PROBABILITY

★ INTRODUCTION

In our day-to-day con vWersation, we generally use the phrases like :

(i) **Probably,** Satya will visit my house today

(ii) **Most probably,** Megha is preparing for CAT.

(iii) Khusboo is **quite sure** to be on the top.

(iv) **Chances** are high that Regi will head the organization,

The words' probably', 'most probably', 'quite sure', 'chances'etc involve an element of uncertainty.

Probability – Probability is the mathematical measurement of uncertainty.

Probability Theory – it is that branch of mathematics in which the degree of uncertainty (or certainty of occurrence of event) is measured numerically.

★ SOME BASIC CONCEPTS/TERMS

1. **Experiment :** An action or operation which can produce some well defined result is known as **experiment.**

2. **Deterministic experiment :** If we perform an experiment and repeat it under identical conditions, we get almost the same result every time, such an experiment is called a **deterministic experiment.**

3. **Random experiment :** An experiment is said to be a random experiment if it satisfies the following two conditions :

(i) It has more than one possible outcomes.

(ii) It is not possible to predict the outcome (result) in advance.

Ex. (i) Tossing a pair of fair coins. (ii) Rolling an unbiased die.

4. **Outcomes :** The possible results of a random experiment are called **outcomes.**

5. **Trial :** When an experiment is repeated under similar conditions and it does not give the same result each time but may result in any one of the several possible outcomes, the result is called a **trial.**

Ex. If a coin is tossed 100 times, then one toss of the coin is called a trial.

6. **Event :** The collection of all or some outcomes of a random experiment is called an **event.**

Ex. Suppose we toss a pair of coins simultaneously and let E be the event of getting exactly one head. Then, the event E contains HT and TH.

Ex. Suppose we roll a die and let E be the event of getting an even number. Then the event E contains 2, 4 and 6.

7. **Elementary or Simple Event :** An outcome of a trial is called an **elementary event.**

NOTE : An elementary event has only one element.

Ex. Let a pair of coins is tossed simultaneously. Then, possible outcomes of this experiment are.

HH : Getting H on first H on second (= E_1) [H = Head, T = Tail and E = event]

HT : Getting H on first T on second (= E_2)

TH : Getting T on first H on second (= E_3)

and TT : Getting T on first T on second (= E_4)

Here, E_1, E_2, E_3 and E_4 are the element events associated with the random experiment of tossing of two coins.

8. **Compound event or composite event or mixed event :** An event associated to a random experiment and obtained by combining two or more simple events associated to the same random experiment, is called a **compound event .**

OR

A compound event is an aggregate of some simple (elementary) event and is decomposable into simple events.

Ex. If we throw a die, then the event E of getting an odd number is a compound event because the event E contains three elements 1, 3 and 5, which is a compound of three simple events E_1, E_2, and E_3 containing 1, 3 and 5 respectively.

9. **Equally likely events :** The out comes of an experiment are said to be equally likely events if the chances of their happenings are neither less nor greater then other.
In other words, a given number o events are said to be equally likely if none of them is experiment to occur in preference to the others.

Ex. In tossing a coin, getting head (H) and tail (T) are equally likely events.

★ EXPERIMENTAL (OR EMPIRICAL) PROBABILITY

The experiment or empirical probability P(E) of an event is defined as

$$P(E) = \frac{Number\ of\ trials\ in\ which\ the\ event\ happened}{Total\ number\ of\ trials}$$

i.e., P (E) = $\frac{m}{n}$

NOTE : (i) These probabilities are based on results of an actual experiment.
(ii) These probabilities are only 'estimates', i.e., we may get different probabilities for the same event in various experiments.

★ THEORETICAL (OR CLASSICAL) PROBABILITY

The theoretical or classical probability of an event E, written as P(E), is defined as

$$P(E) = \frac{Number\ of\ outcomes\ favourable\ to\ E}{Number\ of\ all\ possible\ outcomes\ of\ the\ experiment}$$

Where the outcomes of the experiment are equally likely.

Ex. A die is thrown once (i) What is the probability of getting a number greater than 4? (ii) What is the probability of getting a number less than or equal to 4?

Sol. The possible outcomes are 1, 2, 3, 4, 5 and 6.
Let E = the event of getting a number greater than 4
and F = The event of getting a number less than or equal to 4
(i) The outcomes favorable to E are 5 and 6.
∴ the number of outcomes favorable to E is 2.

The therefore, P(E) = P(number greater than 4) = $\frac{4}{6} = \frac{2}{3}$

NOTE : Events E and F are not elementary events because event E has 2 outcomes and the event F has 4 outcomes,

ANIMPORTANT REMARK

In the experiment or empirical approach to probability, the probability of events are based on the results of actual experiment and adequate recordings of the happening of the events, while in theoretical approach to probability, we try to find (predict) the probabilities of the events without actually performing the experiment.

★ SOME SPECIAL EVENTS

» **IMPOSSIBLE EVENT (OR NULL EVENT) :** An event is said to be an impossible event when none of the outcomes is favorable to the event.
The probability of an impossible event = 0 .

Ex. What is the probability, of getting
Sol. The possible outcomes are 1, 2, 3, 4, 5, 6.
Let E = the event of getting a number 8 in a single throw of a die.
Clearly, the number of outcomes favorable to E is 0 and the total number of possible outcomes is 6.

Therefore, $P(E) = \frac{0}{6} = 0$.

Here, E is an impossible event.

» **SURE (OR CERTAIN) EVENT :** An event is said to be a sure (or certain) event when all possible outcomes are favorable to the event.
The probability of a sure event is 1.

Ex. What is the probability of getting a number less than 7 in a single of a die?
Sol. The possible outcomes are : 1, 2, 3, 4, 5, 6.
Let F = the event of getting a number 7 in a single throw of a die. Clearly, the number of outcomes favorable to F are 1, 2, 3, 4, 5, 6. i.e., the number of outcomes favorable to F is 6.

Therefore, $P(E) = \frac{6}{6} = 1$.

Here, F is an impossible event.

» **COMPLEMENT OF AN EVENT :** Corresponding to every event E associated with random experiment, there is an event 'not E', which occurs only when E does not occur.
The event $\overline{E}$, representing 'not E', is called the complement of the event E.
E and $\overline{E}$, are also called complementary events.
In general, $P(E) + P(\overline{E}) = 1$
i.e., $P(\overline{E}) = 1 - P(E)$ or $P(\text{not E}) = 1 - P(E)$

» **AN IMPORTANTR RESULT :** The probability of an event always lies between 0 and 1.
i.e., $0 \le P(E) \le 1$
PROOF Let m be the number of favorable outcomes of an event E and n be the total number of outcomes.
Then, $0 \le m \le n$ [m cannot be negative integer and m cannot be greater than n]

$$\Rightarrow \quad 0 \le \frac{m}{n} \le \frac{n}{n} \Rightarrow 0 \le \frac{m}{n} \le 1 \Rightarrow a \le P(E) \le 1$$

Thus, the probability of an event always lies between 0 and 1.

NOTES : (i) $0 \le P(E) \le 1$
(ii) Let $E_1, E_2, E_3, \ldots, E_n$ be the n elementary events associated with a random experiment having exactly n outcomes. Then,
$P(E_1) + P(E_2) + P(E_3) + \ldots + P(E_n) = 1$

Ex. A bag contains 3 red balls, 4 white balls and 5 green balls. A ball is drawn at random.
Let R = the event of getting a red ball,
W = the event of getting a wither ball,
and G = the event of getting a green ball,
Here, total number of balls (outcomes) = 3 + 4 + 5 = 12.

Then, $P(R) = \frac{3}{12}$ [Number of favorable outcomes = 3]

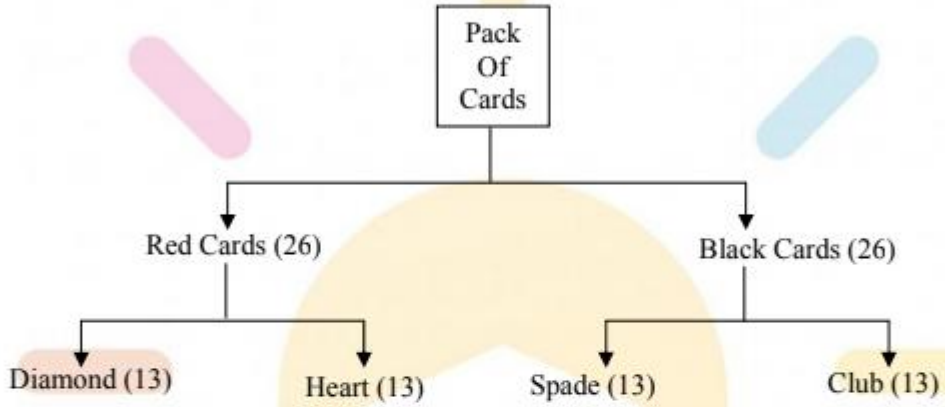
$P(W) = \frac{4}{12}$ [Number of favorable outcomes = 4]

And, $P(G) = \frac{5}{12}$ [Number of favorable outcomes = 5]

Clearly, $\frac{3}{12} + \frac{4}{12} + \frac{5}{12} + \frac{12}{12} = 1.$

i.e., $P(R) + P(W) + P(G) = 1.$

DESIGNATION OF PLAYING CARDS



(i) A beck (pack) of cards contains 52 cards, out of which there are 26 red cards and 26 black cards.
(ii) There are four suits each containing 13 cards.
(iii) The cards in each suit are ace (A). king, queen, jack, 10, 9, 8, 7, 6, 5, 4, 3 and 2.
(iv) Kings, queens and jacks are called **face cards** (4 + 4 + 4 = 12).
(v) Kings, queens jacks and are called **honors cards** (4 + 4 + 4 + 4= 16).

JUST FOR YOU

1. $P(E) = \frac{number\ of\ outcomes\ favourable\ to\ E}{number\ of\ all\ possible\ outcomes\ of\ the\ experiment}$, where outcomes of the experiment are equally likely.
2. Probability of an impossible event = 0.
3. Probability of a sure event = 1.
4. $P(E) + P(E) = 1$, where E and $\overline{E}$ are complementary events.
5. $0 \le P(E) \le 1$
6. The sum of the probabilities of all the elementary events of an experiment is 1.

