Probability

OBJECTIVE TYPE QUESTIONS

Multiple Choice Questions (MCQs)

1. If P is the probability of happening of an event E, then

(a) $P \le 0$ (b) $0 < P \le 1$

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

2. Events E_1, E_2, E_3 are the only possible events of an experiment and their probabilities are recorded. Which of the following can be the possible correct answer?

(a) $P(E_1) = 0.3, P(E_2) = 0.4, P(E_3) = 0.3$

(b) $P(E_1) = 0.2, P(E_2) = 0.4, P(E_3) = 0.3$

(c) $P(E_1) = 0.6, P(E_2) = -0.3, P(E_3) = 0.7$

(d) $P(E_1) = 0.4, P(E_2) = 0.1, P(E_3) = 0.3$

3. The weights of 40 students of a class are given below:

Weight (in kg)	40	41	42	43	44	45
Number of students	3	11	4	8	5	9

Find the probability that a person is selected at random has weight between 41 and 44 kg.

(a) $\frac{2}{5}$ (b) $\frac{3}{5}$ (c) $\frac{7}{10}$ (d) $\frac{3}{10}$

4. In an experiment, E and F are the only two possible outcomes. If $P(E) = 0.62$, then $P(F)$ is equal to

(a) 0.38 (b) 0.28 (c) 0.72 (d) 0.62

5. In a class, there are a boys and b girls. A student is selected at random, then probability of selecting a girl is

(a) $\frac{a}{b}$ (b) $\frac{a}{a+b}$ (c) $\frac{b}{a+b}$ (d) $\frac{b}{a}$

6. On a particular day, 187 two wheelers, 178 three wheelers and 135 four wheelers passed through a crossing. What is the probability that next vehicle will pass through crossing is not a three wheeler?

(a) $\frac{161}{250}$ (b) $\frac{89}{250}$ (c) $\frac{187}{500}$ (d) $\frac{27}{100}$

7. While working out a question on probability it was found that there were 197 letters of English alphabet. The following was observation of occurrence of each letter : $a = 40$, $b = 8$, $e = 14$, $r = 25$, $i = 20$; others (not including vowels) = 90. The probability of choosing a vowel is

(a) $\frac{70}{197}$ (b) $\frac{36}{197}$ (c) $\frac{100}{197}$ (d) $\frac{74}{197}$

8. Three coins are tossed simultaneously 500 times and we get the following observations :

Three heads = 104, Exactly 2 heads = 166, Exactly 1 head = 120 and No head = 110.

The probability of non-occurrence of exactly 2 heads is

(a) 0.16 (b) 0.384 (c) 0.4 (d) 0.668

9. A coin is tossed 600 times, if the probability of getting a head is 3/8, how many times tail is obtained?

(a) 525 (b) 375 (c) 625 (d) 725

10. The percentage of attendance of different classes in a year in a school is given below.

Class	X	IX	VIII	VII	VI	V
Attendance	81	62	85	92	76	55

What is the probability that the class attendance is more than 80%?

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

11. A bag contains 100 coins and each coin is marked from 1 to 100. One coin is picked at random. The probability that the number on the coin is not a prime number, is

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

12. In a football match, Ronaldo makes 9 goals from 12 penalty kicks. The probability of converting a penalty kick into a goal by Ronaldo, is

(a) $\frac{3}{4}$ (b) $\frac{1}{6}$ (c) $\frac{1}{3}$ (d) $\frac{2}{5}$

13. The CBSE has prepared a list of 600 examiners in Mathematics. Out of these, 250 examiners are from government schools and 350 from private schools. Find the probability that an examiner selected at random from the list is from government school.

(a) $\frac{5}{8}$ (b) $\frac{3}{8}$ (c) $\frac{1}{4}$ (d) $\frac{5}{12}$

14. The following table gives the distribution of IQ (intelligence quotient) of 60 pupils of class IX in a school.

IQ	Number of pupils
70-80	3
80-90	6
90-100	16
100-110	14
110-120	13
120-130	8

Find the probability that a student of class IX selected at random has IQ in the interval 90-100.

(a) $\frac{1}{60}$ (b) $\frac{1}{8}$ (c) $\frac{1}{5}$ (d) $\frac{4}{15}$

15. The following table shows the birthday of 40 students of class IX :

Day	Number of students
Sunday	4
Monday	9
Tuesday	3
Wednesday	2
Thursday	10
Friday	7
Saturday	5

Find the probability that a student was born on Saturday.

(a) $\frac{2}{15}$ (b) $\frac{1}{8}$ (c) $\frac{1}{3}$ (d) $\frac{1}{2}$

16. The following distribution gives the time taken by 30 students to solve a problem.

Time (in minutes)	Number of students
20-25	5
25-30	9
30-35	7
35-40	6
40-45	3

Find the probability that the time taken by a student to solve the problem lies in the interval 30-35 or 35-40.

(a) $\frac{1}{2}$ (b) $\frac{13}{30}$ (c) $\frac{1}{4}$ (d) $\frac{1}{5}$

17. In a survey, out of all students, 53% said 'No', 20% said 'Yes' and the remaining said 'They could not decide'. If a student is chosen at random, then what is the chance that the student did not say 'No'?

(a) $\frac{15}{100}$ (b) $\frac{43}{100}$ (c) $\frac{47}{100}$ (d) $\frac{57}{100}$

18. 9 bags of wheat flour, each marked 6 kg, actually contained the following weights of flour (in kg): 6.01, 5.97, 6.05, 6.08, 6.03, 5.98, 6.04, 6.08, 5.96. The probability that a bag chosen at random, contains less than 6 kg of flour is

(a) $\frac{2}{9}$ (b) $\frac{1}{3}$ (c) $\frac{4}{9}$ (d) $\frac{7}{9}$

19. In a survey, out of 450 women, 168 were found to be working. If a woman is selected at random, the probability that she is not working is

(a) $\frac{66}{225}$ (b) $\frac{47}{75}$ (c) $\frac{134}{225}$ (d) $\frac{41}{75}$

20. A surveyor was asked to survey 131 families in a locality in which newspaper is read by the families. He submitted the data as :

Name of newspaper	Number of families
The Hindustan Times	37
The Times of India	37
The Navbharat Times	20
The Hindu	37

Find the ratio of the probability of the families who read 'The Times of India' to the families who read 'The Navbharat Times'.

(a) 20 : 37 (b) 1 : 1
(c) 37 : 20 (d) 1 : 20

21. In 75 throws of a die, the outcomes were noted as follows :

Outcome	1	2	3	4	5	6
Number of times	9	12	14	19	10	11

The die is thrown at random. What is the probability of not getting a prime number?

(a) $\frac{3}{75}$ (b) $\frac{3}{5}$ (c) $\frac{13}{25}$ (d) $\frac{12}{25}$

22. On one page of a directory, there are 200 telephone numbers. The frequency distribution of the unit place digit is given as under :

Unit place digit	0	1	2	3	4	5	6	7	8	9
Frequency	23	20	22	15	22	25	18	21	15	19

From this page, one of the numbers is chosen at random. What is the probability that the unit place digit in the chosen number is 3 or 7?

