than 6

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

$A \cup B=\{(1,1), (1,3), (1,5), (3,1), (3,3), (3,5),(5,1), (5,3), (5,5), (2,2),$
$(2, 4), (2,6), (4,2), (4, 4), (4,6), (6,2), (6, 4), (6,6)\}$

$A \cap B=\varnothing$

$A \cup C=\{(1,1), (1,2), (1,3), (1,4), (1,5), (2,1), (2,2), (2,3), (3,1), (3,2),$
$(4,1), (3,3), (3,5),(5,1), (5,3), (5,5)\}$

$A \cap C=\{(1,1), (1,3), (3,1)\}$

$B \cap C=\varnothing$

**Q7**

A = Getting an even number on the first die.

A={(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)}

B = Getting an odd number on the first die.

B={(1,1), (1,2), (1,3), (1,4), (1,5), (1,6),

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

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

C = Getting at most 5 as sum of the numbers on the two dice.

C={(1,1), (1,2), (1,3), (1,4), (2,1), (2,2), (2,3), (3,1), (3,2), (4,1)}

D = Getting the sum of the numbers on the dice $> 5$ but $< 10$.

D={(1,5), (1,6), (2,4), (2,5), (2,6), (3,3), (3,4), (3,5), (3,6)

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

E = Getting at least 10 as the sum of the numbers on the dice.

E={(4,6), (5,5), (5,6), (6,4), (6,5), (6,6)}

F = Getting an odd number on one of the dice.

F={(1,1), (1,2), (1,3), (1,4), (1,5), (1,6), (3,1), (3,2), (3,3), (3,4),

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

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

## Q8

We have four slips of paper with numbers 1,2,3 & 4.

A person draws two slips without replacement.

$\therefore$ Number of elementary events = ${}^4C_2$

$$\therefore \qquad n(s) = \frac{4\times 3}{2\times 1} = 6$$

$A$ = The number on the fist slip is larger than the one on the second slip

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

$B$ = The number on the second slip is greater than 2

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

$C$ = The sum of the numbers on the two slips is 6 or 7

$$\therefore \qquad C = \{(2,4),\ (3,4),\ (4,2),\ (4,3)\}$$

and,

$D$ = The number on the second slips is twice that on the first slip

$$D = \{(1,2),\ (2,4)\}$$

and, $A$ and $D$ form a pair of mutually exclusive events as $A \cap B = \phi$

## Q9

(i)

Sample space for picking up a card from a set of 52 cards is set of 52 cards itself

(ii)

For an event of chosen card be black faced card,

event is a set of jack, king, queen of spades and clubs

# 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)

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

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

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

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

**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.

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

$n(E) = 3$

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

## 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

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

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

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

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

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

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

## 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

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

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

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

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

## 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.

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

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

## Q7

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

The sample space for the two days will be

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

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

$E = \{SU, M\}$

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

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

## 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

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

## Q9

Three dice are rolled then,

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

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

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

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

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

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

## 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.

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

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

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

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

## 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

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

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

(ii) either a black card or a king

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

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

$= 26 + 4 - 2$

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

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

(iii) a black and a king

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

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

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

(iv) a jack, queen or a king

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

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

$= 4 + 4 + 4$

$= 12$

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

## 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

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

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

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

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

## 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$)$

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

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

$= 4$

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

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

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

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

## 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.

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

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

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

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

## 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.

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

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

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

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

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

**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 ${}^{4}C_2$

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

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

## 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.

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

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

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

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

## 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

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

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

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

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

## 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

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

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

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

## 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

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

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

## 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

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

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

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

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

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

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

## 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) $= 4! \times 3!$

Total number of arrangements are $6!$

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

## 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.

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

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

## Q24

'FORTUNATES' 7 there are 10 letters

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

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

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

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

## 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

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

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

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

## Q26

Since odd in favour of an event is 2:3

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

$= 5k$

and, $\quad n(E) = 2k$

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

## 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-cccurance of the event is

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

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

$$= \frac{7}{16}$$

## 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

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

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

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

$$= \frac{40}{182}$$

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

$\therefore$ Probability that both are of different colour

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

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

$$= \frac{71}{91}$$

$$= 0.78$$

## 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.

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

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

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

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

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

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

(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.