Ex.1 Complete the following statements :

(i) Probability of an event E + probability of the event 'not E' = ...
(ii) The Probability of an event that is certain to happen is..... Such an event is called.....
(iii) The Probability of an event is greater than or equal to..... and less than or equal to.....
(iv) P(E) = $\frac{\text{.....}}{\text{Total number of trials}}$

Sol. (i) 1 (ii) 1, sure or certain event (iii) 0, 1 (iv) number of trials in which event happened.

Ex.2 Which of the following experiments have equally likely outcomes ? Explain.
(i) A driver attempts to starts a car. The car starts or does not start.
(ii) A player attempts to shoot a basketball. She/he shoots or misses the shot.
(iii) A coin is tossed. It turns to be a head or a tail.
(iv) A monitor is nominated by the class teacher of a class. It is a boy or a girl.

Sol. (iii) because when a coin is tossed either a head or a tail turns.

Ex.3 Mach the following.

(i)	**P($\overline{E}$) =**	**(a) 0**
(ii)	**Probability of an impossible event**	**(b) 0.5**
(iii)	**Probability of an event cannot be more than**	**(c) 1 – P(E)**
(iv)	**A cards is drawn form a pack of 52 cards, then the probability of getting a red card is equal to**	**(d) 1**

Sol. (i) (c), (ii) (a), (iii) (d), (iv) (b)

Ex.4 If P(E) = 0.05, what is the probability of 'not E'?

Sol. We have P(E) = 0.05
$\therefore$ P(not E) = 1 – P(E) = 1 – 0.05 = 0.95
Therefore, P(not E) = 0.95.

Ex.5 Find the probability of getting a head when a coin is tossed once.

Sol. When a coin is tossed, then all possible outcomes are H and T
Total number of possible outcomes = 2
Let E be the event of getting a head
$\therefore$ number of favorable outcome = 1
Hence, required probability = P(E) = $\frac{\text{Number of favourable outcomes}}{\text{Total number of possible outcomes}} = \frac{1}{2}$

Ex.6 Two unbiased coins are tossed simultaneously. Find the probability of getting

(i) one head	**(ii) one tail**	**(iii) two heads**
(iv) at least one head	**(ii) at most one tail**	**(iii) no head.**

Sol. If two unbiased coins are tossed simultaneously, then all possible outcomes are :
HH, HT, TH, TT.
Total number of possible outcomes = 4.
(i) Let A_1 = the event of getting one head.
Then, favorable outcomes are HT, TH.
Number of favorable outcomes = 2.

Hence, required probability = P (getting one head) = $P(A_1) = \frac{2}{4} = \frac{1}{2}$

(ii) Let A_2 = the event of getting one tail.
Then, favorable outcomes are TH, HT.
Number of favorable outcome = 2.

Hence, required probability = P (getting one tail) = $P(A_2) = \frac{2}{4} = \frac{1}{2}$

(iii) Let A_3 = the event of getting two tail.
Then, favorable outcomes is HH
Number of favorable outcome = 1

Hence, required probability = P (getting two heads) = $P(A_3) = \frac{1}{4}$

(iv) Let A_4 = the event of getting at least one head.
Then, favorable outcomes are HT, TH, HH
Number of favorable outcome = 3

Hence, required probability = P (getting at least one head) = $P(A_4) = \frac{3}{4}$

(v) Let A_5 = the event of getting almost one head.
Then, favorable outcomes are TT, HT, TH.
Number of favorable outcome = 3

Hence, required probability = P (getting almost one head) = $P(A_5) = \frac{3}{4}$

(vi) Let A_6 = the event of getting no head.
Then, favorable outcomes are TT
Number of favorable outcome = 1

Hence, required probability = P (getting one head) = $P(A_6) = \frac{1}{4}$

Ex.7 Three unbiased coins are tossed together. Find the probability of getting
(i) one head (ii) two heads (iii) all heads (iv) at least two heads

Sol. If three unbiased coins are tossed together, then all possible outcomes are :
HHH, HHT, THH, HTT, THT, TTH, TTT
Total number of possible outcomes = 8

(i) Let A_1 = the event of getting one head.
Then, favorable outcomes are HHT, THT, THH.
Number of favorable outcomes = 3.

Hence, required probability = P (getting one head) = $P(A_1) = \frac{3}{8}$

(ii) Let A_2 = the event of getting two head.
Then, favorable outcomes are HHT, HTH, THH.
Number of favorable outcomes = 3.

Hence, required probability = P (getting two heads) = $P(A_2) = \frac{3}{8}$

(iii) Let A_3 = event of getting all heads.

Then, favorable outcomes are HHH
Number of favorable outcomes = 1

Hence, required probability = P (getting all head) = $P(A_3) = \frac{1}{8}$

(iv) Let A_4 = event of getting at least two heads.
Then, favorable outcomes are HHT, HTH, THH, HHH
Number of favorable outcomes = 4

Hence, required probability = P (getting at least two heads) = $P(A_4) = \frac{4}{8} = \frac{1}{2}$

Ex.8 A die is thrown once. Find the probability of getting
(i) a prime number (ii) a number lying between 2 and 6 (iii) an odd number.

Sol. If a die is thrown, then all possible outcomes are 1, 2, 3, 4, 5, 6.
Total number of possible outcomes = 6.

(i) Let A_1 = event of getting a prime number.
Then, the favorable outcomes are 2, 3, 5.
Number of favorable outcomes = 3.

Hence, required probability = P (getting a prime number) = $P(A_1) = \frac{3}{6} = \frac{1}{2}$

(ii) Let A_2 = event of getting a number lying between 2 and 6.
Then, the favorable outcomes are 3, 4, 5.
Number of favorable outcomes = 3.

Hence, required probability = P (getting a number lying between 2 and 6) = $P(A_2) = \frac{3}{6} = \frac{1}{2}$

(iii) Let A_3 = event of getting an odd number.
Then, the favorable outcomes are 1, 3, 5.
Number of favorable outcomes = 3.

Hence, required probability = P (getting an odd number) = $P(A_3) = \frac{3}{6} = \frac{1}{2}$

Ex.9 A die is thrown twice. What is the probability that
(i) 5 will not come up either time? (ii) 5 will come up at least once?

Sol. If a die is thrown twice, then all the possible outcomes are :
(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).
Total number of getting 5 not either time

(i) Let A_1 = event of getting 5 not either time.
Then, the favorable outcomes are: (1, 1), (1, 2), (1,3), (1, 4), (1, 6),
(2, 1), (2, 2), (2,3), (2, 4), (2, 6),
(3, 1), (3, 2), (3,3), (3, 4), (3, 6),
(4, 1), (4, 2), (4,3), (4, 4), (4, 6),
(6, 1), (6, 2), (6,3), (6, 4), (6, 6).
Number of favorable outcomes = 25

Hence, required probability = P (5 will not come up either time) = $P(A_1) = \frac{25}{36}$

(ii) Let A_2 = event of getting 5 at least onec.
Then, the favorable outcomes are:
(1, 5), (2, 5), (3,5), (4, 5), (5, 1), (5, 2), (5, 3), (5,4), (5, 5), (5, 6), (6, 5).
Number of favorable outcomes = 11

Hence, required probability = P (5 will not come up at least onec) = $P(A_2) = \frac{11}{36}$

Ex.10 A pair of dice is thrown simultaneously. Find the probability of getting
(i) a doublet
(ii) sum of the numbers on two dice is always 7
(iii) an even number on the first die and a multiple of 3 on the other.

Sol. If a pair of dice is thrown simultaneously, then all the possible outcomes are :
(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).
Total number of possible outcome = 36

(i) Let A_1 = event of getting a doublet.
Then, the favorable outcomes are (1, 1), (2, 2), (3,3), (4, 4), (5, 5), (6, 6).
Number of favorable outcomes = 6

Hence, required probability = P (getting a doublet) = $P(A_1) = \frac{6}{36} = \frac{1}{6}$

(ii) Let A_2 = event of getting a sum of numbers on two dice is always 7
Then, the favorable outcomes are (1, 6), (2, 5), (3, 4), (5, 2), (6, 1).
Number of favorable outcomes = 6

Hence, required probability = P (getting a sum of the numbers on two dice is always 7) = $P(A_2) = \frac{3}{36} = \frac{1}{6}$

(iii) Let A_3 = event of getting an even umber on the first die and a multiple of 3 on the other.
Then, the favorable outcomes are (2, 3), (2, 6), (4, 3), (4, 6), (6, 3), (6, 6).
Number of favorable outcomes = 6
Hence, required probability = P (getting an even umber on the first die and a multiple of 3 on the other)
$= P(A_3) = \frac{6}{36} = \frac{1}{6}$

Ex.11 Two dice, one blue and one grey, are thrown at the same time. Write down all the possible outcomes. What is the probability that the sum of the two numbers appearing on the top of the dice is
(a) 8 (b) 13 (iii) less than or equal to 12? (NCERT)

Sol. If two dice, one blue and one grey, are thrown at the same time, then all possible outcomes are :
(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).

Total number of possible outcome = 36

(i) Let A_1 = event of getting a sum two numbers appearing on the top o the dice is 8.
Then, the favorable outcomes are (2, 6), (2, 5), (4, 4), (5, 3), (6, 2).
Number of favorable outcomes = 5.

Hence, required probability = $P(A_1) = \frac{5}{36}$

(ii) Let A_2 = event of getting a sum two numbers appearing on the top o the dice is 13.
Then, the favorable outcomes = 0.

Hence, required probability = $P(A_2) = \frac{0}{36} = 0$

(iii) Let A_3 = event of getting a sum two numbers appearing on the top o the dice is less than or equal to 12.
Then, the favorable outcomes = all the possible outcomes = 36.

Hence, required probability = $P(A_3) = \frac{36}{36} = 1$.

Ex.12 A cards is drawn at random from a well shuffled deck of 52 cards. Find the probability that the card drawn is–
(i) a red card (ii) a non-ace (iii) a king or a jack (iv) neither a king nor a queen.

Sol. If a card is drawn at random from a well shuffled deck of 52 cards, then total number of possible outcomes = 52

(i) Let A_1 = event of getting a red card.
Then, the favorable outcomes = 26.

