Assignments in Mathematics Class IX (Term 2)
15. PROBABILITY

IMPORTANT TERMS, DEFINITIONS AND RESULTS

- The science which measures the degree of uncertainty is called probability.
- In the experimental approach to probability, we find the probability of the occurrence of an event by actually performing the experiment a number of times and record the happening of an event.
- The observations of an experiment are called outcomes.
- A trial is an action which results in one or several outcomes.
- An event of an experiment is the collection of some outcomes of the experiment.
- The emperical (or experimental) probability P(E) of an event E is given by :

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

- The probability of an event lies between 0 and 1 (0 and 1 inclusive).
- A dice is a well balanced cube with its six faces marked with numbers 1 to 6, one number on one face. Sometimes dots appear in place of numbers.

SUMMATIVE ASSESSMENT

MULTIPLE CHOICE QUESTIONS   [1 Mark]

A. Important Questions

1. A coin is tossed 100 times with the following frequencies :

   Head : 25, Tail : 75

   Probabilities for each event are respectively :

   (a) $\frac{1}{4}, \frac{3}{4}$ (b) $\frac{3}{4}, \frac{1}{4}$ (c) $\frac{1}{2}, \frac{1}{2}$ (d) $\frac{1}{8}, \frac{7}{8}$

2. Two coins are tossed simultaneously 100 times. The results are given below :

   No heads : 20 times, one head : 40 times, two heads : 40 times.

   The probability of getting one head is :

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

3. In an experiment a coin is tossed 500 times. If the head turns up 280 times, the experimental probability of getting a head is :

   (a) $\frac{14}{25}$ (b) $\frac{11}{25}$ (c) $\frac{13}{25}$ (d) $\frac{19}{25}$

4. In a cricket match, a batsman hits a boundary 4 times out of 25 balls he plays. The probability that he hits a boundary is :

   (a) $\frac{4}{25}$ (b) $\frac{21}{25}$ (c) $\frac{25}{4}$ (d) $\frac{25}{21}$

5. A survey of 650 men showed that only 52 of them know English. Out of them, if one is selected at random, what is the probability that the selected man knows English ?

   (a) $\frac{2}{25}$ (b) $\frac{3}{25}$ (c) $\frac{26}{25}$ (d) none of these

6. In a One-Day cricket match, a batsman played 40 balls. The runs scored were as follows :

Runs scored	No. of balls
0	13
1	15
2	5
3	1
4	4
6	2

   The probability that the batsman scored no run is :

   (a) 0   (b) $\frac{1}{13}$ (c) $\frac{13}{40}$ (d) $\frac{2}{11}$

7. A coin is tossed 100 times and head appears 64 times. The probability of getting a tail is :

   (a) $\frac{18}{25}$ (b) $\frac{9}{25}$ (c) 0   (d) 1

8. A coin is tossed 500 times and head appeared 300 times. The sum of the probability of getting

a head and the probability of getting a tail is :

(a) $\dfrac{3}{5}$　(b) $\dfrac{2}{5}$　(c) $\dfrac{1}{5}$　(d) 1

9. Three coins are tossed simultaneously 200 times with following outcomes :

Outcomes	Frequency
3 heads	23
2 heads	72
1 head	77
No head	28

The probability of getting two heads is :

(a) $\dfrac{23}{25}$　(b) $\dfrac{9}{25}$　(c) $\dfrac{28}{25}$　(d) $\dfrac{4}{5}$

10. A survey of 600 men, showed that only 85 of them know English. Out of them one man is selected at random. The probability that the selected man does not know English is :

(a) $\dfrac{17}{120}$　(b) $\dfrac{103}{120}$　(c) $\dfrac{130}{120}$　(d) $\dfrac{120}{103}$

11. 12 packets of salt, each marked 2 kg, actually contained the following weights (in kg) of salt :

1.980, 2.000, 2.025, 1.850, 1.990, 2.040, 1.950, 2.050, 2.060, 1.980, 2.030, 1.970

Out of these packets, one packet is chosen at random. The probability that the chosen packet contains less than 2 kg of salt is :

(a) $\dfrac{1}{12}$　(b) $\dfrac{1}{4}$　(c) $\dfrac{1}{3}$　(d) $\dfrac{1}{2}$

12. In a survey of 400 students, 160 liked Mathematics and rest disliked it. The probability that a student chosen at random likes Mathematics is :

(a) $\dfrac{1}{5}$　(b) $\dfrac{2}{5}$　(c) $\dfrac{3}{5}$　(d) none of these

13. Following are the ages (in years) of 360 patients, getting medical treatment in a hospital :

Age in years	No. of patients
10-20	90
20-30	50
30-40	60
40-50	80
50-60	50
60-70	30

One of the patients is selected at random. The probability that his age is 30 years or more but less than 40 years is :