(a) $\frac{2}{5}$ (b) $\frac{3}{100}$ (c) $\frac{9}{50}$ (d) $\frac{29}{200}$

23. A Mathematics book contains 350 pages. A page is selected at random. What is the probability that the number on the page is divisible by 14?

(a) $\frac{1}{8}$ (b) $\frac{1}{10}$ (c) $\frac{1}{14}$ (d) $\frac{2}{5}$

24. If $P(E_1) = \frac{1}{6}$, $P(E_2) = \frac{1}{3}$, $P(E_3) = \frac{1}{4}$, 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) $\frac{1}{4}$

25. In a group of 60 persons, 35 like coffee. Out of this group, if one person is chosen at random, then what is the probability that he or she does not like coffee?

(a) $\frac{7}{12}$ (b) $\frac{5}{12}$ (c) $\frac{5}{7}$ (d) $\frac{3}{12}$

26. The following table shows the age distribution of patients of malaria in a village during a particular month.

Age (in years)	0-10	10-20	20-30	30-40	40-50
Number of patients	3	5	9	5	3

If an affected person is selected at random, then find the probability that a person is below 40 years.

(a) $\frac{22}{25}$ (b) $\frac{3}{25}$ (c) $\frac{17}{25}$ (d) 1

27. In a sample study of 642 people, it was found that 514 people have a high school certificate. If a person is selected at random, the probability that the person has a high school certificate is :

(a) 0.5 (b) 0.6 (c) 0.7 (d) 0.8

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

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

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

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

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

Number of heads	2	1	0
Frequency	200	550	250

The probability for at most one head is

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

30. 80 bulbs are selected at random from a lot and their life time (in hrs) is recorded in the form of a frequency table as given below :

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

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

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

31. A die is tossed 216 times. The results are as follows :

Outcome	1	2	3	4	5	6
Frequency	40	35	25	35	36	45

The probability of getting 2 is

(a) 25/216 (b) 35/216

(c) 36/216 (d) 40/216

32. The following table shows the blood group of 60 students of a class.

Blood group	A^+	B^+	O^-	AB^+
No. of students	16	12	23	9

One student of the class is chosen at random. What is the probability that the chosen student has blood group O^- ?

(a) 23/60 (b) 3/20 (c) 4/15 (d) 1/5

33. The given table shows the ages (in years) of 360 patients, getting medical treatment in a hospital.

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

One of the patients is selected at random. The probability that the selected patient's age is 30 years or more but less than 40 years, is

(a) 1/6 (b) 2/9 (c) 0 (d) 1

34. In a one day match, a player played 40 balls. The runs scored are as follows :

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

Find the probability that player hits a four or a six.

(a) 3/20 (b) 1/2 (c) 1/4 (d) 9/20

35. The following data shows the relation between the number of families and number of children they have. What is the probability of a family chosen at random having at least two children?

Number of Children	0	1	2	3	4	5
Number of families	12	7	15	3	6	10

(a) 33/53 (b) 35/53 (c) 34/53 (d) 19/53

36. The given table shows the number of students participating in various activities in a school.

Activities	Games	Music	Singing	Drama
No. of students	27	36	15	12

One student is chosen at random. Find the probability that the student participates in games.

(a) 3/10 (b) 1/2 (c) 1/7 (d) 1/10

37. On a particular day, the number of vehicles passing through a crossing is given below:

Vehicle	**Frequency**
Cars	57
Auto rickshaw	33
Bikes	30

A particular vehicle is chosen at random. What is the probability that it is not a four-wheeler?

(a) 21/80 (b) 21/40 (c) 3/4 (d) 5/4

38. If $\frac{10}{100}, \frac{13}{100}, \frac{15}{100}, \frac{18}{100}, \frac{x}{100}, \frac{30}{100}$ are the probabilities of 6 observations of an experiment, then find the value of x.

(a) 12 (b) 13 (c) 14 (d) 15

39. Two sections of class IX having 27 students in each section appeared for Mathematics olympiad. The marks obtained by them are shown below.

46, 31, 74, 68, 42, 54, 14, 61, 48, 37, 26, 8, 64, 57, 93, 72, 53, 59, 38, 16, 88, 56, 46, 66, 45, 61, 54, 27, 27, 44, 63, 58, 43, 81, 64, 36, 49, 50, 76, 38, 47, 77, 62, 53, 40, 71, 60, 45, 42, 34, 46, 40, 59, 42

One student is selected at random. Find the probability that selected student is having marks more than 49.

(a) 1/3 (b) 1/2 (c) 1/4 (d) 7/9

40. 100 plants each were sown in six different colonies *A, B, C, D, E* and *F*. After 31 days, the number of plants survived are as follows:

Colonies	*A*	*B*	*C*	*D*	*E*	*F*
No. of plants survived	80	90	84	76	82	92

Find the probability that more than 80 plants survived in a colony?

(a) 2/3 (b) 1/3 (c) 5/6 (d) 1/6

Case Based MCQs

Case I : Read the following passage and answer the questions from 41 to 45.

A jeweller has different types of bracelets in his shop. Sunita wants to purchase a bracelet for her sister's birthday gift. When Sunita goes to shop, she founds the following data which represents the number of bracelets of different types in the shop.

Types of bracelets	**Number of bracelets**
Bangle bracelet	50
Chain bracelet	74
Cuff bracelet	48

Charm bracelet	96
Pearl bracelet	92
Total	**360**

41. Find the probability that Sunita chooses Chain Bracelet.

(a) $\frac{23}{180}$ (b) $\frac{37}{180}$ (c) $\frac{37}{90}$ (d) $\frac{23}{90}$

42. Find the probability that she chooses Pearl bracelet.

(a) $\frac{23}{180}$ (b) $\frac{37}{180}$ (c) $\frac{37}{90}$ (d) $\frac{23}{90}$

43. What is the probability of a sure event?

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

44. What is the probability that she chooses neither Bangle bracelet nor Pearl bracelet?

(a) $\frac{23}{180}$ (b) $\frac{45}{180}$ (c) $\frac{109}{180}$ (d) $\frac{23}{45}$

45. What is the probability that Sunita purchased a Cuff bracelet?

(a) $\frac{6}{17}$ (b) $\frac{2}{13}$ (c) 1 (d) $\frac{2}{15}$

Case II : Read the following passage and answer the questions from 46 to 50.

On one day in school, teacher performed an activity with the students. She tells every student to write their weights on their notebook. After that she makes the following frequency distribution table from the collected data and asks some questions.