Hence, required probability = P (getting a red card) = $P(A_1) = \frac{26}{52} = \frac{1}{2}$

(ii) Let A_2 = event of getting a non-ace
Then, the favorable outcomes = 48. [$\because$ there are 4 aces in a pack of playing cards]

Hence, required probability = P (getting a non-ace) = $P(A_2) = \frac{48}{52} = \frac{12}{13}$

(iii) Let A_3 = event of getting a king or a jack.
There are 4 king cards and 4 jack cards.
Hence, required probability = $P(A_3)$ = P (getting a king or a jack) = P (getting a king) + P (getting a jack)

$= \frac{4}{52} + \frac{4}{52} + \frac{8}{52} + \frac{2}{13}$

(iv) Let A_4 = event of getting neither a king nor a queen.
There are 4 king cards and 4 queen cards.
Hence, required probability = $P(A_4)$ = P (getting neither a king nor a queen)
= 1 – P (getting a king or a queen)
= 1 – P (getting a king) + P (getting a queen)]

$= 1 - \left(\frac{4}{52} + \frac{4}{52}\right) = 1 - \frac{8}{52} = \frac{44}{52} = \frac{11}{13}$

ALITER: Let A_4 : event of getting neither king nor queen.
$\therefore$ no, of favorable outcomes.
i.e., neither king nor queen cards = 52 – 8 = 44

Hence, $P(A_4) = \frac{44}{52} = \frac{11}{13}$

Ex.13 All the three face cards of spades are removed from a well-shuffled pack of 52 cards. A card is then drawn at random from the remaining pack. Find the probability of getting
(i) a black face card (ii) a queen (iii) a black card

Sol. If all the three face cards of spades are removed from a well-shuffled pack of 52 cards, then there are 49 cards left in the pack.

(i) Let A_1 = event of getting a black face card.
There are 3 black face cards left. (face cards of club)

Hence, required probability = $P(A_1)$ = P (getting a black face card) = $\frac{3}{49}$

(ii) Let A_2 = event of getting a queen.

There are three queens left.

Hence, required probability = $P(A_2)$ = P (getting a queen) = $\frac{3}{49}$

(iii) Let A_3 = event of getting a black card.
There are 23 black cards left.

Hence, required probability = $P(A_3)$ = P (getting a black card) = $\frac{23}{49}$

Ex.14 Five cards, the-ten, jack, queen, king and ace of diamonds, are well-shuffled with their faces downwards. One card is then picked up at random.
(i) What is the probability that the card is the queen?
(ii) If the queen is drawn and put aside, what is the probability that the second card picked up is
(a) an ace ? (b) a queen ?

Sol. There are five cards as the ten, jack, queen, king and ace of diamond.
(i) Let A = event of getting a queen
There is only one queen out of the five cards.

Hence, required probability = P(A) = P (getting a queen) = $\frac{1}{5}$

(ii) When a queen is drawn and put aside four cards, the ten, jack, king and ace are left. Therefore.

(a) required probability = P (getting an ace) = $\frac{1}{4}$

(b) required probability = P (getting a queen) = $\frac{0}{4} = 0$.

Ex.15 A box contains 5 red. 4 green and 7 white balls. A ball is drawn at random from the box. Find the probability that the ball drawn is
(i) white (ii) neither red nor white

Sol. Total number of balls in the box = 5 + 4 + 7 = 16 .
Let A_1 = event of getting a red ball
A_2 = event of getting a white ball.
(i) There are 7 white balls in the box.

Hence, required probability = $P(A_2)$ = P (getting a white ball) = $\frac{7}{16}$

(ii) There are 7 white and 5 red balls in the box.
Hence, required probability = P (getting neither red nor white ball)
= 1 – P (getting either red or white ball)
= 1 – P (getting a red) + P (getting a white ball)]

$$= 1 - \left(\frac{5}{16} + \frac{7}{16}\right) = 1 - \frac{12}{16} = \frac{4}{16} = \frac{1}{4}$$

ALITER P(getting neither red nor white ball) = P (getting a green ball) = $\frac{4}{16} = \frac{1}{4}$

Ex.16 A bag contains 5 red balls and some blue balls. If the probability of drawing a blue ball is double that of red ball, determine the number of blue balls in the bag.

Sol. There are 5 red balls in a bag.
Let number of blue balls be x.
Let A_1 = event of getting a red ball
and A_2 = event of getting a blue ball.

$P(A_1)$ = P (getting a red ball) = $\frac{5}{x+5}$

$P(A_2)$ = P (getting a blue ball) = $\frac{x}{x+5}$

$\because 2P(A_1) = P(A_2) \Rightarrow \frac{2\times 5}{x+5} = \frac{x}{x+5} \Rightarrow 10 = x \Rightarrow x = 10$

Hence, required number of blue balls = 10.

Ex.17 A box contains 5 red marbles, 8 white marbles and 4 green marbles one marble is taken out of the box at random. What is the probability that the marble taken out will be
(i) red (ii) white (iii) not green?

Sol. Total number of marbles in the box = 5 + 8 + 4 = 17.

Let A_1 = event of getting a red marble
A_2 = event of getting a white marble
and A_3 = event of getting a green marble.

(i) There are 5 red marbles in the box.

Hence, required probability = $P(A_1)$ = P (getting a red marble) $= \frac{5}{17}$

(ii) There are 8 white marbles in the box.

Hence, required probability = $P(A_2)$ = P (getting a white marble) $= \frac{8}{17}$

(iii) There are 4 green marbles in the box.

$\therefore$ $P(A_3)$ = P (getting a green marble) = $\frac{4}{17}$

Hence, required probability = P (not getting a green marble)

= 1 – P (getting a green marble) = 1 – $P(A_3)$ $= 1 - \frac{4}{17} = \frac{13}{17}$.

Ex.18 A box contains 19 balls bearing numbers 1, 2, 3,……, 19 respectively. A ball is drawn at random from the box. Find the probability that the number on the ball is –
(i) a prime number (ii) even number
(iii) divisible by 3 or 5 (iv) neither divisible by 5 nor by 10.

Sol. Total number of balls in the box = 19

$\therefore$ number of all possible outcomes = 19

(i) Let A_1 = event of getting a prime number.
Then, the favorable outcomes are 2, 3, 5, 7, 11, 13, 17, 19.
Number of favorable outcomes = 8.

Hence, required probability = P (getting a prime number) = $P(A_1)$ $= \frac{8}{19}$.

(ii) Let A_2 = event of getting an even number.
Then, the favorable outcomes are 2, 4, 6, 8, 10, 12, 14, 16, 18.
Number of favorable outcomes = 9.

Hence, required probability = P (getting an even number) = $P(A_2)$ $= \frac{9}{19}$.

(iii) Let A_3 = event of getting a number divisible by 3 or 5.
Then, the favorable outcomes are 3, 5, 6, 9, 10, 12, 15, 18.
Number of favorable outcomes = 8.

Hence, required probability = P (getting a number divisible by 3 or 5) = $P(A_3)$ $= \frac{8}{19}$.

(iv) Let A_4 = event of getting a number divisible by 5 or 10.

Then, the favorable outcomes are 5, 10, 15. Number of favorable outcomes = 3.

$\therefore$ P (getting a number divisible by 5 or 10) = $P(A_4) = \frac{3}{19}$

Hence, required probability = P (getting a number neither divisible by 5 nor by 10)

= 1 – P (getting a number neither divisible by 5 nor by 10) $= 1 - \frac{3}{19} = \frac{16}{19}$

Ex.19 Seventeen cards numbered 1, 2, 3, 4,……, 16, 17 are put in a box and mixed thoroughly. One person drawn a card from the box. Find the probability that the number on the card is
(i) odd (ii) a prime (iii) divisible by 3 (iv) divisible by 2 and 3 both

Sol. There are seventeen cards in the box.
$\therefore$ number of all possible outcomes = 17.

(i) Let A_1 = event of getting an odd number.
Then, the favorable outcomes are 1, 3, 5, 7, 9, 11, 13, 15, 17.
Number of favorable outcomes = 9.

Hence, required probability = P (getting an odd number) = $P(A_1) = \frac{9}{17}$.

(ii) Let A_2 = event of getting a prime number.
Then, the favorable outcomes are 2, 3, 5, 7, 11, 13, 17.
Number of favorable outcomes = 7.

Hence, required probability = P (getting a prime number) = $P(A_2) = \frac{7}{17}$.

(iii) Let A_3 = event of getting a number divisible by 3.
Then, the favorable outcomes are 3, 6, 9, 12, 15.
Number of favorable outcomes = 5.

Hence, required probability = $P(A_3) = \frac{5}{17}$.

(iv) Let A_4 = event of getting a number divisible by 2 and 3 both.
Then, the favorable outcomes are 6, 12.
Number of favorable outcomes = 2.

Hence, required probability = $P(A_4) = \frac{2}{17}$.

Ex.20 Find the probability that a number selected at random from the numbers 1 to 15 not a prime number when each of the given numbers is equally likely to be selected.

Sol. The total given numbers = 25
Then, the favorable outcomes (prime numbers) are 2, 3, 5, 7, 11, 13, 17, 19, 23.
Number of favorable outcomes = 9.
Let A = event of getting a non-prime number.
$\therefore$ number of non-prime number = 25 – 9 = 16

$\therefore$ required probability = P (getting a non-prime numbers) = $P(A) = \frac{16}{25}$.

Ex.21 A box contains 90 discs which are numbered from 1 to 90. If one disc is drawn at random from the box, find the probability that it bears
(i) a two digit number (ii) a perfect square number (iii) a number divisible by 5.

Sol. The total of discs = 90. Number of possible outcomes = 90.

(i) Let A_1 = event of getting a two digit number.
There are 9 single-digit numbers and 81 two-digit numbers.
Then, the number of favorable outcomes = 81.

Hence, required probability = $P(A_1)$ = P (getting a two-digit number) $= \frac{81}{90} = \frac{9}{10}$.

(ii) Let A_2 = event of getting a perfect square number.
Then, the number of favorable outcomes are 1, 4, 9, 16, 25, 36, 49, 64, 81.
Number of favorable outcomes = 9.

Hence, required probability = $P(A_2)$ = P (getting a perfect square number) $= \frac{9}{90} = \frac{1}{10}$.

(iii) Let A_3 = event of getting a number divisible by 5.
Then, the number of favorable outcomes are 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90.
Number of favorable outcomes = 18.

Hence, required probability = $P(A_3)$ = P (getting a number divisible by 5) $= \frac{18}{90} = \frac{1}{5}$.