$\therefore \quad \tilde{E}$ 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

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

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

$\therefore \quad P(\tilde{E}) = \dfrac{24}{36}$

$= \dfrac{4}{6}$

$= \dfrac{2}{3}$

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

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

$= \dfrac{1}{3}$

## 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.

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

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

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

$= \frac{18}{95}$

## 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

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

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

$= \frac{62}{306}$

$= \frac{31}{153}$

## Q32

As the letter is choosen from English alphabet

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

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

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

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

(ii) Probability that a consonant is choosen

$$\Rightarrow \quad P(\overline{E}) = 1 - P(E)$$
$$= 1 - \frac{5}{26}$$
$$= \frac{21}{26}$$

## 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

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

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

## 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

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

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

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

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

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

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

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

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

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

## 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

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

## 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

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

## 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

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

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

## 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

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

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

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

## 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

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

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

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

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

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

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

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

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

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

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

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

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

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

## 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

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

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

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

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

## 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

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

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

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

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

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

## 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

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

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

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

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

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

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

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

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

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

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

## 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

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

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

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

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

## 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

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

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

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

$= \dfrac{11}{4165}$

## Q45

In the word 'UNIVERSITY' there are 10 letters.

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

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

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

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

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

$P(\overline{E}) = 1 - P(E) = 1 - \dfrac{1}{5} = \dfrac{4}{5}$

$\therefore$ $P(\overline{E}) = \dfrac{4}{5}$

# EX - 33.4

**Q1(a)**

Given,

$P(A) = 0.4$

$P(B) = 0.5$

$\therefore$ A and B are mutually exclusive events, then $P(A \cap B) = 0$

Now,

(i) $P(A \cup B) = P(A) + P(B)$

$= 0.4 + 0.5$

$= 0.9$

$\therefore$ $P(A \cup B) = 0.9$

(ii) $P(\overline{A} \cap \overline{B}) = 1 - P(A \cup B)$

$= 1 - 0.9$

$= 0.1$

$\therefore$ $P(\overline{A} \cap \overline{B}) = 0.1$

(iii) $P(\overline{A} \cap B) = P(B) - P(A \cap B)$

$= 0.5 - 0$

$\therefore$ $P(\overline{A} \cap B) = 0.5$

(iv) $P(A \cap \overline{B}) = P(A) - P(A \cap B)$

$= 0.4 - 0$

$= 0.4$

$\therefore$ $P(A \cap \overline{B}) = 0.4$

## Q1(b)

Given,

$$P(A) = 0.54$$
$$P(B) = 0.69$$
$$P(A \cap B) = 0.35$$

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

$= 0.54 + 0.69 - 0.35$

$= 1.23 - 0.35$

$\therefore$ $P(A \cup B) = 0.88$

(ii) $P(\overline{A} \cap \overline{B}) = 1 - P(A \cup B)$

$= 1 - 0.88$

$= 0.12$

$\therefore$ $P(\overline{A} \cap \overline{B}) = 0.12$

(iii) $P(A \cap \overline{B}) = P(A) - P(A \cap B)$

$= 0.54 - 0.35$

$= 0.19$

$\therefore$ $P(A \cap \overline{B}) = 0.19$

(iv) $P(B \cap \overline{A}) = P(B) - P(A \cap B)$

$= 0.69 - 0.35$

$= 0.34$

$\therefore$ $P(B \cap \overline{A}) = 0.34$

## Q1(c)

(i) Given,

$$P(A) = \frac{1}{3}, \qquad P(A \cap B) = \frac{1}{15}$$

$$P(B) = \frac{1}{5}, \qquad P(A \cup B) = \ldots$$

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

$$= \frac{1}{3} + \frac{1}{5} - \frac{1}{15}$$

$$= \frac{5+3-1}{15}$$

$$= \frac{8-1}{15} = \frac{7}{15}$$

$$\therefore\ P(A \cup B) = \frac{7}{15}$$

(ii) Given,

$$P(A) = 0.35, \qquad P(B) = \ldots$$

$$P(A \cap B) = 0.25, \qquad P(A \cup B) = 0.6$$

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

$$0.6 = 0.35 + P(B) - 0.25$$

$$0.6 = 0.10 + P(B)$$

$$P(B) = 0.6 - 0.1$$

$$P(B) = 0.5$$

(iii) Given,

$$P(A) = 0.5, \qquad P(B) = 0.35$$

$$P(A \cap B) = \ldots\ , \qquad P(A \cup B) = 0.7$$

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

$$0.7 = 0.5 + 0.35 - P(A \cap B)$$

$$0.7 = 0.85 - P(A \cap B)$$

$$P(A \cap B) = 0.85 - 0.7$$

$$P(A \cap B) = 0.15$$

## Q2

We know by addition theorem on probability

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

$\Rightarrow \quad 0.5 = 0.3 + 0.4 - P(A \cap B)$

$$P(A \cap B) = 0.3 + 0.4 - 0.5$$
$$= 0.7 - 0.5$$
$$= 0.2$$

$\therefore \; P(A \cap B) = 0.2$

## Q3

We know by addition theorem on probability

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$
$$= 0.5 + 0.3 - 0.2$$
$$= 0.8 - 0.2$$
$$= 0.6$$

$\therefore \; P(A \cup B) = 0.6$

## Q4

We know,

$$P(A \cup B) = 0.8$$
$$P(A \cap B) = 0.3$$
$$P(\overline{A}) = 0.5$$

$\Rightarrow \quad 1 - P(A) = 0.5$

$\Rightarrow \quad P(A) = 1 - 0.5 = 0.5$

Now, by addition theorem on probabiltiy

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$
$$0.8 = 0.5 + P(B) - 0.3$$
$$0.8 = P(B) + 0.2$$
$$P(B) = 0.8 - 0.2$$
$$= 0.6$$

$\therefore \; P(B) = 0.6$

## Q5

Given,

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

$$P(B) = \frac{1}{3}$$

$\therefore$ A and B are mutually exclusive events, then $P(A \cap B) = 0$

$$\begin{aligned} P(A \cup B) &= P(A) + P(B) \\ &= \frac{1}{2} + \frac{1}{3} \\ &= \frac{3+2}{6} \\ &= \frac{5}{6} \end{aligned}$$

$\therefore$ $P(A \cup B) = \frac{5}{6}$

## Q6

$P\left(\overline{A}\right) : P\left(B\right) = 8 : 3$

$\Rightarrow \quad \dfrac{1 - P\left(A\right)}{P\left(A\right)} = \dfrac{8}{3}$

$\Rightarrow \quad P\left(A\right) = \dfrac{3}{11}$

$P\left(\overline{B}\right) : P\left(B\right) = 5 : 2$

$\Rightarrow \quad \dfrac{1 - P\left(B\right)}{P\left(B\right)} = \dfrac{5}{2}$

$\Rightarrow \quad \dfrac{1}{P\left(B\right)} = \dfrac{5}{2} + 1 = \dfrac{7}{2}$

$\Rightarrow \quad P\left(B\right) = \dfrac{2}{7}$

$\because$ $A, B$ and $C$ are mutually exhaustive

$\therefore \quad A \cup B \cup C = S$

$\Rightarrow \quad P\left(A \cup B \cup C\right) = P\left(S\right)$

$\Rightarrow \quad P\left(A\right) + P\left(B\right) + P\left(C\right) = 1$

$P\left(C\right) = 1 - \left\{P\left(A\right) + P\left(B\right)\right\}$

$= 1 - \left(\dfrac{3}{11} + \dfrac{2}{7}\right)$

$= 1 - \dfrac{43}{77}$

$= \dfrac{34}{77}$

$\Rightarrow \quad P\left(\overline{C}\right) = 1 - P\left(C\right)$

$= 1 - \dfrac{34}{77}$

$= \dfrac{43}{77}$

$\therefore$ Odds against $C$ is

$P\left(\overline{C}\right) : P\left(C\right) = \dfrac{43}{77} : \dfrac{34}{77}$

$= 43 : 34$

## Q7

let chance in favour of other be $x$

So $x+\frac{2}{3}x=1$

$x=\frac{3}{5}$

Odds in favour of other $=\frac{\frac{3}{5}}{\frac{2}{5}}=\frac{3}{2}=3:2$

## Q8

$\because$ 1 card is drawn from a well shuffled deck of 52 cards

$\therefore \quad S = {}^{52}C_1 = 52$

Now,

The favourable events is that drawn card is either spade or a king

Let $A$ = Event of choosing shade

$\Rightarrow \quad {}^{13}C_1 = 13$

$B$ = Event of choosing a king

$\Rightarrow \quad {}^{4}C_1 = 4$

Also, king can be of spade

$\therefore \quad (A \cap B) = 1$

$\therefore \quad P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$$= \frac{13}{52} + \frac{4}{52} - \frac{1}{52}$$

$$= \frac{16}{52}$$

$$= \frac{4}{13}$$

## Q9

Since two dice is thrown,

$\therefore \quad S = 6^2 = 36$

Let $A$ be the event of choosing doublet

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

$$\Rightarrow \quad P(A) = \frac{6}{36} = \frac{1}{6}$$

$B$ the event of choosing total of 9.