(a) $\dfrac{1}{6}$　(b) $\dfrac{2}{9}$　(c) 0　(d) 1

14. In an experiment, a coin is tossed 500 times. If the head turns up 280 times, then the probability of getting a tail is :

(a) $\dfrac{14}{25}$　(b) $\dfrac{11}{25}$　(c) $\dfrac{13}{25}$　(d) $\dfrac{19}{25}$

15. A dice is tossed 200 times simultaneously, and the frequencies of various outcomes are given below :

Outcomes	Frequency
1	15
2	40
3	25
4	50
5	65
6	5

The probability of getting 5 is :

(a) $\dfrac{1}{40}$　(b) $\dfrac{13}{40}$　(c) $\dfrac{11}{40}$　(d) $\dfrac{1}{5}$

16. Marks obtained by 80 students of a class in a test of maximum marks 100 are given below :

Marks	No. of students
0-15	6
15-30	13
30-45	17
45-60	24
60-75	16
75 and above	4

A student of the class is selected at random. The probability that he gets less than 45% marks is :

(a) $\dfrac{1}{6}$　(b) $\dfrac{3}{40}$　(c) $\dfrac{9}{20}$　(d) $\dfrac{37}{40}$

17. An organisation selected 200 families and surveyed them to determine the number of girls in the family as follows.

No. of girls in a family	0	1	2
No. of families	40	130	30

The probability of a family having 1 girl is :

(a) $\dfrac{1}{130}$　(b) $\dfrac{13}{20}$　(c) $\dfrac{1}{15}$　(d) 0

18. 80 bulbs are selected at random from a lot and their life time (in hrs) is recorded in the form of a frequency table given below :

Life time (in hours)	Frequency
300	10
500	12
700	23
900	25
1100	10

One bulb is selected at random from the lot. The probability that its life is 1150 hours, is :

(a) $\dfrac{1}{80}$ (b) $\dfrac{7}{16}$ (c) 0   (d) 1

19. A dice is thrown 1000 times and the outcomes were recorded as follows :

Outcome	Frequency
1	180
2	150
3	160
4	170
5	150
6	190

If the dice is thrown once more, then the probability that it shows 5 is :

(a) $\dfrac{7}{16}$ (b) $\dfrac{3}{20}$ (c) $\dfrac{4}{25}$ (d) $\dfrac{7}{25}$

20. In a medical examination of students of a class, the following blood groups are recorded :

Blood group	Number of students
A	10
AB	13
B	12
O	5

A student is selected at random from the class. The probability that he/she has blood group B, is :

(a) $\dfrac{1}{4}$ (b) $\dfrac{13}{40}$ (c) $\dfrac{3}{10}$ (d) $\dfrac{1}{8}$

21. A die is thrown 225 times and the results were as follows :

Outcomes	Frequency
1	34
2	50
3	16
4	71
5	24
6	30

The probability of getting a prime number is :

(a) $\dfrac{8}{45}$ (b) $\dfrac{2}{5}$ (c) $\dfrac{24}{225}$ (d) $\dfrac{124}{225}$

22. Games played by 200 students of a school are recorded as below :

Games	No. of students
Cricket	115
Football	35
Tennis	16
Badminton	34

A student is chosen at random. The probability that he plays neither cricket nor football is :

(a) $\dfrac{23}{40}$ (b) $\dfrac{7}{40}$ (c) $\dfrac{3}{4}$ (d) $\dfrac{1}{4}$

23. Three coins were tossed simultaneously 200 times with the following frequencies of different outcomes :

Outcomes	Frequencies
3 heads	72
2 heads	48
1 head	35
No heads	45

The probability of getting more than one head is :

(a) $\dfrac{3}{5}$ (b) $\dfrac{9}{25}$ (c) $\dfrac{6}{25}$ (d) $\dfrac{31}{40}$

24. 20 students of a class were tested to find their pulse rate. The following figures were obtained for the number of beats per minute :

70, 60, 72, 80, 74, 81, 69, 72, 75, 77, 79, 71, 69, 75, 73, 68, 75, 79, 82, 80

If a student is selected at random, the probability that his heart beat per minute is less than 70 is :

(a) $\dfrac{1}{5}$ (b) $\dfrac{4}{5}$ (c) $\dfrac{3}{5}$ (d) $\dfrac{2}{5}$

25. Marks obtained by 50 students in a class test of 100 marks are given below :

Marks	No. of students
0-25	4
25-50	12
50-75	18
75-100	16

The probability that a student obtains less than 50% marks is :

(a) $\dfrac{2}{25}$ (b) $\dfrac{6}{25}$ (c) $\dfrac{8}{25}$ (d) $\dfrac{9}{25}$

26. A machine generated these 10 codes :
{0A1, AAA, ABC, 2B1, 3B7, BB2, 1AC, 111, 222, 333}.

A code is drawn at random to allot an employee. The probability that the code have at least two digits is :