Ex.22 12 defective pens are accidentally mixed with 132 good ones. It is not possible to just look at a pen and tell whether or not is defective. One pen is taken out at random from this from this lot. Determine the probability that the pen taken out is a good one.

Sol. There are 12 defective pens and 132 good pens.
$\therefore$ Total number of possible outcomes = 12 + 132 = 144.
Let A = event of getting a good pen
Then, the number of favorable outcomes = 132

Hence, required probability = P(A) = P (getting a good pen) $= \frac{132}{144} = \frac{11}{12}$.

Ex.23 A lot consists of 144 ball pens of which 20 are defective and the others are good. Nuri will buy a pen if it is good, but will not buy if it is defective. The shopkeeper draws one pen at random and gives it t her. What is the probability that (i) she will buy it (ii) she will not buy it?

Sol. There are 144 ball pens.
$\therefore$ total number of possible outcomes = 144.

(i) Let A_1 = event of buying a good pen.
There are 20 ball pens which are defective out of 144 ball pens.
$\therefore$ number of good ball pens = 144 – 20 = 124

Hence, required probability = $P(A_1)$ = P (buying a good pen) $= \frac{124}{144} = \frac{31}{36}$.

(ii) Let A_2 = event of not buying a good pen i.e., buying a defective pen.
Then, the number of favorable outcomes = 20.

Hence, required probability = $P(A_2)$ = P (not buying a good pen) $= \frac{20}{144} = \frac{5}{36}$.

Ex.24 Savita and Hamida are friend. What is the probability that both will have
(i) different birthdays (ii) the same birthday (ignoring leap year). (NCERT)

Sol. There are 365 days in a year.
$\therefore$ the total number of possible outcomes = 365.

(i) Let A_1 = event that Hamida's birthday is different from Savita's birthday Then, the number of favorable outcomes for her birthday = 365 – 1 = 364.

Hence, required probability = $P(A_1)$ = P (Hamida's birthday is different from Savita's birthday) $= \frac{364}{365}$.

(ii) Let A_2 = the event the Savita and Hamida have the same birthday
Hence, required probability = $P(A_2)$ = P (Savita and Hamida have the same birthday)
= 1 – P (both have different birthday) $= \frac{364}{365} = \frac{1}{365}$.

Ex.25 A jar contains 24 marbles, some are green and others are blue. If a marble is drawn at random from the jar, the probability that is green is $\frac{2}{3}$. Find the number of blue marbles in the jar.

Sol. There are 24 marbles in a jar.
$\therefore$ the total number of possible outcomes = 24.
Let number of green marbles be x.

(ii) Let A_1 = event of getting a green marble.

$\therefore$ required probability = $P(A_1)$ = P (getting a green marble) = $\frac{x}{24}$

But it is given that the probability of green marble is $\frac{2}{3}$

$\therefore \quad \frac{2}{3}=\frac{x}{24} \Rightarrow x=\frac{2\times 24}{3} \Rightarrow x=16$

So, number of green marbles = 16.
Hence, number of blue marble in jar = 24 – 16 = 8.

Ex.36 What is the probability that an ordinary year has 53 Sundays?

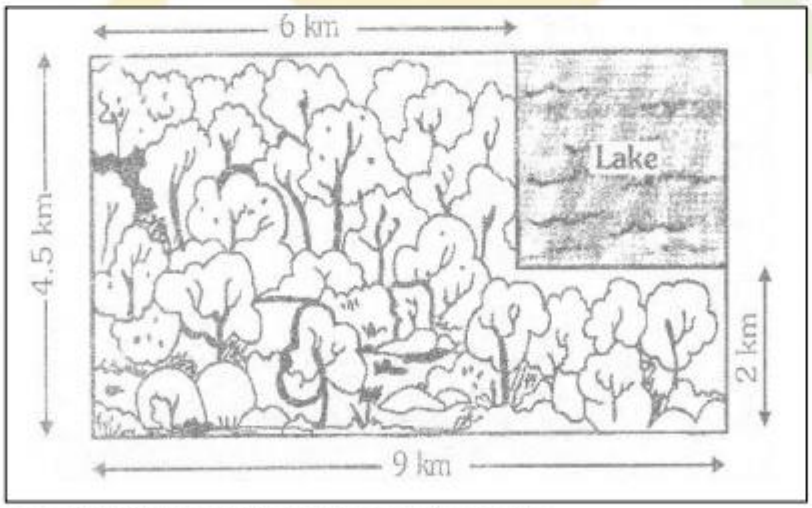
Sol. There are 365 day i.e., 52 weeks and 1 day in an ordinary year.
This 1 day can be anyone of the 7 days of the week.

$\therefore$ P (this day is Sunday) = $\frac{1}{7}$

Also, 52 weeks have 52 Sundays.

Hence, required probability = P (an ordinary year has 53 Sundays) = $\frac{1}{7}$.

Ex.27 A missing helicopter is reported to have crashed somewhere in the rectangular region in figure. What is the probability that it crashed inside the lake shown in the figure? (NCERT)



Sol. The helicopter is equally likely to crash anywhere in the region.
Area of entire rectangular region, where the helicopter con crash = (4.5 × 9) km^2 = 40.5 km^2.
Area of the lake = (2.5 × 3) km^2 = 7.5 km^2.
Let A = the event that the helicopter crashed inside the lake.
Then, number of favorable outcomes = 7.5 km^2

Hence, required probability = P(A) = P (helicopter crashed in the lake) $= \frac{7.5}{40.5} = \frac{75}{405} = \frac{5}{27}$.

Ex.28 A piggy bank contains hundred 50p coins, fifty Re. 1 coins, twenty Rs. 2 coins and ten Rs. 5 coins. If it is likely that one of the coins will fall out when the bank is turned upside down, what is the probability that the coin
(i) will be a 50p coin **(ii) will not be a Rs. 5 coin?**

Sol. Number of 50p coins = 100
Number of Rs. 1 coins = 50
Number of Rs. 2 coins = 20
Number of Rs. 5 coins = 10
$\therefore$ total number of coins = 180.
$\therefore$ the total number of possible outcomes = 180.

(i) Let A_1 = event of getting 50p coin.
Then, the number of favorable outcomes = 100.
Hence, required probability = $P(A_1)$ = P (getting a 50p coin) $= \frac{100}{180} = \frac{5}{9}$.

(ii) Let A_2 = event of getting not a Rs. 5 coin.
Hence, required probability = $P(A_2)$ = P (not getting Rs. 5 coin)
= 1 – P (getting a Rs. 5 coin)
$= 1 - = \frac{10}{180} = \frac{170}{180} = \frac{17}{18}$.

Ex.29 In a musical chair game, the person playing the music has been advised to stop playing the music at any time within two minutes after she/he starts playing. What is the probability that the music will stop within the first half minute after starting?

Sol. The possible outcomes are all the numbers between 0 and 2.
This is the portion of the number line from 0 to 2.

Let A = the event that the music is stopped within the first half-muiute.
Then, the favorable outcomes are points on the number line from 0 to $\frac{1}{2}$
The distance from 0 to 2 is 2, while the distance from 0 to $\frac{1}{2}$ is $\frac{1}{2}$
Since all the outcomes are equally likely, therefore, the total distance = 2 and favorable to A = $\frac{1}{2}$.
Hence, required probability = P(A) = P (the music is stopped within the first half minute) $= \frac{\frac{1}{2}}{2} = \frac{1}{4}$

Ex.30 **There are 40 students in class X of a school of whom 25 are girls and 15 are days. The class teacher has to select one student as a class representative. She writes the name of each student on a separte card, the cards being identical. Then she puts cards in a bag and stir them thoroughly. She, then draws one card from the bag. What is the probability that the name written on the card is the name of :**
(i) a girl **(ii) a boy?** **(NCERT)**

Sol. There are 40 students out of which 25 are girls and 15 are days.
$\therefore$ number of all possible outcomes = 40.

(i) Let A_1 = event that the name written on the card is the name of a gils.
Then, the number of favorable outcomes = 25.
Hence, required probability = $P(A_1) = \frac{25}{40} = \frac{3}{8}$.

(ii) Let A_2 = event that the name written on the card is the name of a bot.
Then, the number of favorable outcomes = 15.
Hence, required probability = $P(A_2) = \frac{15}{40} = \frac{3}{8}$.

EXERCISE – 1 (FOR SCHOOL/BOARD EXAMS)

OBJECTIVE TYPE QUESTIONS

CHOOSE THE CORRECT OPTION IN EACH OF THE FOLLOWING

1. If A be the event such that $P(A) = \frac{2}{5}$, then P(not A) is equal to

(a) $\frac{3}{5}$ (b) $\frac{4}{5}$ (c) $\frac{1}{5}$ (d) None of these

An unbiased die is thrown (Q. NO. 2 to 6)

2. The probability of getting a prime number is

(a) $\frac{1}{6}$ (b) $\frac{1}{3}$ (c) $\frac{1}{2}$ (d) $\frac{2}{3}$

3. The probability of getting a multiple of 3is

(a) $\frac{1}{6}$ (b) $\frac{1}{3}$ (c) $\frac{3}{6}$ (d) $\frac{4}{6}$

4. The probability of getting a number greater than 1is

(a) $\frac{1}{6}$ (b) $\frac{2}{6}$ (c) $\frac{4}{6}$ (d) $\frac{5}{6}$

5. The probability of getting a number between 1 and 6 is

(a) $\frac{1}{6}$ (b) $\frac{2}{6}$ (c) $\frac{4}{3}$ (d) $\frac{2}{3}$

6. The probability of getting an odd number is

(a) $\frac{1}{6}$ (b) $\frac{2}{6}$ (c) $\frac{4}{6}$ (d) None of these

Two unbiased coins are tossed simultaneously (Q. No. 7 to 10)

7. The probability of getting one head is

(a) $\frac{1}{2}$ (b) $\frac{3}{4}$ (c) $\frac{1}{4}$ (d) None of these

8. The probability of getting two heads

(a) $\frac{1}{2}$ (b) $\frac{1}{4}$ (c) $\frac{3}{4}$ (d) None of these

9. The probability of getting no head is

(a) $\frac{1}{4}$ (b) $\frac{3}{4}$ (c) $\frac{1}{2}$ (d) None of these

10. The probability of getting at least one head is

(a) $\frac{1}{2}$ (b) $\frac{1}{4}$ (c) $\frac{3}{4}$ (d) None of these

One card is drawn from a pack of 52 cards (Q. No. 11 to 14)