Weight (in kg)	35-40	40-45	45-50	50-60	60-65	Total
No. of students	9	18	12	7	4	50

46. Find the probability of a randomly chosen student of weight atleast 50 kg.

(a) $\frac{11}{50}$ (b) $\frac{13}{50}$ (c) $\frac{21}{50}$ (d) $\frac{7}{50}$

47. The probability that the selected student has atmost 65 kg weight is

(a) 0 (b) $\frac{23}{41}$ (c) $\frac{16}{17}$ (d) 1

48. The probability that the weight of the student is not more than or equal to 45 kg is

(a) $\frac{15}{31}$ (b) $\frac{1}{2}$ (c) $\frac{27}{50}$ (d) $\frac{2}{3}$

49. The probability that weight of student is less than 60 kg but more than or equal to 45 kg is

(a) $\frac{23}{50}$ (b) $\frac{13}{50}$ (c) $\frac{11}{50}$ (d) $\frac{19}{50}$

50. If an experiment is performed, then the probability of an event (E) is

(a) $P(E) = \frac{\text{No. of trials in which the event has happened}}{\text{Total no. of trials}}$

(b) $P(E) = \frac{\text{Total no. of trials}}{\text{No. of trials in which the event has happened}}$

(c) $P(E) = \frac{\text{No. of trials in which the event has not happened}}{\text{Total no. of trials}}$

(d) none of these

Case III : Read the following passage and answer the questions from 51 to 55.

In a factory, the workers are paid on daily basis. The new manager wants to know the salary slab of the workers and finds the data as given below.

Salary per day (in ₹)	**No. of workers**
301-500	90
501-700	280
701-900	250
901-1100	180

Now, if a worker is chosen at random, then :

51. Probability that the worker is getting atmost ₹ 500 is

(a) $\frac{3}{80}$ (b) $\frac{9}{80}$ (c) $\frac{1}{80}$ (d) $\frac{4}{25}$

52. Probability that the worker is getting atleast ₹ 701 is

(a) $\frac{23}{80}$ (b) $\frac{43}{80}$ (c) $\frac{41}{80}$ (d) $\frac{61}{80}$

53. Probability that the worker is getting ₹ 901 - ₹ 1100 is

(a) $\frac{3}{40}$ (b) $\frac{1}{40}$ (c) $\frac{9}{40}$ (d) $\frac{2}{23}$

54. Probability that the worker is getting atmost ₹ 900 is

(a) $\frac{7}{40}$ (b) $\frac{3}{31}$ (c) $\frac{31}{40}$ (d) $\frac{4}{31}$

55. Probability that the worker is getting less than ₹ 300 is

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

Assertion & Reasoning Based MCQs

Directions (Q.56 to 60) : In these questions, a statement of Assertion is followed by a statement of Reason is given. Choose the correct answer out of the following choices :

(a) Assertion and Reason both are correct statements and Reason is the correct explanation of Assertion.

(b) Assertion and Reason both are correct statements but Reason is not the correct explanation of Assertion.

(c) Assertion is correct statement but Reason is wrong statement.

(d) Assertion is wrong statement but Reason is correct statement.

56. Assertion : A coin is tossed 30 times and head appears 18 times. Then the probability of getting a tail is $\frac{12}{30}$.

Reason : Probability of happening of an event $= \frac{\text{Number of trials in which the event happened}}{\text{Total number of trials}}$.

57. Assertion : A die is thrown, if probability of getting an even number is $\frac{1}{2}$, then the probability of getting an odd number is also $\frac{1}{2}$.

Reason : $P(E_1) + P(E_2) + P(E_3) + ... + P(E_n) = 1$, where $E_1, E_2, E_3, ..., E_n$ are n elementary events associated to a random experiment.

58. Assertion : Three coins are tossed. Number of elements in the sample space is 8.

Reason : When a coin is tossed n times, then the number of elements in its sample space is 2^n.

59. Assertion : In a survey of 365 students aged 13-14 years, it was found that 130 liked to opt French as third language. If a student selected at random, then the probability that he/she does not like to opt French as third language is 47/73.

Reason : The probability of an event

$E = \frac{\text{Number of trials in which } E \text{ is not happened}}{\text{Total number of trials}}$

60. Assertion : In a class of 45 students, 39 passed an examination. If a student is selected at random, then the probability that the student has not passed the examination is $\frac{13}{15}$.

Reason : $P(E) + P(\text{not } E) = 1$

SUBJECTIVE TYPE QUESTIONS

Very Short Answer Type Questions (VSA)

1. The following data represents the number of girls in a family.

Number of girls in a family	2	1	0
Number of families	475	514	11

A family is chosen at random. Find the probability of having exactly 2 girls in the chosen family.

2. A survey of 100 children of a locality shows their favourite sport

No. of children who like football	48
No. of children who like cricket	52

Out of these children, one is chosen at random. What is the probability that the chosen child likes football?

3. In a game, a woman wins 16 times out of 20 balls she plays. Find the probability that she does not win the game.

4. The following table shows the birth months of 48 babies in a hospital:

Jan	**Feb**	**March**	**April**	**May**	**June**
2	4	3	4	5	1

July	Aug	Sept	Oct	Nov	Dec
6	6	4	3	4	6

Find the probability of months in which 6 babies were born.

5. In a single throw of two dice, find the probability that there will be a doublet.

6. Ram and Priya are playing a game. Ram's winning probability is $\frac{1}{3}$. Find the Priya's winning probability.

7. Find the probability of choosing a vowel randomly from the letters of the word 'EXAMINATION'.

8. A coin is tossed 500 times with the following frequencies : Head : 255, Tail : 245.
Then find the sum of the probabilities of each event.

9. A bag contains 6 green and 5 blue balls. If probability of choosing a green ball randomly is $\frac{n}{11}$, then find the value of n.

10. Based on the given information, find the probability of people with age 60, 61 & 64 who can drive.

Age (in years)	Number of persons of different age who can drive the car
60	16090
61	11490
62	8012
63	5448
64	3607
65	2320

Short Answer Type Questions (SA-I)

11. A die is thrown 100 times and following observations were recorded:

Number on die	1	2	3	4	5	6
Frequency	12	18	14	26	14	16

Find the probability that the die shows
(i) a number less than 3.
(ii) a number greater than 4.

12. An integer is chosen at random from the first 200 positive integers. Find the probability that the integer is divisible by 11.

13. A die was rolled 100 times and the number of times, 6 came up was noted. If the experimental probability calculated from this information is $\frac{2}{5}$, then how many times 6 came up?

14. In a locality of 5000 families a survey was conducted and the following data was collected.

Number of members	2	3	4	5	6 or more
Number of families	1060	1000	1020	1070	850

Out of these families, a family is chosen at random. What is the probability that the chosen family has less than 5 members?

15. In 60 throws of a die, the outcomes were noted as below:

Outcomes	1	2	3	4	5	6
Number of times	8	10	15	10	7	10

If die is thrown at random, then what is the probability that upper face of a die shows an even prime number? Also find the probability that upper face shows an odd number.

16. There are 35 students in class IX–A, 34 in IX-B and 33 in IX–C. Some of them are allotted project on Chapter 2 (Polynomials) and some on Chapter-1 (Number system) as shown in the table.

Projects	Ch-1	Ch-2
No. of students	74	28

Find the probability that the student chosen at random,
(i) prepares project on chapter 1
(ii) prepares project on chapter 2

17. The percentage of attendance of different classes in a year in a school is given below:

Class	X	IX	VIII	VII	VI	V
Attendance	30	62	85	92	76	55

(i) What is the probability that the class attendance is more than 75%?
(ii) Find the probability that the class attendance is less than 50%.