(a) $\dfrac{2}{5}$ (b) $\dfrac{3}{5}$ (c) $\dfrac{4}{5}$ (d) none of these

27. A dice is tossed 270 times and the results were as follows :

Outcomes	Frequency
1	40
2	65
3	60
4	32
5	55
6	18

The probability of getting either 1 or 3 is :

(a) $\dfrac{4}{27}$ (b) $\dfrac{2}{9}$ (c) $\dfrac{1}{25}$ (d) $\dfrac{10}{27}$

28. A coin is tossed 100 times with the following frequencies :

Head : 64, Tail : 36

The ratio of probabilities for each event is :
(a) 16 : 9 (b) 9 : 16 (c) 1 : 1 (d) 3 : 4

29. The weight of 150 students of a class were recorded as below:

Weight (in kg)	No. of students
30-40	36
40-50	54
50-60	25
60-70	24
80 and above	11

A student is chosen at random. The probability that his weight is 50 kg or more, is :

(a) $\dfrac{1}{5}$ (b) $\dfrac{5}{6}$ (c) $\dfrac{2}{5}$ (d) $\dfrac{3}{5}$

30. There are 1000 Engineers, 2000 Doctors and 500 Lawyers. If one professional is chosen at random, the probability that he is an Engineer is :

(a) $\dfrac{1}{35}$ (b) $\dfrac{1}{7}$ (c) $\dfrac{2}{7}$ (d) $\dfrac{6}{35}$

31. The height of 50 students were recorded as below:

Height (in cm)	No. of students
140-150	16
150-160	24
160-170	8
170-180	2

A student is chosen at random. The probability that his height is less than 170 cm is :

(a) $\dfrac{12}{25}$ (b) $\dfrac{8}{25}$ (c) $\dfrac{4}{25}$ (d) $\dfrac{24}{25}$

32. A coin is tossed 50 times and head appears 18 times. If we toss the coin randomly, the probability of getting neither a head nor a tail is :

(a) $\dfrac{9}{25}$ (b) $\dfrac{16}{25}$ (c) 0   (d) 1

33. In a cricket match, a batsman hits a boundary 6 times out of 36 balls he plays. The probability that he did not hit a boundary is:

(a) $\dfrac{1}{6}$ (b) $\dfrac{5}{6}$ (c) $\dfrac{6}{5}$ (d) 1

34. The salaries of 150 employees in an office are given below :

Salary (in Rs.)	No. of employees
3000-6000	52
6000-9000	35
9000-12000	29
12000-15000	26
15000 or above	8

An employee is selected at random. The probability that his salary is Rs 6000 or more but less than Rs 12000 is :

(a) $\dfrac{7}{30}$ (b) $\dfrac{32}{75}$ (c) $\dfrac{29}{150}$ (d) $\dfrac{58}{75}$

35. The following table shows the blood groups of 60 students of a class:

Blood group	Number of students
A	16
B	12
O	23
AB	9

One student of the class is chosen at random.

What is the probability that the chosen student has either blood group A or B?

(a) $\dfrac{1}{5}$ (b) $\dfrac{1}{30}$ (c) $\dfrac{7}{15}$ (d) $\dfrac{17}{30}$

36. Three coins are thrown simultaneously 60 times, with the following frequencies :

3 Heads : 10 times, 2 Heads : 5 times, 1 Head : 18 times, No Head : 27 times.

P (getting 3 heads) + P (getting no head) is equal to :

(a) 37   (b) $\dfrac{37}{60}$ (c) $\dfrac{60}{37}$ (d) $\dfrac{23}{60}$

37. In an experiment, a coin is tossed 500 times. If head turns up 320 times, the experimental probability to get either a head or a tail is :

(a) $\dfrac{16}{25}$ (b) $\dfrac{9}{25}$ (c) 0   (d) 1

38. Number of matchsticks in 25 matchboxes were recorded as below :

51, 48, 50, 47, 52, 50, 51, 50, 46, 48, 47, 50, 51, 54, 45, 46, 49, 47, 48, 52, 49, 50, 48, 52, 48.

If one matchbox is chosen at random, the probability that it contains exactly 50 matchsticks is :

(a) 1   (b) $\dfrac{1}{5}$ (c) $\dfrac{2}{5}$ (d) $\dfrac{1}{25}$

39. A coin is tossed 100 times and head appears 46 times. If we toss a coin at random, what is the probability of getting a tail ?