11. The probability of getting a jack card is

(a) $\frac{1}{13}$ (b) $\frac{2}{13}$ (c) $\frac{3}{13}$ (d) $\frac{4}{13}$

12. The probability of getting a face card is

(a) $\frac{1}{13}$ (b) $\frac{2}{13}$ (c) $\frac{3}{13}$ (d) $\frac{4}{13}$

13. The probability of getting a '10' of black suit is

(a) $\frac{1}{26}$ (b) $\frac{1}{13}$ (c) $\frac{2}{26}$ (d) None of these

14. The probability of getting a red and a king card is

(a) $\frac{5}{26}$ (b) $\frac{1}{13}$ (c) $\frac{7}{26}$ (d) None of these

15. A bag contains 4 red balls and 3 green balls. A ball is drawn at random. The probability a green ball is

(a) $\frac{1}{7}$ (b) $\frac{2}{7}$ (c) $\frac{3}{7}$ (d) $\frac{4}{7}$

16. P(E) + P($\overline{E}$) is equal to
The probability of getting a jack card is

(a) 0 (b) $\frac{1}{2}$ (c) 1 (d) None of these

Which one of the following cannot be the probability of an event (Q. No. 17 to 18)

17. (a) $\frac{1}{3}$ (b) $\frac{11}{36}$ (c) $\frac{-2}{3}$ (d) 1

18. (a) $\frac{2}{7}$ (b) 0 (c) $\frac{13}{29}$ (d) $\frac{5}{2}$

Choose the correct alternative for each of the following and justify your answer (Q. No. 19 to 22)

19. Probability of an impossible event is equal to

(a) 1 (b) 0 (c) $\frac{1}{2}$ (d) None of these

20. If $P(E_1)=\frac{1}{6}, P(E_2)=\frac{1}{3}, P(E_3)=\frac{1}{6}$, where E_1, E_2, E_3 and E_4 are elementary events of a random experiment, then $P(E_4)$ is equal to

(a) $\frac{1}{2}$ (b) $\frac{2}{3}$ (c) $\frac{1}{3}$ (d) None of these

21. Cards each marked with one of the numbers 4, 5, 6,…., 20 are placed in box and mixed thoroughly. One card is drawn at random from the box. Then, the probability of getting an even prime number is

(a) 0 (b) 1 (c) $\frac{1}{2}$ (d) None of these

22. A bag contains 5 red and 4 black balls. A ball is drawn at random from the bag. Then, the probability of getting a black ball is

(a) $\frac{1}{5}$ (b) $\frac{4}{9}$ (c) $\frac{1}{5}$ (d) $\frac{1}{4}$

OBJECTIVE				ANSWER KEY					EXERCISE-4						
Que.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Ans.	A	C	B	D	D	D	A	B	A	C	A	C	A	D	C
Que.	**16**	**17**	**18**	**19**	**20**	**21**	**22**								
Ans.	C	C	D	B	C	A	B								

EXERCISE – 1 (FOR SCHOOL/BOARD EXAMS)

SUBJCTIVE TYPE QUESTIONS

1. (a) Two dice are thrown at the same time. Complete the following table

Event : Sum on 2 dice	2	3	4	5	6	7	8	9	10	11	12
Probability	$\frac{1}{36}$						$\frac{5}{36}$				$\frac{1}{36}$

(b) A die is numbered in such a way that its faces show the numbers 1, 2, 3, 4, 5, 6. It is thrown two times and the total score in two throws is noted. Complete the following table which gives a few values of the total score on the two throws.

Number in first throw

Number in second throw						
+	1	2	2	3	3	6
1	2	3	3	4	4	7
2	3	4	4	5	5	8
2					5	
3						
3			5			9
6	7	8	8	9	9	12

(c) Justify the statement : "Tossing a coin a fair of deciding which team should get the batting first at the beginning of a cricket game"

2. Which of the following experiment have not equally likely outcomes? Explain.

(i) A trial is made to answer a true-false question. The answer is right or wrong.

(ii) A baby is born. It is boy or a girl.

(iii) Kushagra appears in an interview. He is selected or not selected.

(iv) A die is thrown. It turns to be an even or an odd number.

3. Match the following :

A black die and a white die are thrown at the same time.

(i) The probability of getting a total of 9. (a) $\frac{1}{6}$

(ii) The probability of getting a total of 10. (b) $\frac{5}{36}$

(iii) The probability of getting a total of more then 9. (c) $\frac{1}{12}$

(iv) The probability of getting the sum of the two numbers is 8. (d) $\frac{1}{9}$

4. (a) The probability that it will rain tomorrow is 0.85. What is the probability that it will not rain tomorrow?
(b) If The probability of winning a game is 0.6, what is the probability of losing it?

5. Find the probability of getting a tail when a coin is tossed once.

6. (a) Two unbiased coins are tossed simultaneously. Find the probability of getting
(i) exactly one gead (ii) exactly one tail (iii) two tails
(iv) at least one tail (v) atmost one tail (vi) no tail.
(b) Harpreet tosses two different coins simultaneously. What is the probability that she gets at least one head?

7. Three unbiased coins are tossed together. Find the probability of getting
(a) (i) one tail (ii) two tails (iii) all tails (iv) at least two tails

(b) (i) at most two tails (ii) at most two heads.

8. (a) A die is thrown once. Find the probability of getting
(i) a multiple of 2
(ii) a number lying between 1 and 5
(iii) an odd number.
(b) A child has a die whose six faces show the letters as given below

A	B	C	D	E	A

The die is thrown once. What is the probability of getting (i) A (ii) D?

9. A die is thrown twice. What is the probability that
(i) 3 will not come up either time?
(ii) 6 will come up at least once?

10. A pair of dice is thrown simultaneously. Find the probability of getting
(i) a multiple of 3 on both dice
(ii) sum of the numbers on two dice is always less than 7.
(iii) an odd number on the first die and a prime number on the other.

11. Two dice, one blue and green are thrown at the same time. What is the probability that sum of the two umbers appearing on the top of the dice is
(i) 9 (ii) greater than 10 (iii) less than or equal to 11

12. One card is drawn from a well-shuffled deck of 52 cards. Find the probability of getting
(a) (i) a king of red colour (ii) a face card (iii) a red face card (iv) a jack of hearts
(b) (i) a spade (ii) the queen of diamonds (iii) neither a red card nor a queen.
(c) (i) a non-face card (ii) a black king or a red queen

13. (a) From a pack of 52 playing cards jacks, queens, kings and aces of red colour are removed. From a remaining, a card is drawn at random. Find the probability that the card drawn is
(i) a black queen (ii) a red card (iii) a ten (iv) a picture card [jacks, queens and kings are picture cards]
(b) All cards of ace, jack and queen are removed from a deck of playing cards. One card is drawn at random from the remaining cards. Find the probability that the card drawn is
(i) a face card

(ii) not a face card

14. Five cards – the ten, jack, queen, king and ace of diamonds are well-shuffled with their face downwards. One card is then picked up at random.

(i) What is the probability that the card is jack?

(ii) If the king is drawn and put aside, what is the probability that the second card picked up is

(a) a queen (b) a ten?

15. (a) A bag contains 7 red, 5 white and 3 black balls. A ball is drawn at random from the bag. Find the probability that the drawn ball is

(b) (i) A bag contains 5 white balls, 7 red balls, 4 black and 2 blue balls. One ball is drawn at random from the bag. What is the probability that the ball drawn is

(1) white or blue (2) red or black (3) not white (4) neither white nor black

(ii) A bag contains 6 red balls, 8 white balls, 5 green balls and 3 black balls. One ball is drawn at random from the bag. Find the probability that the ball drawn is

(1) white (2) red or black (3) not green (4) neither white nor black

(iii) A bag contains a red balls, a blue balls, a yellow balls, all the balls being of the same size. Kritika takes out a ball from the bag without looking into it. What is the probability that the she takes out the

(1) yellow ball (2) red ball (3) blue ball?

(iv) A box contains 7 red balls, 8 green balls, 5 white balls. A ball is drawn at random from the box. Find the probability that the ball drawn is

(1) white (2) neither red nor white

(c) Poonam buys a fish from a shop for her aquarium. The shopkeeper takes out one fish at random from a tank containing 5 male fish 8 female fish. What is the probability that the fish taken out is a male fish?

16. A box contains 12 balls out of which x are black. If one ball is drawn at random from the box, what is the probability that it will be a black ball?

If 6 more black balls are put in the box, the probability of drawing a black ball is now doubled of what it was before, find x.

17. (a) A box contain 3 blue, 2 white and 4 red marbles. If a marble is drawn at random from the box. What is the probability of that it will be

(i) white (ii) blue (iii) red?

(b) A bag contain 5 red, 8 green and 7 white balls. One ball is drawn at random from the bag, find the probability of getting

(i) a white ball or a green ball (ii) neither a green ball nor a red ball

18. (a) A box contains 20 balls bearing numbers 1, 2, 3,….., 20 respectively. A ball is drawn at random from the box what is the probability that the number on the ball is

(b) Find the probability that a number selected at random from the numbers 1, 2, 3, 4, 5,….., 34, 35 is a

(i) prime number (ii) multiple of 7 (iii) multiple of 3 or 5

(c) Cards bearing numbers 3 to 19 are put in a box and mixed thoroughly. A card is drawn from the box at random. Find the probability that the number on the card drawn is

(i) even (ii) a prime (iii) divisible by 2 and 3 both.

19. Fifteen cards numbered 1, 2, 3, 4,…..,14, 15 are put in a box and mixed thoroughly. A man drawn a card at random from the box. Find the probability that the number on the card is
(i) an odd number (ii) a multiple of 4 (iii) divisible by 5 (iv) divisible by 2 and 3 both.
(v) less than or equal to 10.

20. (a) There are 30 cards numbered from 1 to 30. One card is drawn at random. Find the probability that the number of the selected card is not divisible by 3.

(b) A game of chance consists of spinning an arrow which comes to rest pointing at one of the numbers 1, 2, 3, 4, 5, 6, 7, 8, and these are equally likely outcomes. What is the probability that it will point at
(i) 8 (ii) an odd number (iii) a number greater than 2 (iv) a number less than 9.