18. The number of hours spent by Ashu, a school student, on various activities on a working day are given below:

Activity	No. of Hours
Sleep	7
School	7
Home work	2
Tuition out of home	3
Playing Outdoor games	3
Other activity at home	2

His friend Sonu came to his house to meet Ashu. What is the probability that
(i) Ashu is available at home.
(ii) Ashu will play outdoor games.

19. The probability of guessing the correct answer to a certain question is $\frac{x}{5}$. If the probability of not guessing the correct answer is $\frac{2x}{3}$. Then, find the value of $26x$.

20. If the difference between the probability of success and failure (*i.e.*, not success) of an event is 5/19 (assuming probability of failure is greater than that of success). Find the probability of success and failure of the event respectively.

Short Answer Type Questions (SA-II)

21. A Tyre manufacturing company kept a record of the distances covered, before a tyre needed to be replaced. The table shows the result of 2000 cases:

Distance (in km)	Frequency
less than 3000	40
3000 to 6000	890
6000 to 9000	420
more than 9000	650

If Anuj buy a tyre of this company, then what is the probability that
(i) It will need to be replaced before it has covered 3000 km?
(ii) It will last more than 6000 km?
(iii) It will need to be replaced after it has covers somewhere between 3000 km and 9000 km?

22. On one page of a telephone directory, there were 250 telephone numbers. The frequency distribution of their unit's place digit (*e.g.*, in the number 35285976, the unit's place digit is 6) is given in the following table

Digit	0	1	2	3	4	5	6	7	8	9
Frequency	25	21	19	33	15	25	27	27	31	27

Of these numbers, one number is chosen at random. What is the probability that
(i) The digit at its unit's place is 8?
(ii) The digit at the unit place is not 7?

23. The record of a weather station shows that out of the past 365 consecutive days, its weather forecasts were correct 190 times.
(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?

24. Two coins tossed simultaneously 1000 times with the following frequencies of different outcomes :

Two Heads : 320 times
One Head : 450 times
No Head : 230 times

Find the probability of occurrence of each of these events.

25. A survey of 700 families was conducted to know their opinion about a particular newspaper. If 325 families liked that newspaper and the remaining families disliked it, find the probability that a family chosen at random
(i) likes the newspaper.
(ii) does not like it.

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

Unit test	I	II	III	IV	V
Percentage of marks	58	72	78	63	86

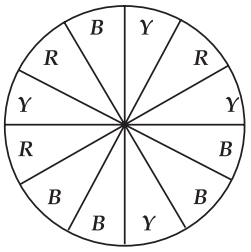
Find the probability that the student gets
(i) more than 80% marks.
(ii) atleast 60% marks.

27. Here is an extract from a mortality table.

Age (in years)	**Number of persons surviving out of a sample of one million**
60	16090
61	11490
62	8012
63	5448
64	3607
65	2320

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

28. A spinner is coloured by 3 different colours : yellow, blue and red in 12 equal sectors. After spinning the wheel, what is the probability that



(i) wheel stops at yellow colour?
(ii) wheel stops at red colour?
(iii) wheel stops at blue colour?

29. The diameters of circles (in mm) drawn in a design are given below.

Diameters	14-20	21-27	28-34	35-41	42-48
Number of circles	3	5	8	11	7

If a circle is chosen at random, find the probability that
(i) chosen circle has diameter less than 28.
(ii) chosen circle has radius lying between 14 to 17.
(iii) chosen circle has diameter above 50.

30. A letter is chosen at random from the letters of the word 'PROBABILITY'. Find the probability that the letter chosen is a
(i) consonant
(ii) vowel.

Long Answer Type Questions (LA)

31. The following table gives the lifetime (in hours) of 400 CFL:

Lifetime (in hours)	200-300	300-400	400-500	500-600	600-700	700-800	800-900
Number of CFL	14	56	60	86	74	62	48

A CFL is selected at random. Find the probability that lifetime of the selected CFL is
(i) less than 400 hours
(ii) between 300 to 800 hours
(iii) atleast 700 hours
(iv) more than 800 hours

32. Sixty seeds were selected at random from each of 8 bags of seeds, and were kept under standardised conditions favourable to germination. After 1 month, the number of seeds which had germinated in each collection were counted and recorded as follows :

Bag	1	2	3	4	5	6	7	8
Number of seeds germinated	20	28	22	29	31	46	38	40

What is the probability of germination of
(i) more than 30 seeds in a bag ?
(ii) 50 seeds in a bag ?
(iii) less than 30 seeds in a bag ?

33. On a busy road, following data was observed about cars passing through it and number of occupants.

No. of Occupants	1	2	3	4	5	6
No. of Cars	29	28	33	27	15	10

If a car passes by, then find the probability that it has
(i) exactly 5 occupants
(ii) more than 2 occupants

(iii) less than 5 occupants
(iv) atleast 4 occupants

34. A inverter battery manufacturing company kept a record of battery life before it was replaced.

Battery life (in month)	Number of batteries
More than 54	250
42-54	150
30-42	120
18-30	200
Less than 18	80

If you buy a battery of this company, then what is the probability that
(i) it will need a replacement before 30 months?
(ii) it will last more than 42 months?
(iii) it will need to be replaced between 18 to 54 months?
(iv) it will need to be replaced after 54 months?

35. Given below is the frequency distribution of daily wages (in ₹) of 30 workers in a certain factory.

Daily wages (in ₹)	Number of workers
110-130	3
130-150	4
150-170	5
170-190	6
190-210	5
210-230	4
230-250	3

A worker is selected at random. Find the probability that his wages is
(i) less than ₹ 150
(ii) atleast ₹ 210
(iii) more than or equal to ₹ 150 but less than ₹ 210
(iv) in the interval 190-250

ANSWERS

OBJECTIVE TYPE QUESTIONS

1. (c)

2. (a) : (a) $P(E_1) + P(E_2) + P(E_3) = 0.3 + 0.4 + 0.3 = 1$

(b) $P(E_1) + P(E_2) + P(E_3) = 0.2 + 0.4 + 0.3 = 0.9 \neq 1$

(c) $P(E_2) = -0.3$, which does not lie between 0 and 1. Hence, it is not possible.

(d) $P(E_1) + P(E_2) + P(E_3) = 0.4 + 0.1 + 0.3 = 0.8 \neq 1$

3. (d) : Let E be the event that the person has weight between 41 and 44 kg

$\therefore \quad n(E) = 4 + 8 = 12$

$\therefore \quad P(\text{Weight between 41 and 44 kg}) = \frac{12}{40} = \frac{3}{10}$

4. (a) : We know that $P(E) + P(F) = 1$

$\Rightarrow \quad 0.62 + P(F) = 1 \qquad [\because P(E) = 0.62 \text{ (Given)}]$

$\Rightarrow \quad P(F) = 1 - 0.62 = 0.38$

5. (c) : Number of girls = b

Total number of students = $a+b$

$\therefore \quad P(\text{Selecting a girl}) = \frac{b}{a+b}$

6. (a) : Total number of vehicles = 187 + 178 + 135 = 500

Number of three wheelers = 178

$\therefore \quad P(\text{a three wheeler}) = \frac{178}{500} = \frac{89}{250}$

$P(\text{not a three wheeler}) = 1 - P(\text{a three wheeler})$

$= 1 - \frac{89}{250} = \frac{161}{250}$

7. (d) : Total number of alphabets = 197

Number of vowels = 40 + 14 + 20 = 74

$\therefore \quad P(\text{Choosing a vowel}) = \frac{74}{197}$

8. (d) : Number of coins = 500

Let E denote the event of occurrence of exactly 2 heads *i.e.*, $n(E) = 166$

$\therefore \quad P(E) = \frac{166}{500}$

$\therefore \quad P(\text{not } E) = 1 - P(E) = 1 - \frac{166}{500} = \frac{334}{500} = 0.668$

Hence, the probability of non-occurrence of exactly 2 heads is 0.668.