(a) $\dfrac{23}{50}$ (b) $\dfrac{27}{50}$ (c) $\dfrac{26}{50}$ (d) $\dfrac{28}{50}$

40. There are 60 students in a class and out of them 21 are girls. If a student is selected for lucky draw, the probability that a student must be a boy is :

(a) $\dfrac{6}{13}$ (b) $\dfrac{13}{20}$ (c) $\dfrac{2}{7}$ (d) $\dfrac{3}{11}$

41. Two coins are tossed 1000 times and the outcomes are recorded as below :

Number of heads	2	1	0
Frequency	200	550	250

Based on this information, the probability for at most one head is :

(a) $\dfrac{1}{5}$ (b) $\dfrac{1}{4}$ (c) $\dfrac{4}{5}$ (d) $\dfrac{3}{4}$

B. Questions From CBSE Examination Papers

1. A die is tossed 1000 times and the outcomes are recorded in the following table.   **[T-II (2011)]**

Outcome	1	2	3	4	5	6
Frequency	160	170	140	280	120	130

The probability of getting an even number is :

(a) $\dfrac{29}{50}$ (b) $\dfrac{21}{50}$ (c) $\dfrac{11}{25}$ (d) $\dfrac{14}{25}$

2. A coin is tossed 25 times and the data is recorded as follows :   **[T-II (2011)]**

Head :   15

Tail :   10

The probability of not getting a head is :

(a) $\dfrac{2}{5}$ (b) $\dfrac{3}{5}$ (c) 0   (d) $\dfrac{1}{2}$

3. Probability of not getting an even number when a die is thrown is :   **[T-II (2011)]**

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

4. A box has 390 bulbs. Out of this 26 are defective. A bulb is chosen at random. Find the probability of the bulb chosen, not being defective.

   [T-II (2011)]

(a) $\dfrac{1}{15}$ (b) $\dfrac{14}{15}$ (c) $\dfrac{3}{20}$ (d) $\dfrac{2}{29}$

5. Which one cannot be the probability of an event?

   [T-II (2011)]

(a) $\dfrac{2}{3}$ (b) $-\dfrac{1}{2}$ (c) $\dfrac{3}{5}$ (d) $\dfrac{1}{6}$

6. Two coins are tossed simultaneously for 600 times and the outcomes are as follows :   **[T-II (2011)]**

Two heads : 200

One head : 160

No head : 240

The probability of getting one head is :

(a) $\dfrac{4}{15}$ (b) $\dfrac{1}{3}$ (c) $\dfrac{2}{5}$ (d) $\dfrac{1}{5}$

7. The probability of happening of an events is 45%. The probability of the event is :   **[T-II (2011)]**

(a) 45   (b) 4.5   (c) 0.45   (d) 0.045

8. In an experiment, the sum of probabilities of all events is :   **[T-II (2011)]**

(a) 0.5   (b) 1   (c) –2   (d) $\dfrac{3}{8}$

9. If P (E) denotes the probability of an event E, then :   **[T-II (2011)]**

(a) P(E) < 0   (b) P(E) > 1

(c) $0 \le P(E) \le 1$ (d) $-1 \le P(E) \le 1$

10. A bag contains *x* white, *y* red and *z* blue balls. A ball is drawn at the random, then the probability of drawing a blue ball is :   **[T-II (2011)]**

(a) $\dfrac{z}{x+y+z}$ (b) $\dfrac{y}{x+y+z}$

(c) $\dfrac{x}{x+y+z}$ (d) 0

11. In a survey, out of 200 students, it is observed that 125 students like mathematics. The probability that the students who do not like mathematics is : **[T-II (2011)]**

(a) $\dfrac{5}{8}$ (b) $\dfrac{7}{8}$ (c) $\dfrac{3}{8}$ (d) $\dfrac{1}{2}$

12. Out of 35 students participating in a debate, 10 are girls. The probability that winner is a boy is : **[T-II (2011)]**

(a) $\dfrac{1}{7}$ (b) $\dfrac{3}{7}$ (c) $\dfrac{4}{7}$ (d) $\dfrac{5}{7}$

13. In a class, there are x girls and y boys. A student is selected at random, then the probability of selecting a boy is : **[T-II (2011)]**

(a) $\dfrac{x}{y}$ (b) $\dfrac{x}{(x+y)}$ (c) $\dfrac{y}{(x+y)}$ (d) $\dfrac{y}{x}$

14. In a sample survey of 640 people, it was found that 400 people have a secondary school certificate. If a person is selected at random, the probability that the person does not have such certificate is : **[T-II (2011)]**
(a) 0.375   (b) 0.625   (c) 0.725   (d) 0.875

15. A die is thrown once, a number is noted, then the probability that it is a prime number is : **[T-II (2011)]**

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

16. In a cricket match, a batsman hits a sixer 8 times out of 32 balls played. The probability that a sixer is not hit in a ball is : **[T-II (2011)]**
(a) 0.75   (b) 0.25   (c) –0.25   (d) 0.5

17. In a survey of 364 children aged 20-40 months, it was found that 91 liked to eat potato chips. If a child is selected at random, the probability that he /she does not like to eat potato chips is : **[T-II (2011)]**
(a) 0.25   (b) 0.50   (c) 0.75   (d) 0.80

18. In an experiment 100 drawing pins were dropped on a floor. 73 landed point up and the rest landed point down. A pin is selected at random and dropped. What is the probability that the pin will land point down? **[T-II (2011)]**
(a) 0.73   (b) 0.27   (c) 0.37   (d) 0.72