$$\{(3,6),\ (4,5),\ (5,4),\ (6,3)\}$$

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

$\therefore$ Probability of choosing neither a doublet nor a total of 9.

$$= P\left(\overline{A \cap B}\right) = 1 - P(A \cup B) \qquad ---(i)$$

Now,

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

$$= \frac{1}{6} + \frac{1}{9} + 0$$

$$= \frac{3+2}{18}$$

$$= \frac{5}{18}$$

Now,

$$P(A \cup B) = \frac{5}{18}$$

$\therefore$ (i) simplies $P\left(\overline{A \cap B}\right) = 1 - \frac{5}{8}$

$$= \frac{13}{18}$$

## Q10

Since a number is chosen from first 500

$\therefore \quad n(S) = 500$

Let $A$ be the event of choosing number divisible by 3 = $[3,6,9,\ldots,498]$

$\therefore \quad n(A) = 166$

$$P(A) = \frac{166}{500} \qquad \left[\begin{array}{l} \because a + (n-1)d = 498 \\ 3 + (n-1)3 = 498 \\ 3n = 498 \Rightarrow n = 166 \end{array}\right]$$

$B$ be the event of choosing number

$[5,10,15,\ldots,500]$

$n(B) = 100$

$\Rightarrow \quad P(B) = \frac{100}{500}$

Also, $(A \cap B) = \{15,30,\ldots,495\}$

$\Rightarrow \quad n(A \cap B) = 33$

$$P(A \cap B) = \frac{33}{500}$$

$$\therefore \; P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$= \frac{166}{500} + \frac{100}{500} - \frac{33}{500}$$

$$= \frac{233}{500}$$

## Q11

A die is thrown twice

$\Rightarrow \quad n(S) = 36$

Let $A$ be the event of getting 3 in first throw

$$\therefore \quad P(A) = \frac{6}{36} = \frac{1}{6} \qquad [\because A = \{(3,1),\ (3,2),\ (3,3),\ (3,4),\ (3,5)\}]$$

$B$ be the event of getting 3 in 2nd throw

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

Also, $P(A \cap B) = \frac{1}{36} \qquad [\because A \cap B = \{3,3\}]$

$$\therefore \; P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$= \frac{1}{6} + \frac{1}{6} - \frac{1}{36}$$

$$= \frac{11}{36}$$

## Q12

Let $A$ be the event of getting an ace

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

$B$ be the event of getting a spade card

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

$P(A \cap B) = \frac{1}{52}$ [In a spade suit there is one ace also]

$$\therefore \; P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$= \frac{1}{13} + \frac{1}{4} - \frac{1}{52}$$

$$= \frac{16}{52}$$

$$= \frac{4}{13}$$

## Q13

Let $E$ be event that student passed in english examination

$$\therefore \quad P(E) = 0.75$$

Let $H$ be event that student passed in hindi examination

$$\therefore \quad P(H) = ?$$

Also, $P(E \cap H) = 0.5$ and $P(\overline{E} \cap \overline{H}) = 0.1$

$$\because \quad P(\overline{E} \cap \overline{H}) = 1 - P(E \cup H)$$

$$\Rightarrow \quad P(E \cup H) = 1 - 0.1$$

$$= 0.9$$

Now,

$$P(E \cup H) = P(E) + P(H) - P(E \cap H)$$

$$0.9 = 0.75 + P(H) - 0.5$$

$$P(H) = 0.90 - 0.25$$

$$= 0.65$$

## Q14

Let $A$ be the event of choosing a number divisible by 4

$\therefore \quad A = \{4, 8, \ldots, 100\}$

$\Rightarrow \quad n(A) = 25$

$P(A) = \dfrac{25}{100}$

Let $B$ be the event of choosing a number dividible by 6

$\therefore \quad B = \{6, 12, \ldots, 96\}$

$\Rightarrow \quad n(B) = 16$

$P(B) = \dfrac{16}{100}$

Also, $(A \cap B) = \{12, 24, \ldots, 96\}$

$\Rightarrow \quad n(A \cap B) = 8$

$\therefore \quad P(A \cap B) = \dfrac{8}{100}$

$$\therefore \; P(A \cup B) = P(A) + P(B) - P(A \cap B)$$
$$= \frac{25}{100} + \frac{16}{100} - \frac{8}{100}$$
$$= \frac{33}{100}$$

## Q15

Since 4 cards are drawn from a well schuffled pack of cards.