9. (b) : Let H be the event of getting head and T be the event of getting tail.

Let x be the number of trials in which H occurred

$\therefore \quad P(\text{H}) = \frac{\text{Number of times H occurred}}{\text{Total number of trials}}$

$\Rightarrow \quad \frac{3}{8} = \frac{x}{600} \Rightarrow x = \frac{3}{8} \times 600 = 225$

$\therefore$ Number of times event T occurred = 600 – 225 = 375

10. (d) : Total number of classes = 6

Number of classes in which percentage of attendance is more than 80% = 3

$\therefore \quad P(\text{class attendance is more than 80\%}) = \frac{3}{6} = \frac{1}{2}$

11. (b) : Total number of coins = 100

Prime numbers between 1 to 100 are 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83,

89 and 97.

$\therefore$ Number of prime numbers between 1 to 100 = 25

$\therefore$ P(prime number) = $\frac{25}{100} = \frac{1}{4}$

$\Rightarrow$ P(not a prime number) = 1 – $P(E)$ = 1 – $\frac{1}{4} = \frac{3}{4}$

12. (a) : Total number of penalty kicks = 12

Number of goals = 9

$\therefore$ P(converting a penalty kick into goal) = $\frac{9}{12} = \frac{3}{4}$

13. (d) : Total number of examiners = 600

Number of examiners from government school = 250

$\therefore$ Required probability = $\frac{250}{600} = \frac{5}{12}$

14. (d) : Total number of pupils = 60

Number of pupils having IQ in the interval 90-100 = 16

$\therefore$ Required probability = $\frac{16}{60} = \frac{4}{15}$.

15. (b) : Total number of students = 40

Number of students born on Saturday = 5

$\therefore$ Required probability = $\frac{5}{40} = \frac{1}{8}$.

16. (b) : Total number of students = 30

Number of students who take time between 30-35 or 35-40 minutes = 7 + 6 = 13

$\therefore$ Required probability = 13/30.

17. (c) : Let total number of students be 100.

$\therefore$ Number of students who said 'NO' = 53% of 100
= 53

Number of students who did not say 'NO' = 100 – 53 = 47

$\therefore$ Required probability = 47/100

18. (b) : Total number of bags = 9

There are 3 bags which contain less than 6 kg of flour *i.e.*, 5.97, 5.98, 5.96

$\therefore$ Required probability = $\frac{3}{9} = \frac{1}{3}$

19. (b) : Total number of women = 450

Number of working women = 168

Now, number of women who are not working
= 450 – 168 = 282

$\therefore$ Required probability = $\frac{282}{450} = \frac{47}{75}$

20. (c) : Let E_1 be the event of families who read 'The Times of India', *i.e.*, $n(E_1) = 37$

Let E_2 be the event of families who read 'The Navbharat Times', *i.e.*, $n(E_2) = 20$

$\therefore$ $P(E_1) = \frac{37}{131}$ and $P(E_2) = \frac{20}{131}$

$\therefore$ Required ratio = $\frac{37}{131} : \frac{20}{131} = 37 : 20$

21. (c) : Let E be the event of getting a prime number (*i.e.*, 2, 3, 5). So, $n(E)$ = 12 + 14 +10 = 36

$\therefore$ $P(E) = \frac{\text{Number of times the prime number occur}}{\text{Total number of throws}}$

$= \frac{36}{75} = \frac{12}{25}$

$\therefore$ P(not E) = 1 – $P(E)$ = 1 – $\frac{12}{25} = \frac{13}{25}$

22. (c) : Total number of telephone numbers on one page of a directory= 200

Number of times 3 occurs at unit digit = 15

Number of times 7 occurs at unit digit = 21

Number of favourable outcomes when 3 or 7 occurs at unit digit = 15 + 21 = 36

$\therefore$ Required probability = $\frac{36}{200} = \frac{9}{50}$

23. (c) : Total number of pages of a book = 350

Numbers between 1 and 350, which are divisible by 14 are 14, 28, 42, 56, 70, 84, 98, 112, 126, 140, 154, 168, 182, 196, 210, 224, 238, 252, 266, 280, 294, 308, 322, 336, 350

No. of favourable outcomes= 25

$\therefore$ Required probability = $\frac{25}{350} = \frac{1}{14}$

24. (d) : We know that, $P(E_1) + P(E_2) + P(E_3) + P(E_4) = 1$, where E_1, E_2, E_3 and E_4 are elementary events.

$\Rightarrow$ $\frac{1}{6} + \frac{1}{3} + \frac{1}{4} + P(E_4) = 1$

$\Rightarrow$ $P(E_4) = 1 - \left(\frac{2+4+3}{12}\right) = 1 - \frac{9}{12} = \frac{3}{12} \Rightarrow P(E_4) = \frac{1}{4}$

25. (b) : Total number of persons in the group = 60.

Number of persons who like coffee = 35.

Number of persons who do not like coffee = (60 – 35)
= 25

$\therefore$ Required probability = $\frac{25}{60} = \frac{5}{12}$

26. (a) : Let E be the event of selecting an affected person whose age is below 40 years *i.e.*, $n(E)$ = 3 + 5 + 9 + 5 = 22

Total number of persons = 25

$\therefore$ $P(E)$ = 22/25

27. (d) : Total number of people = 642

Number of people having a high school certificate = 514

$\therefore$ The probability that the person has a high school certificate $= \frac{514}{642} = 0.8$

28. (c) : Total number of students in a medical examination = 10 + 13 + 12 + 5 = 40

Number of students who have blood group B = 12

$\therefore$ The probability that selected student has blood group B $= \frac{12}{40} = \frac{3}{10}$

29. (c) : Since the coins are tossed 1000 times.