19. Sum of the probability of happening and not happening of an event is : **[T-II (2011)]**
(a) 1   (b) 2   (c) 0   (d) none of these

20. A fair coin is tossed 100 times and the head occurs 58 times and tail 42 times. The experimental probability of getting a head is : **[T-II (2011)]**

(a) $\dfrac{1}{2}$ (b) $\dfrac{21}{50}$ (c) $\dfrac{29}{50}$ (d) $\dfrac{42}{58}$

SHORT ANSWER TYPE QUESTIONS　　　　　　　　　　**[2 Marks]**

A. Important Questions

1. Can the experimental probability of an event be a negative number? If not, why?

2. Can the experimental probability of an event be greater than1? If not, why?

3. Can the experimental probability of an event be zero? If not, why?

4. State whether the following is correct or not. The emperical probability P(E) of an event E happening is given by

$$P(E) = \dfrac{\text{Total number of trials}}{\text{No.of trials in which the event happened}}$$

5. The probability of an event can be any number from 0 to 1. Is it true ? Justify.

6. As the number of tosses increases, the ratio of the number of heads to the total number of tosses will be $\dfrac{1}{2}$. Is it correct? if not, write the correct one.

7. What is the probability of an impossible event?

8. What is the probability of a sure event ?

9. An unbiasd die is thrown. List all possible outcomes.

10. Two coins are tossed simultaneously. List all possible outcomes.

11. Two coins are tossed 500 times and the outcomes are recorded as below:

No. of heads	2	1	0
Frequency	100	250	150

Based on this information, find the probability for (i) at most one head (ii) at least one head.

12. In a sample study of 420 people, it was found that 240 people were government employees. If a person is selected at random, find the probability that the person is not a government employee.

B. Questions From CBSE Examination Papers

1. In a cricket match, a batsman hits a boundary 6 times out of 30 balls played. Find the probability that he did not hit a boundary. **[T-II (2011)]**

2. Eleven bags of wheat flour, each marked 5 kg, actually contained the following weights of flour (in kg) : 4.97, 5.05, 5.08, 5.00, 5.00, 5.06, 5.08, 4.98, 5.04, 5.07, 5.00. Find the probability that any of these bags chosen at random contains more than 5 kg of flour. **[T-II (2011)]**

3. A die is thrown 500 times, the frequency of outcomes 1, 2, 3, 4, 5 and 6 are noted in the following frequency distribution table : **[T-II (2011)]**

Outcome	1	2	3	4	5	6
Frequency	90	70	75	95	88	82

Find the probability of occurrence of a prime number.

4. A dice is tossed 100 times and the outcomes are recorded as below : **[T-II (2011)]**

Out come	Frequency
1	20
Even number less than 6	35
Odd no. greater than 1	30
6	15

Find the probability of getting :
(a) The number 6 (b) Even number less than 6

5. Following table shows the marks obtained by 30 students in a class test : **[T-II (2011)]**

Marks obtained	Number of students
70	3
58	5
60	4
52	7
65	6
75	2
68	3

Find the probability that a student secures
(a) 60 marks   (b) less than 60 marks.

6. A survey of 100 students is done regarding the likes and dislikes about the subject mathematics. The data are given below : **[T-II (2011)]**

Views	Number of students
Likes	80
Dislikes	20

Find the probability that a student chosen randomly
(a) likes mathematics
(b) does not like mathematics

7. One card is drawn at random from a well shuffled deck of 52 cards. Find the probability for getting a face card. **[T-II (2011)]**

8. Two dice are thrown simultaneously 200 times. Each time the sum of numbers appearing on their tops is noted and recorded as below.
[T-II (2011)]

Sum	Frequency
2	18
3	10
4	26
5	16
6	25
7	29
8	15
9	4
10	24
11	20
12	13

Find the probability of getting a sum :
(i) more than 10? (ii) less than or equal to 5?

SHORT ANSWER TYPE QUESTIONS   [3 Marks]

A. Important Questions

1. The following table is an extract from a mortality table.

Age in years	No. of persons surviving out of a sample of one million
60	16090
61	11490
62	8012
63	5448
64	3607
65	2320

(i) Based on this information, what is the probability of a person 'aged 60' of dying within a year ?
(ii) What is the probability that a person 'aged 61' will live for 4 years?

2. In a survey of 200 people, it was found that 142 read newspapers daily and rest read newspapers occasionally. Find the probability that a person chosen at random :
(i) reads newspaper daily
(ii) reads newspaper occasionally

3. The percentage of marks obtained by a student in monthly unit test are given below :

Unit test	I	II	III	IV	V
% of marks obtained	70	72	65	68	85

Find the probability that the student gets :
(i) more than 70% marks
(ii) less than 70% marks
(iii) more than 90% marks.