21. A box contains 50 discs which are numbered from 1 to 50. If one disc is drawn at random from the box, find the probability that it bears
(i) a two digit number less than (ii) a prime number (iii) a number divisible by 3

22. (i) A lot of 20 bulbs contains 4 defective ones. One bulb is drawn at random from the lot. What is the probability that this bulb is defective?

(ii) Suppose the bulb drawn in (i) is not defective and is not replaced. Now one bulb is drawn at random from the rest. What is the probability that this bulb is not defective?

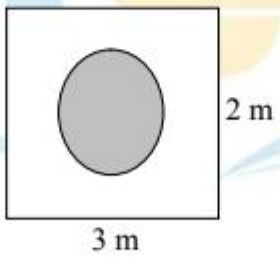
23. A carton consists of 100 shirts of which 88 are good, 8 have minor defects and 4 have major defects. Jimmy, a trader, will only accept the shirts which are good, but Sujata, another trader, will only reject the shirts which have major defects. One shirt is drawn at random from the carton. What is the probability that
(i) it is acceptable to Jimmy? (ii) it is acceptable to Sujata.

24. It is given that in a group of 3 students, the probability of 2 students not having the same birthday is 0.992. What is the probability that the 2 students have the same birthday?

25. The probability of selecting a green marble at random from a jar that contains only green, white and yellow marbles is $\frac{1}{4}$. The probability of selecting a white marble at random from the same jar is $\frac{1}{3}$. If this jar contains 10 yellow marbles, what is the total number of marbles in the jar.

26. What is the probability that a leap year has 53 Sundays?

27. Suppose you drop a die at random on the rectangular region shown in figure. What is the probability that it will lend inside the circle with diameter 1 m?



28. A purse contains 10 five hundred rupee note, 20 hundred rupee notes, 30 fifty rupee note and 40 ten rupee note. If it is likely that one of the notes will fall out when the purse turns upside. What is the probability that the note
(i) will be a fifty rupee note (ii) will not be a five hundred rupee note.

29. In a musical chair game, the person playing the music has been advised to stop playing the music at any time within three minutes after she starts playing. What is the probability that the music will stop within the first half minute after starting?

30. There are 44 students in class X of a school of whom 32 are boys and 12 are girls. The class teacher has to selected one student as a class representative. He writes the name of each student on a separate card, the cards being identical. Then he puts cards in a bag and stir them thoroughly. He then drawn one card from the bag. What is the probability that the name written on the card is the name of

(i) a girl? (ii) a boy?

- **Subjective type Question**

1. (a)

Sum on 2 dice	2	3	4	5	6	7	8	9	10	11	12
Probability	$\frac{1}{36}$	$\frac{2}{36}$	$\frac{3}{36}$	$\frac{4}{36}$	$\frac{5}{36}$	$\frac{6}{36}$	$\frac{5}{36}$	$\frac{4}{36}$	$\frac{3}{36}$	$\frac{2}{36}$	$\frac{1}{36}$

(b)

+	1	2	2	3	3	6
1	2	3	3	4	4	7
2	3	4	4	5	5	8
2	3	4	4	5	5	8
3	4	5	5	6	6	9
3	4	5	5	6	6	9
6	7	8	8	9	9	12

2. (iii), because selection depends on number of factors, (constraints) **3.** (i)- (d), (ii)- (c), (iii)- (a), (iv)- (b)

4. (a) 0.15, (b) 0.4 **5.** $\frac{1}{2}$ **6.** (a) (i) $\frac{1}{2}$, (ii) $\frac{1}{2}$, (iii) $\frac{1}{4}$, (iv) $\frac{3}{4}$, (v) $\frac{3}{4}$, (vi) $\frac{1}{4}$, (b) $\frac{3}{4}$

7. (a) (i) $\frac{3}{8}$, (ii) $\frac{3}{8}$, (iii) $\frac{1}{8}$, (iv) $\frac{1}{2}$: (b) (i) $\frac{7}{8}$, (ii) $\frac{7}{8}$ **8.** (a) (i) $\frac{1}{2}$, (ii) $\frac{1}{2}$, (iii) $\frac{1}{2}$; (b) (i) $\frac{1}{3}$, (i) $\frac{1}{6}$

9. (i) $\frac{25}{36}$, (ii) $\frac{11}{36}$, **10.** (i) $\frac{1}{9}$, (ii) $\frac{5}{12}$, (iii) $\frac{1}{4}$, **11.** (i) $\frac{1}{9}$, (ii) $\frac{1}{12}$, (iii) $\frac{25}{36}$,

13. (a) (i) $\frac{1}{22}$, (ii) $\frac{9}{22}$, (iii) $\frac{1}{11}$, (iv) $\frac{3}{22}$; (b) (i) $\frac{1}{10}$, (ii) $\frac{9}{10}$, **14.** (i) $\frac{1}{5}$, (ii) $\frac{1}{4}$, (b) $\frac{1}{4}$,

15. (a) (i) $\frac{4}{5}$, (ii) $\frac{4}{5}$, (iii) $\frac{7}{15}$; (b) (i) (1) $\frac{7}{18}$, (2) $\frac{11}{18}$, (3) $\frac{13}{18}$, (4) $\frac{1}{2}$; (ii) (1) $\frac{4}{11}$, (2) $\frac{9}{22}$, (3) $\frac{17}{22}$, (4) $\frac{1}{2}$;
(iii) (1) $\frac{1}{3}$, (2) $\frac{1}{3}$, (3) $\frac{1}{3}$; (iv) (1) $\frac{1}{4}$, (2) $\frac{2}{5}$, (c) $\frac{5}{13}$

16. $\frac{x}{12}, x = 3$ **17.** (a) (i) $\frac{2}{9}$, (ii) $\frac{1}{3}$, (iii) $\frac{4}{9}$; (b) (i) $\frac{3}{4}$, (ii) $\frac{7}{20}$

18. (a) (i) $\frac{1}{2}$, (ii) $\frac{13}{20}$, (iii) $\frac{2}{5}$, (iv) $\frac{9}{10}$; (b) (i) $\frac{11}{35}$, (ii) $\frac{1}{7}$ (iii) $\frac{16}{35}$; (c) (i) $\frac{8}{17}$, (ii) $\frac{7}{17}$, (iii) $\frac{3}{17}$,

19. (i) $\frac{8}{15}$, (ii) $\frac{1}{5}$, (iii) $\frac{1}{5}$, (iv) $\frac{2}{15}$, (v) $\frac{2}{3}$, **20.** (a) $\frac{2}{3}$; (b) (i) $\frac{1}{8}$, (ii) $\frac{1}{2}$, (iii) $\frac{3}{4}$, (iv) 1

21. (i) $\frac{2}{5}$, (ii) $\frac{3}{10}$, (iii) $\frac{8}{25}$ **22.** (i) $\frac{1}{5}$, (ii) $\frac{15}{19}$ **23.** (i) 0.88 (ii) 0.96 **24.** (i) 0.008 **25.** 24 **26.** $\frac{2}{7}$

27. $\frac{\pi}{24}$ **28.** (i) $\frac{3}{10}$, (ii) $\frac{9}{10}$ **29.** $\frac{1}{6}$ **30.** (i) $\frac{3}{11}$, (ii) $\frac{8}{11}$

EXERCISE – 1 (FOR SCHOOL/BOARD EXAMS)

PREVIOUS YEARS BOARD (CBSE) QUESTIONS

1. Mark Question :

1. From a well shuffled pack of cards, a card is drawn at random. Find the probability of getting a black queen. **[Delhi- 2008]**

2. A bag contains 4 red and 6 black balls. A ball is taken out of the bag at random. From the probability of getting a black ball. **[Al-2008]**

3. A die is thrown once. Find the probability of getting a number less than 3. **[Foreign-2008]**

4. Cards bearing numbers 3 to 20 are placed in a bag and mixed thoroughly. A card is taken out from the bag at random. What is the probability that the number on the card taken out is an even number? **[Delhi-2008 C]**

5. Two friends were born in the year 2000. What is the probability that they have the same birthday? **[Al-2008 C]**

OR

Two coins are tossed simultaneously. Find the probability of getting exactly one head. **[Al-2008]**

2 Mark Question :

1. A die is thrown once. Find the probability of getting **[Delhi-2008]**

(i) A prime number

(ii) A number divisible by 2.

2. Cards, carked with numbers 5 to 50, are placed in a box and mixed thoroughly. A card is drawn from the box at random. Find the probability that the number on the taken card is :

(i) A prime number less than 10.

(ii) A number which is a perfect square

3. A pair of dice is thrown once. Find the probability of getting the same number on each dice. **[Foreign-2008]**

4. A bag contains 5 red, 4 blue and 3 green balls. A ball is taken out of the bag at random. Find the probability that the selected ball is (i) of red colour (ii) not of green colour.

OR

A card is drawn at random from a well-shuffled deck of playing cards. Find the probability of drawing a
(i) face card (ii) card which is neither a king nor a red card. **[Delhi-2008 C]**

5. Two dice are thrown simultaneously. Find the probability that the sum of the two numbers appearing on the top is less than or equal to 10.

OR

The king, queen and jack of diamonds are removed from a pack of 52 cards and than the pack is well shuffled. A card is drawn from the remaining cards. Find the probability of getting a card of (i) diamonds (ii) a jack.
[Al-2008 C]

3 Marks Question :

1. A bag contains 5 black, 7 red and 3 white balls. A ball is drawn from the bag at random. Find the probability that the ball drawn is (i) red (ii) black or white (iii) not black. **[Delhi-2004]**
2. A bag contains 7 black, 8 red and 3 white balls. A ball is drawn from the bag at random. Find the probability that the ball drawn is (i) red (ii) black or white (iii) not black. **[Delhi-2004]**
3. A bag contains 6 black, 7 red and 2 white balls. A ball is drawn from the bag at random. Find the probability that the ball drawn is (i) red (ii) black or white (iii) not black. **[Delhi-2004]**
4. A bag contains 4 red, 5 black and 6 white balls. A ball is drawn from the bag at random. Find the probability that the ball drawn is (i) white (ii) red (iii) not black (iv) red or white. **[Al-2004]**
5. A bag contains 4 red, 5 black and 6 white balls. A ball is drawn from the bag at random. Find the probability that the ball drawn is (i) white (ii) red (iii) not black (iv) red or white. **[Al-2004]**
6. A bag contains 3 red, 5 black and 7 white balls. A ball is drawn from the bag at random. Find the probability that the ball drawn is (i) white (ii) red (iii) not black (iv) red or white. **[Al-2004]**
7. A bag contains 6 red, 5 black and 4 white balls. A ball is drawn from the bag at random. Find the probability that the ball drawn is (i) white (ii) red (iii) not black (iv) red or white. **[Al-2004]**
8. 15 cards, numbered 1, 2, 3,…., 15 are put in a box and mixed thoroughly. A card is drawn at random from the box. Find the probability that the card drawn bears (i) an even number (ii) a number divisible by 2 or 3.**[Al-2004]**
9. A card is drawn at random from a pack of 52 playing cards. Find the probability that the card drawn is neither an ace nor a king. **[Foreign-2004]**
10. Out of 400 bulbs in a box, 15 bulbs are defective. One bulb is taken out at random from the box. Find the probability that the drawn bulb is not defective.