$\therefore$ The total number of trials = 1000

Number of outcomes for atmost one head = 250 + 550 = 800

$\therefore$ The probability for atmost one head $= \frac{800}{1000} = \frac{4}{5}$

30. (c) : Total number of bulbs in a lot = 80
Number of bulbs whose life time is 1150 hours = 0
$\therefore$ The probability of selecting the bulb whose life time is 1150 hours $= \frac{0}{80} = 0$

31. (b) : P(getting 2) = $\frac{35}{216}$

32. (a) : Total number of students = 60
Number of students whose blood group is O^- = 23
P(blood group is O^-) $= \frac{23}{60}$

33. (a) : Total number of patients = 360.
Let E be the event that patients having 30 years or more but less than 40 years of age $\Rightarrow n(E) = 60$

$\therefore \quad P(E) = \frac{n(E)}{360} = \frac{60}{360} = \frac{1}{6}$

34. (a) : Total number of balls, $n(S) = 40$
Let E be the event that player hit a four or a six.
$\Rightarrow \quad P(E) = \frac{n(E)}{n(S)} = \frac{4+2}{40} = \frac{6}{40} = \frac{3}{20}$

35. (c) : Number of families, $n(S) = 53$
Let E be the event that number of families having at least 2 children
$\Rightarrow \quad n(E) = 3 + 6 + 10 + 15 = 34$
$\Rightarrow \quad P(E) = \frac{n(E)}{n(S)} = \frac{34}{53}$

36. (a) : Number of students, $n(S) = 90$
Let E be the event that number of students participating in games
$n(E) = 27$
$P(E) = \frac{n(E)}{n(S)} = \frac{27}{90} = \frac{3}{10}$

37. (b) : Number of cars = 57
Number of auto rickshaw = 33
Number of bikes = 30
$\therefore$ Total number of vehicles = 57 + 33 + 30 = 120
Vehicles that are not a four-wheeler = 30 + 33 = 63
$\therefore$ Probability that the vehicle chosen at random is not a four-wheeler $= \frac{63}{120} = \frac{21}{40}$

38. (c) : As we know that sum of the probabilities of all observations of an experiment is 1.
$\Rightarrow \quad \frac{10}{100} + \frac{13}{100} + \frac{15}{100} + \frac{18}{100} + \frac{x}{100} + \frac{30}{100} = 1$
$\Rightarrow \quad 86 + x = 100 \Rightarrow x = 14$

39. (b) : Total number of students = 27 + 27 = 54
Number of students having marks more than 49 = 27
So P(student having marks more than 49) $= \frac{27}{54} = \frac{1}{2}$

40. (a) : Here, we have total number of colonies = 6
Number of colonies in which more than 80 plants survived = 4 (*i.e., B, C, E* and *F*)
$\therefore \quad P$ (more than 80 plants survived) $= \frac{4}{6} = \frac{2}{3}$

41. (b) : Total number of bracelets = 360
$\therefore$ Probability of chosing Chain bracelet = $\frac{74}{360} = \frac{37}{180}$

42. (d) : Probability of chosing a Pearl bracelet
$= \frac{92}{360} = \frac{23}{90}$

43. (a) : Probability of a sure event is always 1.

44. (c) : Total number of bangle bracelets and pearl bracelets = 92 + 50 = 142
$\therefore$ No. of bracelets which are neither pearl bracelet nor bangle bracelet = 360 – 142 = 218
So, required probability $= \frac{218}{360} = \frac{109}{180}$

45. (d) : Required probability $= \frac{48}{360} = \frac{2}{15}$

(46-50) : Total no. of students in the class = 50

46. (a) : No. of students whose weight is atleast 50 kg
= 7 + 4 = 11
$\therefore$ Required probability $= \frac{11}{50}$

47. (d) : No. of students whose weight is atmost 65 kg
= 9 + 18 + 12 + 7 + 4 = 50
$\therefore$ Required probability $= \frac{50}{50} = 1$

48. (c) : No. of students whose weight is not more than or equal to 45 kg = 9 + 18 = 27
$\therefore$ Required probability $= \frac{27}{50}$

49. (d) : No. of students whose weight is less than 60 kg but more than or equal to 45 kg = 12 + 7 = 19
$\therefore$ Required probability $= \frac{19}{50}$

50. (a)

(51-55) : Total no. of workers = 90 + 280 + 250 + 180 = 800

51. (b) : No. of workers getting atmost ₹ 500 = 90
$\therefore$ Required probability = $\frac{90}{800} = \frac{9}{80}$

52. (b) : No. of workers getting atleast ₹ 701 = 250 + 180
= 430
$\therefore$ Required probability $= \frac{430}{800} = \frac{43}{80}$

53. (c) : No. of workers getting ₹ 901 - ₹ 1100 = 180
$\therefore$ Required probability = $\frac{180}{800} = \frac{9}{40}$

54. (c) : No. of workers getting atmost ₹ 900
= 90 + 280 + 250 = 620

$\therefore$ Required probability $= \frac{620}{800} = \frac{31}{40}$

55. (a) : No. of workers getting less than ₹ 300 = 0
$\therefore$ Required probability = 0

56. (a) : Total number of trials = 30
Number of times head appears = 18
$\therefore$ Number of times tail appears = 30 – 18 = 12
$\therefore$ P(getting tail) = 12/30
$\therefore$ Both Assertion and Reason are correct and Reason is the correct explanation of Assertion.

57. (a) : In a throw of a die, total number of outcomes = 6
Let E_1 = Even numbers = 2, 4, 6 $\quad \therefore n(E_1) = 3$

$\therefore \quad P(E_1) = \frac{3}{6} = \frac{1}{2}$

Let E_2 = Odd numbers = 1, 3, 5 $\quad \therefore n(E_2) = 3$

$\therefore \quad P(E_2) = \frac{3}{6} = \frac{1}{2}$

$\therefore$ Both Assertion and Reason are correct and Reason is the correct explanation of Assertion.

58. (a) : When three coins are tossed, number of elements in the sample space is {HHH, HHT, HTH, THH, HTT, THT, TTH, TTT} = 8 = 2^3
$\therefore$ Both Assertion and Reason are correct and Reason is the correct explanation of Assertion.

59. (c) : Total number of students = 365
Number of students who like to opt French = 130
Number of students who do not like to opt French = 365 – 130 = 235

$\therefore \quad P$(student does not like to opt French) $= \frac{235}{365} = \frac{47}{73}$

$\therefore$ Assertion is correct but Reason is wrong.

60. (d) : Total number of students = 45
Number of students who passed the examination = 39

$\therefore \quad P$(student has passed the examination) $= \frac{39}{45} = \frac{13}{15}$

P(student has not passed the examination) = $1 - \frac{13}{15} = \frac{2}{15}$

$\therefore$ Assertion is wrong but Reason is correct

SUBJECTIVE TYPE QUESTIONS

1. Total number of families = 1000 = $n(S)$
Number of families having exactly 2 girls = 475 = $n(E)$

$\therefore \quad P(E) = \frac{n(E)}{n(S)} = \frac{475}{1000} = \frac{19}{40}$

2. Total number of students, $n(S) = 100$
Let E be the event that child likes football.
i.e., $n(E) = 48$

$\therefore \quad P(E) = \frac{48}{100} = \frac{12}{25}$

3. P(woman wins the game) $= \frac{16}{20} = \frac{4}{5}$

P(woman does not win the game) $= 1 - \frac{4}{5} = \frac{1}{5}$

4. Number of months = 12 $\Rightarrow n(S) = 12$
Let E be the event having months in which 6 babies were born *i.e.*, July, Aug and Dec

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

$\therefore \quad P(E) = \frac{n(E)}{n(S)} = \frac{3}{12} = \frac{1}{4}$

5. Number of elements in sample space when two dice are thrown = 6 × 6 = 36
Doublets are {(1, 1), (2, 2), (3, 3), (4, 4), (5, 5), (6, 6)}
i.e., 6 in number