4. Bulbs are packed in cartons, each containing 40 bulbs. Seven hundered cartons were examined for defective bulbs and the results are given in the following table :

No. of defective bulbs	Frequency
0	400
1	180
2	48
3	41
4	18
5	8
6	3
more than 6	2

One cartoon was selected at random, what is the probability that it has :
(i) no defective bulbs ?
(ii) defective bulbs from 2 to 6 ?
(iii) defective bulbs less than 4 ?

5. In a One Day International, a batsman played 40 balls. The runs score are as follows :

Runs scored	0	1	2	3	4	6
No. of balls	13	15	5	1	4	2

Find the probability that the batsman will score :
(i) 6 runs.
(ii) a four or a six run.
(iii) 0 or 4 or 6 runs.

6. Over the past 200 working days, the number of defective parts produced by a machine is given below:

No. of defective parts	Days
0	50
1	32
2	22
3	18
4	12
5	12
6	10
7	10
8	10
9	8
10	6
11	6
12	2
13	2

Determine the probability that tomorrow's output will have :
(i) no defective part
(ii) not more than 5 defective parts
(iii) more than 13 defective parts?

B. Questions From CBSE Examination Papers

1. The records of a weather station shows that out of the 250 consecutive days, its weather forecast were correct 175 times. **[T-II (2011)]**
   (i) What is the probability that on a given day it was correct?
   (ii) What is the probability that it was not correct on a given day?

2. Marks obtain by students of class IX in Mathematics are given in the table : **[T-II (2011)]**

Marks	Number of students
0 - 20	8
20 - 40	12
40 - 60	30
60 - 80	30
80 - 100	10

(i) Find the probability that a student gets less than 40% in a test.
(ii) Find the probability that a student gets more than 80%.

3. A bag contains tickets which are numbered from 1 to 100. Find the probability that a ticket number picked up at random **[T-II (2011)]**
   (i) is a multiple of 7
   (ii) is not a multiple of 7.

4. Two coins are tossed simultaneously. Find the probability of getting **:** **[T-II (2011)]**
   (i) atleast one head
   (ii) both heads.

5. A die is thrown 1000 times with the frequencies for the outcome 1, 2, 3, 4, 5 and 6 as given in the following table. **[T-II (2011)]**

Outcomes	1	2	3	4	5	6
Frequency	179	150	157	149	175	190

Find the probability of getting a :
(i) prime number as a outcome.
(ii) number greater than 5 as outcome.

6. 1500 families with 2 children were selected and following data is recorded. **[T-II (2011)]**

No. of girls/family	2	1	0
N. of families	475	814	211

Compute the probability of a family chosen at random having :
- (i) at least 1 girl child
- (ii) not more than 1 girl child.
- (iii) no girl child.

7. A coin is tossed 500 times and head appeared 300 times. Find the sum of the probability of getting a head and the probability of getting a tail. **[T-II (2011)]**

8. 100 cards marked from 2 to 101 are placed in a box and mixed thoroughly. One card is drawn at random from the box. Find the probability that number on the card is **[T-II (2011)]**
- (i) an even number
- (ii) a number which is a perfect square
- (iii) a prime number less than 20

9. It is known that a box of 550 bulbs contains 22 defective bulbs. One bulb is taken out at random from the box. Find the probability of getting :
- (i) defective bulb **[T-II (2011)]**
- (ii) good bulb.

10. A student opens his book and notes down the units digit on the right hand page of his book. He repeats the process for 150 times. The outcomes are recorded. **[T-II (2011)]**

Digits	Frequency
0	7
1	25
2	16
3	30
4	10
5	4
6	11
7	20
8	15
9	12

Based on the above information, find the probability of occurrence of :
- (i) 1 or 4 as unit's digit.
- (ii) At least 5 as the unit's digit.

11. Fifty seeds were selected at random from each of 5 bags of seeds and were kept under standardized conditions favourable to germination. After 20 days, the number of seeds which had germinated in each collection were counted and recorded as follows : **[T-II (2011)]**

Bags	1	2	3	4	5
No. of seeds germinated	40	48	42	39	41

What is the probability of germination of :
- (i) more than 40 seeds in a bag?
- (ii) 49 seeds in a bag?
- (iii) more than 35 seeds in a bag?

12. Two dice are thrown 400 times. Each time sum of two numbers appearing on their tops is noted as given in the following table. **[T-II (2011)]**

Sum	Frequency
2	14
3	20
4	32
5	45
6	62
7	65
8	60
9	43
10	36
11	18
12	5

What is the probability of getting a sum (i) 5 (ii) more than 10 (iii) between 5 and 10

13. Three coins are tossed simultaneously 200 times with the following frequencies of different outcomes. **[T-II (2011)]**

Outcome	Frequency
3 heads	23
2 heads	72
1 head	77
No head	28

From the above, compute the probability of the following :
- (i) at least 2 heads
- (ii) 3 tails
- (iii) at most one head

14. A bag contains cards numbered from 1 to 25. A card is drawn at random from the bag. Find the probability that the selected card bears number which is a multiple of 2 or 3. **[T-II (2011)]**

15. The following table shows the performance of two sections of students in a mathematics test of 100 marks : **[T-II (2011)]**

Marks	Number of students
0-20	7
20-30	10
30-40	10
40-50	20
50-60	20
60-70	15
70 above	8
Total	90

Find the probability that a student obtained :
   (i) less than 20% in the mathematics test.
   (ii) marks 60 or above
   (iii) marks more than or equal to 40 but less than 60.