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

*Let A* be the event of getting 4 cards of same colour

Since there are two colours of cards

$\therefore \quad n(A) = 2 \; {}^{26}C_4$

$$P(A) = 2 \times \frac{{}^{26}C_4}{{}^{52}C_4}$$
$$= 2 \times \frac{26 \times 25 \times 24 \times 23}{52 \times 51 \times 50 \times 49}$$
$$= \frac{92}{833}$$

## Q16

$n(S) = 100$

Let $A$ be the event that students passed in first examination

$\therefore \quad P(A) = \frac{60}{100}$ [60 students were passed in first exam]

Let $B$ be the event that students passed in second examination

$\therefore \quad P(B) = \frac{50}{100}$ [50 students were passed in second exam]

$P(A \cap B) = \frac{30}{100}$ [$\because$ 30 students passed in both exam]

$$\therefore \; P(A \cup B) = P(A) + P(B) - P(A \cap B)$$
$$= \frac{60}{100} + \frac{50}{100} - \frac{20}{100} = \frac{8}{100}$$
$$= \frac{4}{5}$$

## Q17

Let $W$ be the event of drawing white ball

$\therefore \quad P(W) = \frac{10}{26}$

Let $R$ be the event of drawing red ball

$\therefore \quad P(R) = \frac{6}{26}$

$\therefore \; P(W \cup R) = P(W) + P(R) - P(W \cap R)$ [$\because W$ and $R$ are mutually exclusive case]

$\therefore \quad p(W \cap R) = 0$

$$\therefore \quad \frac{10}{26} + \frac{6}{26} - 0$$
$$= \frac{16}{26}$$
$$= \frac{8}{13}$$

## Q18

We have,

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

$\Rightarrow \quad P(A) = \frac{1}{4}$

$$P(B) : P(\overline{B}) = 1 : 4$$

$\Rightarrow \quad P(B) = \frac{1}{5}$

$$P(C) : P(\overline{CB}) = 1 : 5$$

$\Rightarrow \quad P(C) = \frac{1}{6}$

$$P(D) : P(\overline{D}) = 1 : 6$$

$\Rightarrow \quad P(D) = \frac{1}{7}$

$\therefore$ Probability that atleast one of them wins is given by $P(A \cup B \cup C \cup D)$

$$= P(A) + P(B) + P(C) + P(D)$$

$$= \frac{1}{4} + \frac{1}{5} + \frac{1}{6} + \frac{1}{7}$$

$$= \frac{319}{420}$$

## Q19

Let $A$ be the event that the person travel by plane

$$P(A) = \frac{3}{5}$$

Let $B$ be the event that the person travel by train

$$P(B) = \frac{1}{4}$$

$\because$ $A$ and $B$ are mutually exclusive case.

$\therefore \quad P(A \cup B) = P(A) + P(B)$

$$= \frac{3}{5} + \frac{1}{4}$$

$$= \frac{17}{20}$$

## Q20

Two cards are drawn from a well shuffled deck of cards

$\therefore \quad n(S) = {}^{52}C_2$

$A$ be the event of getting black cards

$n(A) = {}^{26}C_2$ $\quad$ [$\because$ There are 26 black cards]

$$\therefore \quad P(A) = \frac{{}^{26}C_2}{{}^{52}C_2} = \frac{26 \times 25}{52 \times 51}$$

$B$ be te event of getting both king cards

$$\therefore \quad P(B) = \frac{{}^{4}C_2}{{}^{52}C_2} = \frac{4 \times 3}{52 \times 51} \qquad [\because \text{ There are 4 king cards}]$$

$$\text{Also,} \quad P(A \cap B) = \frac{{}^{2}C_2}{{}^{52}C_2} = \frac{2 \times 1}{52 \times 51} \qquad [\because \text{ Two king are black also}]$$

Now,

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$
$$= \frac{26 \times 25}{52 \times 51} + \frac{4 \times 3}{52 \times 51} - \frac{2}{52 \times 51}$$
$$= \frac{660}{52 \times 51}$$
$$= \frac{55}{221}$$

## Q21

Let $A$ be the event that choosing student who passed the first exam.