$\therefore \quad P$(getting doublet)

$= \frac{\text{Number of doublets}}{\text{Number of elements in sample space}} = \frac{6}{36} = \frac{1}{6}$

6. Ram's winning probability $= \frac{1}{3}$

$\Rightarrow$ Priya's winning probability $= 1 - \frac{1}{3} = \frac{2}{3}$

7. Number of letters in the word 'EXAMINATION' = 11
Number of vowels in the word = 6

Required probability $= \frac{6}{11}$

8. P(Head appears) $= \frac{255}{500} = \frac{51}{100}$

P(Tail appears) $= \frac{245}{500} = \frac{49}{100}$

Sum of the probabilities $= \frac{51}{100} + \frac{49}{100} = \frac{100}{100} = 1$

9. Number of balls = 6 + 5 = 11 = $n(S)$
Let E be the event of choosing a green ball randomly.

$\therefore \quad P(E) = \frac{n(E)}{n(S)} = \frac{6}{11} = \frac{n}{11} \Rightarrow n = 6$

10. Number of people with age 60, 61 and 64 who can drive = 16090 + 11490 + 3607 = 31187
Total number of people who can drive
= 16090 + 11490 + 8012 + 5448 + 3607 + 2320 = 46967

$\therefore$ Required probability $= \frac{31187}{46967}$

11. $n(S) = 100$
(i) Let E be the event that the die shows a number less than 3, *i.e.*, $n(E) = 12 + 18 = 30$

$\therefore \quad P(E) = \frac{n(E)}{n(S)} = \frac{30}{100} = \frac{3}{10}$

(ii) Let F be the event that the die shows a number greater than 4, *i.e.*, $n(F) = 14 + 16 = 30$

$\therefore \quad P(F) = \dfrac{n(F)}{n(S)} = \dfrac{30}{100} = \dfrac{3}{10}$

12. Total number of integers in the sample space = 200 = $n(S)$.

Among first 200 positive integers, we have 11, 22, 33, 44, 55, 66, 77, 88, 99, 110, 121, 132, 143, 154, 165, 176, 187, 198 are divisible by 11.

$\therefore$ Number of integers which are divisible by 11 = 18

P(integer is divisible by 11)

$$= \frac{\text{Number of integers divisible by 11}}{\text{Total number of integers in sample space}}$$

$$= \frac{18}{200} = \frac{9}{100}$$

13. Here, total number of trials = 100

Let x be the number of times 6 came up.

We know, probability of an event

$$= \frac{\text{Frequency of the event occuring}}{\text{Total number of trials}}$$

$\Rightarrow \quad \dfrac{x}{100} = \dfrac{2}{5}$

$\Rightarrow \quad x = 40$

14. Total number of families, $n(S) = 5000$

Let E be the event that the chosen family has less than 5 members.

i.e., $n(E) = 1060 + 1000 + 1020 = 3080$

$\therefore \quad P(E) = \dfrac{n(E)}{n(S)} = \dfrac{3080}{5000} = \dfrac{77}{125}$

15. Total number of throws, $n(S) = 60$

Let E be the event that upper face shows an even prime number, *i.e.*,

$n(E) = 10$ [$\because$ 2 is the only even prime number]

$\therefore \quad P(E) = \dfrac{n(E)}{n(S)} = \dfrac{10}{60} = \dfrac{1}{6}$

Let F be the event that upper face shows an odd number

= 8 + 15 + 7 = 30

$\therefore \quad P(F) = \dfrac{n(F)}{n(s)} = \dfrac{30}{60} = \dfrac{1}{2}$

16. Total number of students = 35 + 34 + 33 = 102

(i) Number of students prepare project on chapter-1 = 74

$\therefore$ Probability that the student prepares project on chapter-1 $= \dfrac{74}{102} = \dfrac{37}{51}$

(ii) Number of students prepare project on chapter-2 = 28

$\therefore$ Probability that the student prepares project on chapter-2 $= \dfrac{28}{102} = \dfrac{14}{51}$

17. Total number of classes = 6

(i) Number of classes in which attendance percentage is more than 75% = 3

$\therefore \quad$ Required probability $= \dfrac{3}{6} = \dfrac{1}{2}$

(ii) Number of classes in which attendance is less than 50% = 1

$\therefore$ Required probability = 1/6

18. Total number of hours = 24

(i) Number of hours during which Ashu is at home = 7 + 2 + 2 = 11

$\therefore$ Probability that Ashu is available at home $= \dfrac{11}{24}$

(ii) Number of hours during which Ashu plays outdoor games = 3

$\therefore$ Probability that Ashu will play outdoor games $= \dfrac{3}{24} = \dfrac{1}{8}$

19. We have

P(guessing correct answer) $= \dfrac{x}{5}$ and P(not guessing correct answer) $= \dfrac{2x}{3}$

Clearly, P(guessing correct answer) + P(not guessing correct answer) = 1 [$\because P(E) + P$ (not E) = 1]

$\therefore \quad \dfrac{x}{5} + \dfrac{2x}{3} = 1$

$\Rightarrow \quad 3x + 10x = 15 \Rightarrow x = \dfrac{15}{13} \quad \Rightarrow 26x = 26 \times \dfrac{15}{13} = 30$

20. Let the probability of success be x

Then, probability of failure = 1 – probability of success

$\Rightarrow$ Probability of failure = 1 – x

According to question, we have,

Probability of failure – Probability of success = $\dfrac{5}{19}$

$\Rightarrow \quad 1 - x - x = \dfrac{5}{19} \Rightarrow 1 - 2x = \dfrac{5}{19}$

$\Rightarrow \quad 2x = 1 - \dfrac{5}{19} = \dfrac{14}{19} \Rightarrow x = \dfrac{7}{19}$

$\therefore \quad$ Probability of success $= \dfrac{7}{19}$

and probability of failure $= 1 - \dfrac{7}{19} = \dfrac{12}{19}$

21. (i) The total number of cases = 2000

The frequency of a tyre that needs to be replaced before it covers 3000 km is 40.

$\therefore \quad$ Probability (a tyre need to be replaced before it covers 3000 km) = $\dfrac{40}{2000} = 0.02$

(ii) The frequency of a tyre that last more than 6000 km = 420 + 650 = 1070.

$\therefore \quad$ Probability (a tyre will last more than 6000 km)

$$= \frac{1070}{2000} = 0.535$$

(iii) The frequency of a tyre that requires replacement after covering somewhere between 3000 km and 9000 km = 890 + 420 = 1310.

$\therefore$ Probability (a tyre requires replacement after covering somewhere between 3000 km and 9000 km)

$= \frac{1310}{2000} = 0.655$

22. Total number telephone numbers on one page of a directory = 250

(i) Number of telephone numbers having 8 at its unit's place = 31

$\therefore$ P(a number having 8 at its unit's place) = 31/250.

(ii) Number of telephone numbers having 7 at its unit's place = 27

$\therefore$ Number of telephone numbers not having 7 at its unit's place = 250 – 27 = 223

$\therefore$ Required probability = 223/250.