16. The following frequency distribution table gives the weights of 38 students of a class.   **[T-II (2011)]**

Weight in kg	Number of students
30 – 35	10
35 – 40	5
40 – 45	15
45 – 50	5
50 – 55	1
55 – 60	2
Total	38

Find the probability that the weight of a student is
   (i) more than or equal to 45 kg
   (ii) less than 30 kg
   (iii) more than or equal to 30 kg but less than 60 kg

17. When three coins are tossed simultaneously, find the probability of getting at least two tails.   **[T-II (2011)]**

18. Three coins are tossed simultaneously 200 times with the following frequencies of different outcomes :   **[T-II (2011)]**

Outcome	Frequency
3 Heads	23
2 Heads	72
1 Head	77
No Head	28

From the above data, find the probability of getting (i) 2 heads, (ii) 2 tails, (iii) 3 tails.

19. A die is thrown 400 times. The frequency of outcomes of the events are given as under.   **[T-II (2011)]**

Outcome	1	2	3	4	5	6
Frequency	70	65	60	75	62	68

Find the probability of :
   (i) occurrence of an even number.
   (ii) occurrence of a number less than 2.

20. The percentage of marks obtained by a student in monthly unit test are given below : **[T-II (2011)]**

Unit Test	I	II	III	IV	V
% of marks	70	72	65	68	85

Find the probability that the student gets :
   (a) more than 70% marks
   (b) more than 90 % marks

21. Marks obtained by 2500 students are shown in the following table :   **[T-II (2011)]**

Class Inverval	Frequency
Less than 40	610
40 – 60	840
60 – 80	750
80 – 100	300
Total	2500

A student is selected at random. Find the probability that :
   (a) he scores more than 80% marks.
   (b) he scores less than 60% marks.

22. A bag contains cards numbered from 1 to 100. A card is drawn at random from the bag. Find the probability that the :   **[T-II (2011)]**
   (a) card bears a number which is a multiple of 5.
   (b) card bears a number which is greater than or equal to 80.

23. Three coins are tossed simultaneously 150 times with following frequency of different outcomes :   **[T-II (2011)]**

Outcomes	Frequency
3 Heads	20
2 Heads	80
1 Head	30
No Head	20

Compute the probability of getting :
(i) two heads   (ii) at least two heads

24. In a survey of 2500 families with 2 children, selected randomly, the following data were recorded :   **[T-II (2011)]**

Number of girls in a family	2	1	0
Number of families	810	970	720

Calculate the probability of a family, chosen at random has :
   (i) 2 girls   (ii) 1 girl   (iii) no girl

25. Two dice are thrown simultaneously 500 times. Each time the sum of two numbers appearing on them is noted and recorded in the following table :   **[T-II (2011)]**

Sum	Frequency
2	14
3	30
4	42
5	55
6	72
7	75
8	70
9	53
10	46
11	28
12	15

From the above data, what is the probability of getting a sum (i) more than 10? (ii) between 8 and 12?

26. The following data shows the blood groups of 40 students of a class. **[T-II (2011)]**

Blood group	A	AB	B	O
No. of students	10	15	12	3

A student is selected at random from the class. Find the probability that the student :
   (i) has blood group A
   (ii) has blood group O
   (iii) does not have blood group AB.

27. Following distribution gives the weight of 38 students of a class. **[T-II (2011)]**

Weight in kg.	No. of students
31-35	9
36-40	5
41-45	14
46-50	3
51-55	1
56-60	2
61-65	2
66-70	1
71-75	1

Find the probability that weight of a student in the class is (i) at most 60 kg. (ii) at least 36 kg. (iii) not more than 50 kg.

28. Three coins are tossed simultaneously 1000 times with the following frequencies of different outcomes : **[T-II (2011)]**

Outcome	Frequency
2 Heads	190
1 Head	560
No head	250

Find the probability of occurrence of each of these events.