OR

Find the probability of getting 53 Fridays in a leap year. **[Al-2004 C]**

11. A bag contains 8 red, 6 white and 4 black balls. A ball is drawn from the bag at random. Find the probability that the ball drawn is (i)red or white (ii) not black (iii) neither white nor black **[Al-2005]**
12. A bag contains 5 white balls, 7 red balls, 4 black balls, and 2 blue balls. Out ball is drawn at random from the bag. What is the probability that the ball drawn is :
(i) white or blue (ii) red or black (iii) not white (iv) neither white nor black **[Delhi-2006]**
13. A card is drawn at random from a well shuffled deck of playing cards. Find the probability that the card drawn is :
(i) a king or a jack (ii) a non ace (iii) a red card (iv) neither a king nor a queen **[Delhi-2006]**
14. A card is drawn at random from a well shuffled deck of playing cards. Find the probability that the card drawn is :
(i) a card of spade or an ace (ii) a red king (iii) neither a king nor a queen (iv) either a king or queen **[Delhi-2006]**
15. A box contains 19 balls bearing numbers 1, 2, 3, ….., 19. A ball is drawn at random from the box. What is the probability that the number of the ball is (i) a prime number (ii) divisible by 3 or 5 (iii) neither divisible by 5 nor by 10 (iv) an even number. **[Delhi-2006 C]**
16. Find the probability that a number selected at random from the numbers, …., 35 is a (i) prime number
(ii) multiple of 7 (iii) multiple of 3 or 5. **[Delhi-2006 C]**
17. From a pack of 52 playing cards, jacks, queens, kings and aces of red colour are removed. From the remaining cards, a card is drawn at random. Find the probability that the card drawn is : (i) a black queen (ii) a red card
(iii) a black jack (iv) a picture card (jacks, queens and kings are picture cards.) **[Al-2006 C]**

18. Cards marked with numbers 3, 4, 5, …, 50 are placed in a box and mixed thoroughly. One cards is drawn at random from the box. Find the probability that number on the drawn card is (i) divisible by 7 (ii) a number which is a perfect square. **[Delhi-2007]**

19. A bag contains 5 red balls and some blue balls. If the probability of drawing a blue from the bag is thrice that of a red ball, find the number of blue balls in the bag. **[Delhi-2007]**

20. A box contains 5 red balls, 4 green balls and 7 white balls. A ball is drawn at random from the box. Find the probability that the ball drawn is : (i) white (ii) neither red nor white. **[Al-2006]**

21. All the three face cards of spades are removed from a deck of 52 cards. A card is then drawn at random from the remaining pack. Find the probability of getting a card of (i) a black face card (ii) a queen (iii) a black card. **[Al-2009]**

22. The king, queen and jack of clubs are removed from a deck of 52 playing cards and the remaining cards are shuffled. A card is drawn from the remaining cards. Find the probability of getting a card of (i) heart (ii) queen (iii) clubs. **[Delhi-2009]**

23. Two dice are thrown simultaneously. What is the probability that
(i) 5 will not come up on either of them?
(ii) 5 will come up on at least one?
(iii) 5 will come up at both dice? **[Al-2009]**

OR

A box has cards numbered 14 to 99. Cards are mixed thoroughly and a card is drawn from the bag at random. Find the probability that the number on the card, drawn from the box is :
(i) an odd number
(ii) a perfect square number
(iii) a number divisible by 7.

[Foreign-2009]

1 Mark :

1. $\frac{1}{26}$ **2.** $\frac{3}{5}$ **3.** $\frac{1}{3}$ 4. $\frac{1}{2}$ **5.** $\frac{1}{366}$ OR $\frac{1}{2}$

2 Marks :

1. (i) $\frac{1}{2}$ (ii) $\frac{1}{2}$ **2.** (i) $\frac{1}{23}$ (ii) $\frac{5}{46}$ 3. $\frac{1}{6}$ **4.** (i) $\frac{5}{12}$ (ii) $\frac{3}{4}$ OR (i) $\frac{3}{13}$ (ii) $\frac{6}{13}$ **5.** $\frac{11}{12}$ OR (i) $\frac{10}{49}$, (ii) $\frac{3}{49}$

3 Marks :

1. (i) $\frac{7}{15}$ (ii) $\frac{8}{15}$ (iii) $\frac{2}{3}$ 2. (i) $\frac{1}{3}$ (ii) $\frac{2}{3}$ (iii) $\frac{8}{15}$ 3. (i) $\frac{7}{15}$ (ii) $\frac{8}{15}$ (iii) $\frac{3}{5}$ 4. (i) $\frac{2}{5}$ (ii) $\frac{4}{15}$ (iii) $\frac{2}{3}$ (iv) $\frac{2}{3}$

5. (i) $\frac{2}{5}$ (ii) $\frac{4}{15}$ (iii) $\frac{2}{3}$ (iv) $\frac{2}{3}$ 6. (i) $\frac{7}{15}$ (ii) $\frac{1}{5}$ (iii) $\frac{2}{3}$ (iv) $\frac{2}{3}$ 7. (i) $\frac{4}{15}$ (ii) $\frac{2}{5}$ (iii) $\frac{2}{3}$ (iv) $\frac{2}{3}$ 8. (i) $\frac{7}{15}$ (ii) $\frac{2}{3}$

9. $\frac{11}{13}$ 10. $\frac{77}{80}$ OR $\frac{2}{7}$ 11. (i) $\frac{7}{9}$ (ii) $\frac{7}{9}$ (iii) $\frac{4}{9}$ 12. (i) $\frac{7}{18}$ (ii) $\frac{11}{18}$ (iii) $\frac{13}{18}$ (iv) $\frac{1}{2}$ 13. (i) $\frac{2}{13}$ (ii) $\frac{12}{13}$ (iii) $\frac{1}{2}$ (iv) $\frac{11}{13}$

14. (i) $\frac{4}{13}$ (ii) $\frac{1}{26}$ (iii) $\frac{11}{13}$ (iv) $\frac{2}{13}$ 15. (i) $\frac{8}{19}$ (ii) $\frac{8}{19}$ (iii) $\frac{16}{19}$ (iv) $\frac{9}{19}$ 16. (i) $\frac{11}{35}$ (ii) $\frac{1}{7}$ (iii) $\frac{16}{35}$ 17. (i) $\frac{1}{22}$ (ii) $\frac{9}{22}$ (iii) $\frac{1}{22}$ (iv) $\frac{3}{22}$ 18. (i) $\frac{1}{8}$ (ii) $\frac{5}{48}$ 19. 15 20. (i) $\frac{7}{16}$ (ii) $\frac{1}{4}$ 21. (i) $\frac{3}{49}$ (ii) $\frac{3}{49}$ (iii) $\frac{23}{49}$ 22. (i) $\frac{13}{49}$ (ii) $\frac{3}{49}$ (iii) $\frac{23}{49}$

23. (i) $\frac{25}{36}$ (ii) $\frac{11}{36}$ (iii) $\frac{1}{36}$ OR (i) $\frac{1}{2}$ (ii) $\frac{4}{43}$ (iii) $\frac{13}{86}$

EXERCISE – 1 (FOR SCHOOL/BOARD EXAMS)

OBJECTIVE TYPE QUESTIONS

CHOOSE THE CORRECT OPTION IN EACH OF THE FOLLOWING

1. Find the probability of getting a head in a throw of a coin.

(A) $\frac{1}{2}$ (B) 1 (C) 2 (D) None of these

Directions (for Q. No. 2-5) : Two fair coins are tossed simultaneously. Find the probability of

2. Getting only one head

(A) $\frac{1}{2}$ (B) $\frac{3}{4}$ (C) $\frac{2}{3}$ (D) $\frac{3}{4}$

3. Getting two heads

(A) $\frac{1}{4}$ (B) $\frac{3}{4}$ (C) $\frac{1}{2}$ (D) $\frac{3}{8}$

4. Getting at least two heads

(A) $\frac{7}{2}$ (B) $\frac{1}{4}$ (C) $\frac{1}{2}$ (D) $\frac{4}{5}$

5. Getting at least two heads

(A) $\frac{3}{4}$ (B) $\frac{1}{2}$ (C) $\frac{1}{4}$ (D) 1

Directions (for Q. No. 6-12) : Three fair coins are tossed simultaneously. Find the probability of

6. Getting one head

(A) 0 (B) $\frac{3}{4}$ (C) $\frac{5}{8}$ (D) $\frac{3}{8}$

7. Getting one tail

(A) 1 (B) $\frac{1}{4}$ (C) $\frac{5}{8}$ (D) $\frac{3}{8}$

8. Getting at least one heads

(A) $\frac{7}{8}$ (B) $\frac{1}{8}$ (C) $\frac{3}{4}$ (D) $\frac{1}{4}$

9. Getting two heads

(A) $\frac{3}{5}$ (B) $\frac{3}{8}$ (C) $\frac{5}{8}$ (D) $\frac{2}{5}$

10. Getting two heads

(A) $\frac{3}{8}$ (B) $\frac{7}{8}$ (C) $\frac{1}{2}$ (D) $\frac{1}{4}$

11. Getting at least one head and one tail

(A) $\frac{2}{8}$ (B) $\frac{1}{2}$ (C) $\frac{3}{10}$ (D) $\frac{4}{3}$

12. Getting more heads than the number of tails

(A) 2 (B) $\frac{7}{8}$ (C) $\frac{5}{8}$ (D) $\frac{1}{2}$

13. Getting a number less than 7 but greater than 0

(A) 0 (B) $\frac{3}{4}$ (C) 1 (D) $\frac{7}{8}$

14. Getting a multiple of 3.

(A) $\frac{1}{6}$ (B) $\frac{1}{3}$ (C) $\frac{5}{6}$ (D) None of these

15. Getting a prime number

(A) $\frac{1}{2}$ (B) $\frac{3}{5}$ (C) $\frac{5}{7}$ (D) $\frac{5}{8}$

16. Getting an even number

(A) $\frac{1}{2}$ (B) $\frac{4}{5}$ (C) $\frac{5}{7}$ (D) $\frac{5}{8}$

Directions (for Q. No. 17 and 18) : A coin is tossed successively three times. Find the probability of