$\therefore \quad P(A) = 0.8$

Let $B$ be the event that choosing student who passed the 2nd exam.

$P(B) = 0.7$

$n(A \cup B)$ = number of students who passed atleast one of the two exams

$\Rightarrow \quad P(A \cup B) = 0.95$

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$
$$P(A \cap B) = P(A) + P(B) - P(A \cup B)$$
$$= 0.8 + 0.7 - 0.95$$
$$= -0.95 + 1.5$$
$$= 1.5 - 0.95$$
$$= 0.55$$

## Q22

Box 30-bolts

40-nuts

Half the bolts and nuts are rusted

$\therefore$ rusted bolts = 15

rusted bolts = 20

Since two items are drawn

$$\therefore \quad n(S) = {}^{70}C_2$$

Let $A$ be the event of choosing rusting item

$$\therefore \quad P(A) = \frac{{}^{35}C_2}{{}^{70}C_2} = \frac{35 \times 34}{70 \times 69}$$

Let $B$ be the event of choosing bolts

$$\therefore \quad P(B) = \frac{{}^{30}C_2}{{}^{70}C_2} = \frac{30 \times 29}{70 \times 69}$$

Also, $n(A \cap B) = 15$ [bolts that are rusted]

$$\therefore \quad P(A \cap B) = \frac{{}^{15}C_2}{{}^{70}C_2} = \frac{15 \times 14}{70 \times 69}$$

$$\therefore \quad P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$= \frac{35 \times 34}{70 \times 69} + \frac{30 \times 29}{70 \times 69} - \frac{15 \times 14}{70 \times 69}$$

$$= \frac{1850}{4830}$$

$$= \frac{185}{483}$$

## Q23

Let $A$ be the event of choosing a positive integer divisible by 6

$\therefore \quad A = \{6, 12, \ldots, 198\}$

$\Rightarrow \quad n(A) = 33$

$\therefore \quad P(A) = \frac{33}{200}$

Let $B$ be the event of choosing a positive integer divisible by 8

$\therefore \quad B = \{8, 16, \ldots, 200\}$

$\Rightarrow \quad n(B) = 25$

$\therefore \quad P(B) = \frac{25}{200}$

Also, $\quad A \cap B = \{24, 28, \ldots, 192\}$

$\Rightarrow \quad n(A \cap B) = 8$

$\therefore \quad P(A \cap B) = \frac{8}{200}$

$\therefore \quad P(A \cup B) = \frac{1}{4}$

## Q24

$\because$ A coin is tossed four times

$\therefore \quad n(S) = 2^4 = 16$

Let $A$ be the event of getting 2 tails

$\therefore \quad A = \{HHTT, HTHT, HTTH, THTH, TTHH, THHT\}$

$\therefore \quad P(A) = \frac{6}{16}$

Let $B$ be the event of getting 3 tails,

$\therefore \quad B = \{HTTT, THTT, TTHT, TTTH\}$

$\therefore \quad P(B) = \frac{4}{16}$

$\because$ $A$ and $B$ are mutually exclusive case.

$$\therefore \quad P(A \cup B) = P(A) + P(B)$$
$$= \frac{6}{16} + \frac{4}{16}$$
$$= \frac{10}{16}$$
$$= \frac{5}{8}$$

## Q25

Number of multiples of 2 in 1 to 1000 are 500

Number of multiples of 9 in 1 to 1000 are 111

Out of 111, 55 are even numbers. So total favorable numbers are

500+56=556

Probability that integer is a multiple of 2 or a multiple of 9

$$= \frac{556}{1000} = 0.556$$

## Q26

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$
$$= 0.87 + 0.36 - 0.30 = 0.93$$

## Q27

$P(A) = 0.35$ and $P(B) = 0.45$

$P(A \cap B) = 0$

$P(A \cup B) = P(A) + P(B) = 0.80$

$P(A \cap B^c) = P(A) = 0.35$

$P(A^c \cap B^c) = 1 - P(A \cup B) = 1 - 0.8 = 0.2$

## Q28

$P(A) = 0.35$ and $P(B) = 0.45$

$P(A \cap B) = 0$

$P(A \cup B) = P(A) + P(B) = 0.80$

$P(A \cap B^c) = P(A) = 0.35$

$P(A^c \cap B^c) = 1 - P(A \cup B) = 1 - 0.8 = 0.2$