29. The weekly pocket expenses of students are given in the following table : **[T-II (2011)]**

Pocket expenses (in Rs)	Number of students
145	7
140	4
159	10
171	6
158	3
147	8
165	12

Find the probability that the weekly pocket money of a student is :
   (a) Rs 159
   (b) more than Rs 159
   (c) less than Rs 159

30. A bag contains 12 balls out of which x are white. If one ball is taken out from the bag, find the probability of getting a white ball. If 6 more white balls are added to the bag and the probability now for getting a white ball is double the previous one, find the value of x. **[T-II (2011)]**

31. The ages (in years) of workers of a factory are as follows : **[T-II (2011)]**

Age (in years)	No. of workers
10-19	5
20-29	40
30-39	26
40-49	15
50-59	8
60 and above	6

If a worker is selected at random, find the probability that the worker is :
   (i) 30 years or more
   (ii) below 50 years
   (iii) having age from 10-19 years.

FORMATIVE ASSESSMENT

Group Activity - 1

Objective : To find experimental probability when a dice is tossed different number of times by different persons.

Materials Required : Dice, geometry box, etc.

Procedure :

1. Divide the class into groups of 2 or 3 students. Let a student in each group throw a die 30 times. Another student in each group should note down the number of times the numbers 1, 2, 3, 4, 5, 6 come up.

   Following table can be used to record the observations.

Table 1

No. of times a die is thrown	No. of times these numbers turn up					
30	1	2	3	4	5	6
	4	6	5	8	5	2

2. Now throw the die 60 times and record the number of times the numbers 1, 2, 3, 4, 5, 6 come up.

Table 2

No. of times a die is thrown	No. of times these numbers turn up					
60	1	2	3	4	5	6
	10	8	14	12	10	6

3. Again throw the die 90 times and record the observations.

Table 3

No. of times a die is thrown	No. of times these numbers turn up					
90	1	2	3	4	5	6
	14	12	18	20	15	11

4. Repeat the above steps by throwing the die 120, 150, ... times and record your observations.

Observations :

1. **For table 1 :**

$$\frac{\text{No. of times 1 turned up}}{\text{Total no. of times the die is thrown}} = \frac{4}{30} = \frac{2}{15}$$

$$\frac{\text{No. of times 2 turned up}}{\text{Total no. of times the die is thrown}} = \frac{6}{30} = \frac{1}{5}$$

$$\frac{\text{No. of times 3 turned up}}{\text{Total no. of times the die is thrown}} = \frac{5}{30} = \frac{1}{6}$$

$$\frac{\text{No. of times 4 turned up}}{\text{Total no. of times the die is thrown}} = \frac{8}{30} = \frac{4}{15}$$

$$\frac{\text{No. of times 5 turned up}}{\text{Total no. of times the die is thrown}} = \frac{5}{30} = \frac{1}{6}$$

$$\frac{\text{No. of times 6 turned up}}{\text{Total no. of times the die is thrown}} = \frac{2}{30} = \frac{1}{15}$$

2. **For table 2 :**

$$\frac{\text{No. of times 1 turned up}}{\text{Total no. of times the die is thrown}} = \frac{10}{60} = \frac{1}{6}$$

$$\frac{\text{No. of times 2 turned up}}{\text{Total no. of times the die is thrown}} = \frac{8}{60} = \frac{2}{15}$$

$$\frac{\text{No. of times 3 turned up}}{\text{Total no. of times the die is thrown}} = \frac{14}{60} = \frac{7}{30}$$

$$\frac{\text{No. of times 4 turned up}}{\text{Total no. of times the die is thrown}} = \frac{12}{60} = \frac{3}{15}$$

$$\frac{\text{No. of times 5 turned up}}{\text{Total no. of times the die is thrown}} = \frac{10}{60} = \frac{1}{6}$$

$$\frac{\text{No. of times 6 turned up}}{\text{Total no. of times the die is thrown}} = \frac{6}{60} = \frac{1}{10}$$

3. Similarly, calculate the fractions as done above for other tables.

4. You will observe that as the number of throws of the die increases, the value of each fraction calculated for Table 1, Table 2, ... comes closer and closer to $\frac{1}{6}$.

Conclusions :

1. The thoretical probability of getting 1, or 2 or 3 or 4 or 5 or 6 is $\frac{1}{6}$. Clearly, this is not true in case of experimental probability.

2. As the number of throws of the die increases, then the experimental probability of getting 1 or 2 or 3 or 4 or 5 or 6 comes closer and closer to $\frac{1}{6}$.

Note : The above data is for your comprehension. The students must do the Activity and collect the data.

Group Activity - 2

This is an experiment to find out if you can see into the future. You need to work in pairs and you need one coin. One of you is the tosser and recorder and the other is the guesser.

1. The guesser predicts whether the coin will land head up or tail up. The tosser then tosses the coin.

   When this experiment is repeated 100 times, about how many times do you expect the guesser to predict the actual outcome.

2. Now perform the experiment described at least 100 times and record each result as right or wrong as appropriate.

   Use an observation sheet in the form of a tally chart.

3. Compare what you expected to happen with what did happen, using appropriate diagrams as illustrations. Comment on the likelihood of the guesser being able to predict which way the coin will land.

4. State how could you make your results more reliable.

5. Suggest other experiments that you could perform to test whether someone can see into the future.