23. Total number of days for which weather record available = 365

Number of days for which weather forecast was correct = 190

(i) P(the weather forecast was correct on a given day)

$= \frac{190}{365} = \frac{38}{73}$

(ii) P(the weather forecast was not correct on a given day) = $1 - \frac{38}{73} = \frac{35}{73}$

24. Let, the event of getting two heads be denoted by A, event of getting one head be denoted by B, and event of getting no head be denoted by C.

Total number of trials = 1000

Number of trials in which, event A happens = 320

Number of trials in which, event B happens = 450

Number of trials in which, event C happens = 230

$\therefore$ $P(A) = \frac{320}{1000} = 0.32$; $P(B) = \frac{450}{1000} = 0.45$;

$P(C) = \frac{230}{1000} = 0.23$

25. Total number of families = 700

Number of families who likes newspaper = 325

(i) P(a family chosen at random likes the newspaper) = $\frac{325}{700} = \frac{13}{28}$

(ii) P(a familty does not like the newspaper)

= 1 – P(a family likes the newspaper) = $1 - \frac{13}{28} = \frac{15}{28}$

26. Number of unit tests = 5

(i) Number of test in which student scored more than 80% marks = 1

$\therefore$ P(student gets more than 80% marks) = 1/5

(ii) Number of tests in which student scored atleast 60% marks = 4 (*i.e.*, unit test II, III, IV and V)

$\therefore$ P(student gets atleast 60% marks) = 4/5

27. (i) Number of persons aged 60 years = 16090

Number of persons aged 61 years = 11490

$\therefore$ Number of persons died before reaching their 61st birthday = 16090 – 11490 = 4600

So, P(a person aged 60 dying within a year) = $\frac{4600}{16090} = \frac{460}{1609}$

(ii) Number of persons aged 61 years = 11490

Number of persons aged (61 + 4 = 65) years = 2320

$\therefore$ Number of persons who live for 4 years = 2320

So, P(a person aged 61 will live for 4 years)

$= \frac{2320}{11490} = \frac{232}{1149}$

28. (i) P(wheel stops at yellow colour) $= \frac{4}{12} = \frac{1}{3}$

(ii) P (wheel stops at red colour) $= \frac{3}{12} = \frac{1}{4}$

(iii) P (wheel stops at blue colour) $= \frac{5}{12}$

29. Total number of circles = 34

(i) Let E be the event that chosen circle has diameter less than 28.

$\therefore$ $n(E) = 3 + 5 = 8$

$\therefore$ $P(E) = \frac{n(E)}{n(S)} = \frac{8}{34} = \frac{4}{17}$

(ii) Let F be the event that chosen circle has radius lying between 14 to 17 *i.e.*, has diameter between 28 to 34.

$\Rightarrow$ $n(F) = 8$

$\therefore$ $P(F) = \frac{n(F)}{n(S)} = \frac{8}{34} = \frac{4}{17}$

(iii) Let G be the event that chosen circle has diameter above 50.

$n(G) = 0$

$\therefore$ $P(G) = \frac{n(G)}{n(S)} = \frac{0}{34} = 0$

30. There are 11 letters in the word 'PROBABILITY'.

(i) Let E be the event that the chosen letter is a consonant.

$\therefore$ $n(E) = 7 \Rightarrow P(E) = \frac{n(E)}{n(S)} = \frac{7}{11}$

(ii) P(chosen letter is a vowel) = 1 – $P(E)$

$= 1 - \frac{7}{11} = \frac{4}{11}$

31. Total number of CFL = 400

(i) Number of CFL having lifetime less than 400 hours = 14 + 56 = 70

$\therefore$ Probability that lifetime of the selected CFL is less than 400 hours $= \frac{70}{400} = \frac{7}{40}$

(ii) Number of CFL having lifetime between 300 to 800 hours = 56 + 60 + 86 + 74 + 62 = 338

∴ Probability that lifetime of the selected CFL is between 300 to 800 hours $= \frac{338}{400} = \frac{169}{200}$

(iii) Number of CFL having lifetime atleast 700 hours = 62 + 48 = 110

∴ Probability that lifetime of the selected CFL is atleast 700 hours = $\frac{110}{400} = \frac{11}{40}$

(iv) Number of CFL having lifetime more than 800 hours = 48

∴ Probability that lifetime of the selected CFL is more than 800 hours = $\frac{48}{400} = \frac{3}{25}$

32. Total number of bags = 8

(i) Number of bags in which more than 30 seeds germinated = 4

∴ *P*(germination of more than 30 seeds in a bag) = $\frac{4}{8} = \frac{1}{2}$

(ii) Number of bags in which 50 seeds germinated = 0

∴ *P*(germination of 50 seeds in a bag) = 0/8 = 0

(iii) Number of bags in which less than 30 seeds germinated = 4

∴ *P*(germination of less than 30 seeds in a bag) $= \frac{4}{8} = \frac{1}{2}$

33. Total number of cars observed = 142

(i) Number of cars having exactly 5 occupants = 15

∴ *P*(that a car has 5 occupants) = 15/142

(ii) Number of cars having more than 2 occupants = 33 + 27 + 15 + 10 = 85

∴ *P*(that a car has more than 2 occupants) = 85/142

(iii) Number of cars having less than 5 occupants = 29 + 28 + 33 + 27 = 117

∴ *P*(that a car has less than 5 occupants) = 117/142

(iv) Number of cars having atleast 4 occupants = 27 + 15 + 10 = 52

∴ *P*(that a car has atleast 4 occupants) = $\frac{52}{142} = \frac{26}{71}$

34. Total number of batteries = 800

(i) Number of batteries having life less than 30 months = 200 + 80 = 280

∴ *P*(that the battery need replacement before 30 months) $= \frac{280}{800} = \frac{7}{20}$

(ii) Number of batteries having life more than 42 months = 150 + 250 = 400

∴ *P*(that the battery last more than 42 months) = $\frac{400}{800} = \frac{1}{2}$

(iii) Number of batteries having life between 18 to 54 months = 200 + 120 + 150 = 470

∴ *P*(that a battery need replacement between 18 to 54 months) $= \frac{470}{800} = \frac{47}{80}$

(iv) Number of batteries having life more than 54 months = 250

∴ *P*(that a battery need replacement after 54 months) $= \frac{250}{800} = \frac{5}{16}$

35. The total number of workers = 30

(i) Number of workers whose wages are less than ₹ 150 = 3 + 4 = 7

∴ *P*(that worker get wages less than ₹ 150) = 7/30

(ii) Number of workers whose wages are atleast ₹ 210 = 4 + 3 = 7

∴ *P*(that worker get wages atleast ₹ 210) = 7/30

(iii) Number of workers whose wages are more than or equal to ₹ 150 but less than ₹ 210 = 5 + 6 + 5 = 16

∴ *P*(that worker get wages more than or equal to ₹ 150 but less than ₹ 210) = $\frac{16}{30} = \frac{8}{15}$

(iv) Number of workers whose wages lie in the interval 190-250 = 5 + 4 + 3 = 12

∴ *P*(that worker get wages lie in the interval 190-250) $= \frac{12}{30} = \frac{2}{5}$.

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