17. Getting exactly one head or two heads.

(A) $\frac{1}{4}$ (B) $\frac{3}{4}$ (C) $\frac{1}{2}$ (D) $\frac{3}{8}$

18. Getting no heads.

(A) 0 (B) 1 (C) $\frac{1}{8}$ (D) $\frac{7}{8}$

Directions (for Q. No. 19-27) : Two dice are rolled simultaneously. Find the probability of

19. Getting a total of 9

(A) $\frac{1}{3}$ (B) $\frac{1}{9}$ (C) $\frac{8}{9}$ (D) $\frac{9}{10}$

20. Getting a sum greater than 9

(A) $\frac{10}{11}$ (B) $\frac{5}{6}$ (C) $\frac{1}{6}$ (D) $\frac{8}{9}$

21. Getting a total of 9 or 11

(A) $\frac{2}{99}$ (B) $\frac{20}{99}$ (C) $\frac{1}{6}$ (D) $\frac{1}{10}$

22. Getting a doublet

(A) $\frac{1}{12}$ (B) 0 (C) $\frac{5}{8}$ (D) $\frac{1}{6}$

23. Getting a doublet of even number

(A) $\frac{5}{8}$ (B) $\frac{1}{12}$ (C) $\frac{3}{4}$ (D) $\frac{1}{4}$

24. Getting a multiple of two on one die and a multiple of three on the other.

(A) $\frac{15}{36}$ (B) $\frac{25}{36}$ (C) $\frac{11}{36}$ (D) $\frac{5}{6}$

25. Getting the sum of numbers on the two faces divisible by 3 or 4.n even number

(A) $\frac{4}{9}$ (B) $\frac{1}{7}$ (C) $\frac{5}{9}$ (D) $\frac{7}{12}$

26. Getting the sum as a prime number

(A) $\frac{3}{5}$ (B) $\frac{5}{12}$ (C) $\frac{1}{2}$ (D) $\frac{3}{4}$

27. Getting at least one 5.

(A) $\frac{3}{5}$ (B) $\frac{1}{5}$ (C) $\frac{5}{36}$ (D) $\frac{11}{36}$

Directions (for Q. No. 28-35) : One card is drawn from a pack of 52 cards, each of the 52 cards being equally likely to drawn. Find the probability that

28. The card drawn is black

(A) $\frac{1}{2}$ (B) $\frac{1}{4}$ (C) $\frac{8}{13}$ (D) can't be determined

29. The card drawn is a queen

(A) $\frac{1}{12}$ (B) $\frac{1}{13}$ (C) $\frac{1}{4}$ (D) $\frac{3}{4}$

30. The card drawn is black and a queen

(A) $\frac{1}{13}$ (B) $\frac{1}{52}$ (C) $\frac{1}{26}$ (D) $\frac{5}{26}$

31. The card drawn is either black or a queen

(A) $\frac{15}{26}$ (B) $\frac{13}{17}$ (C) $\frac{7}{13}$ (D) $\frac{5}{26}$

32. The card drawn is either king or a queen

(A) $\frac{5}{26}$ (B) $\frac{1}{13}$ (C) $\frac{2}{13}$ (D) $\frac{12}{13}$

33. The card drawn is either a heart, a king or a queen

(A) $\frac{17}{52}$ (B) $\frac{21}{52}$ (C) $\frac{19}{52}$ (D) $\frac{9}{26}$

34. The card drawn is neither a spade nor a king

(A) 0 (B) $\frac{9}{13}$ (C) $\frac{1}{2}$ (D) $\frac{4}{13}$

35. The card drawn is neither a ace nor a king

(A) $\frac{11}{13}$ (B) $\frac{1}{2}$ (C) $\frac{2}{13}$ (D) $\frac{11}{26}$

36. From a well shuffled pack of 52 cards, three cards are drawn at random. Find the probability of drawing an ace, a king and a jack.

(A) $\frac{16}{5525}$ (B) $\frac{16}{625}$ (C) $\frac{16}{3125}$ (D) None of these

37. Four cards are drawn at random from a pack of 52 cards. Find the probability of getting all the four cards of same number.

(A) $\frac{17}{1625}$ (B) $\frac{1}{20825}$ (C) $\frac{7}{25850}$ (D) None of these

38. From a well shuffled pack of 52 cards, four cards are accidently dropped. Find the probability that one card is missing from each suit.

(A) $\frac{17}{20825}$ (B) $\frac{2197}{20825}$ (C) $\frac{197}{1665}$ (D) None of these

39. Four cards are drawn at random from a pack of 52 cards. Find the probability of getting all the four cards different number.

(A) $\frac{141}{4165}$ (B) $\frac{117}{833}$ (C) $\frac{264}{4165}$ (D) None of these

Directions (for Q. No. 40-13) : Four dice are thrown simultaneously. Find the probability that

40. All of them show the same face.

(A) $\frac{1}{216}$ (B) $\frac{15}{16}$ (C) $\frac{15}{36}$ (D) $\frac{1}{2}$

41. All of them show the different face.

(A) $\frac{3}{28}$ (B) $\frac{5}{18}$ (C) $\frac{15}{36}$ (D) $\frac{11}{36}$

42. Two of them show the same face and remaining two show the different faces.

(A) $\frac{4}{9}$ (B) $\frac{5}{9}$ (C) $\frac{11}{18}$ (D) $\frac{7}{9}$

43. At least two of them show the same face.

(A) $\frac{37}{72}$ (B) $\frac{11}{66}$ (C) $\frac{47}{72}$ (D) $\frac{25}{36}$

44. What is the probability that the number selected from the numbers 1, 2, 3, ….., 20, is a prime number when each of the given numbers is equally likely to be selected ?

(A) $\frac{7}{10}$ (B) $\frac{2}{15}$ (C) $\frac{2}{5}$ (D) $\frac{3}{5}$

45. Tickets numbered from 1 to 18 are mixed up together and then a ticket is drawn at random. Find the probability that the ticket has a number which is a multiple of 2 or 3.

(A) $\frac{1}{3}$ (B) $\frac{3}{5}$ (C) $\frac{2}{3}$ (D) $\frac{5}{6}$

46. In a lottery of 100 tickets numbered 1 to 100, two tickets are drawn simultaneously. Find the probability that both the tickets drawn have prime numbers.

47. In the previous question, find the probability that none of the tickets drawn has a prime number.

(A) $\frac{29}{66}$ (B) $\frac{17}{33}$ (C) $\frac{37}{66}$ (D) $\frac{17}{50}$

48. Find the probability that a leap year selected at random will contain 53 Sundays.

(A) $\frac{5}{7}$ (B) $\frac{3}{4}$ (C) $\frac{4}{7}$ (D) $\frac{2}{7}$

Directions (for Q. No. 49-53) : A bag contains 8 red and 4 green balls. Find the probability that

49. The ball drawn is red when one ball is selected at random.

(A) $\frac{2}{3}$ (B) $\frac{1}{3}$ (C) $\frac{1}{6}$ (D) $\frac{5}{6}$

50. All the 4 balls drawn are red when 4 balls drawn at random.

(A) $\frac{17}{32}$ (B) $\frac{14}{99}$ (C) $\frac{7}{12}$ (D) None of these

51. All the 4 balls drawn are green when 4 balls drawn at random.

(A) $\frac{1}{495}$ (B) $\frac{7}{99}$ (C) $\frac{5}{12}$ (D) None of these

52. Two balls are red and one ball is green when three balls are drawn at random.

(A) $\frac{56}{99}$ (B) $\frac{112}{495}$ (C) $\frac{78}{495}$ (D) None of these

53. Three balls are drawn and none of them is red.

(A) $\frac{68}{99}$ (B) $\frac{7}{99}$ (C) $\frac{4}{495}$ (D) None of these

54. The odds in favour of an event are 2:7. find the probability of occurrence of this event.

(A) $\frac{2}{9}$ (B) $\frac{5}{12}$ (C) $\frac{7}{12}$ (D) None of these

55. The odds against of an event are 5:7. find the probability of occurrence of this event.

(A) $\frac{3}{8}$ (B) $\frac{7}{12}$ (C) $\frac{2}{7}$ (D) None of these

56. If there are two children in a family, find the probability that there is at least one girl in the family.

(A) $\frac{1}{4}$ (B) $\frac{1}{2}$ (C) $\frac{3}{4}$ (D) None of these

57. From a group of 3 men and 2 women, two persons are selected at random. Find the probability that at least one woman is selected.

(A) $\frac{1}{5}$ (B) $\frac{7}{10}$ (C) $\frac{2}{5}$ (D) None of these

58. A box contains 5 defective and 15 non-defective bulbs. Two bulbs are chosen at random. Find the probability that both the bulbs are non-defective

(A) $\frac{5}{19}$ (B) $\frac{3}{20}$ (C) $\frac{21}{38}$ (D) None of these

59. In the previous question, find the probability that at least 3 bulbs are defective when 4 bulbs are selected at random.

(A) $\frac{31}{969}$ (B) $\frac{7}{20}$ (C) $\frac{1}{20}$ (D) None of these

OBJECTIVE	ANSWER KEY														
Que.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Ans.	A	A	B	B	C	D	D	A	B	C	D	D	C	B	A
Que.	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
Ans.	A	B	C	B	C	C	D	B	C	C	B	D	A	B	C
Que.	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**	**45**
Ans.	C	C	C	B	A	A	B	B	C	A	B	B	C	C	C
Que.	**46**	**47**	**48**	**49**	**50**	**51**	**52**	**53**	**54**	**55**	**56**	**57**	**58**	**59**	
Ans.	A	C	D	A	B	A	B	C	A	B	C	B	C	A	