Very Short Answer Type Questions

[1 mark]

Que 1. Can the experimental probability of an event be a negative number? Justify your answer.

Sol. No, because the number of trials in which the event can happen cannot be negative and the total number of trials is always positive.

Que 2. Can the experimental probability of an event be greater than 1? Justify your answer.

Sol. No, as the number of trials can't be greater than the total number of trials.

Que 3. As the number of tosses of a coin increases, the ratio of the number of heads to the total number of tosses will be $\frac{1}{2}$. Is it correct? If not, write the correct one.

Sol. No, As the number of tosses of a coin increases, the ratio of the number of heads to the total number of tosses will be near to $\frac{1}{2}$, not exactly $\frac{1}{2}$.

Que 4. In a throw of a die, find the probability of getting an even number.

Sol. Total even number on a die = 3

P (getting an even numbers) = $\frac{3}{6} = \frac{1}{2}$

Que 5. 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. Find the probability that he/she blood group B.

Sol. Total number of students = 10 + 13 + 12 + 5 = 40

P (a student has blood group B) = $\frac{12}{40} = \frac{3}{10}$

Que 6. In tossing a coin 100 times head appears 56 times. What is the probability of head for the coin?

Sol. P (head) = $\frac{56}{100} = 0.56$.

Que 7. A die is thrown. What is the probability of getting a multiple of 3 on the upper face?

Sol. Multiples of 3 on a die = 3, 6

$\therefore$ P (a multiple of 3)$= \frac{2}{6} = \frac{1}{3}$.

Short Answer Type Questions – I

[2 marks]

Que 1. 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, find the probability for at most one head.

Sol. P (at most one head) = P (0 head) + P (1 head)

$$= \frac{250}{1000} + \frac{350}{1000} = \frac{800}{1000} = \frac{4}{5}$$

Que 2. In a single throw of two dice, what is the probability of getting a sum of 9?

Sol. Outcomes with sum of 9 = {(3, 6), (4, 5), (5, 4), (6, 3)}

P (getting a sum of 9 is) = $\frac{4}{36} = \frac{1}{9}$

Que 3. In a survey of 364 children aged 19 – 36 months, it was found that 91 liked to eat potato chips. If a child is selected at random. Find the probability that he/she does not like to eat potato chips.

Sol. Children who do not like potato chips = 364 – 91 = 273

P (a child does not like potato chips) = $\frac{273}{364} = 0.75$

Que 4. 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

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

Find the probability that bulbs selected randomly from the lot has life less than 900 hours.

Sol. Number of bulbs having life less than 900 hours = 10 + 12 + 23 = 45

P (a bulb has life less than 900 hours) = $\frac{45}{80} = \frac{9}{16}$

Que 5. 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?

Sol. Probability of an event = $\frac{Frequency\ of\ the\ event\ occurring}{The\ total\ number\ of\ trials}$

Therefore, $\frac{2}{5} = \frac{x}{100}$, I.e., x = 40

Que 6. Two coins are tossed simultaneously 500 times. If we get two heads 100 times, one head 270 times and no head 130 times, then find the probability of getting one or more than one head.

Sol. Since, frequency of one or more than one head = 100 + 270 = 370

Therefore, P (one or more heads) = $\frac{370}{500} = \frac{37}{50}$.

Que 7. A survey was conducted in a locality regarding the eating habits of persons. Out of 450 persons, if 175 found to be pure vegetarian, what is the probability of person, selected at random of being non-vegetarian?

Sol. Number of pure vegetarians = 175
∴ Number of non-vegetarians = 450 – 175 = 275

Probability of a person being non-vegetarians = $\frac{275}{450} = \frac{11}{18}$.

Que 8. In a survey of 364 children aged 20 – 40 months, it was found that 90 liked to eat potato chips. If a child is selected at random, find the probability that he/she does not like to eat potato chips.

Sol. Number of children = 364
Number of children not like to eat potato chips = 364 – 90 = 273.

The required probability = $\frac{273}{364} = 0.75$.

Short Answer Type Questions – II

[3 marks]

Que 1. Three coins are tossed simultaneously 200 times with the following frequencies of different outcomes:

Outcomes	No tail	One tail	Two tails	Three tails
Frequency	70	210	135	85

What is the probability of getting more than one tail in the next toss?

Sol. Frequency of more than one tail = 135 + 85 = 220

∴ P (more than one tail) = $\frac{220}{500} = \frac{11}{25}$

Que 2. 1500 families with 2 children were selected randomly and the following data were recorded:

Number of girls in a family	2	1	0
Number of families	475	814	211

Compute the probability of family, chosen at random, having
(i) 2 girls, (ii) 1 girl, (iii) No girl.
Also check whether the sum of these probabilities is 1.

Sol. (i) P (a family having 2 girls) = $\frac{Number\ of\ families\ having\ 2\ girls}{Total\ number\ of\ families}$

$= \frac{475}{1500} = \frac{19}{60}$

(ii) P (a family having 1 girl) $= \frac{Number\ of\ families\ having\ 1\ girl}{Total\ number\ of\ families}$

$= \frac{814}{1500} = \frac{407}{750}$

(iii) P (a family having no girl) $= \frac{Number\ of\ families\ having\ no\ girl}{Total\ number\ of\ families}$

$= \frac{211}{1500}$

Sum of probabilities $= \frac{475}{1500} + \frac{814}{1500} + \frac{211}{1500} = \frac{1500}{1500} = 1$

Que 3. To know the opinion of the students about the subject statistics, a survey of 200 students was conducted. The data is recorded in the following table.

Opinion	Number of students
Like	135
Dislike	65

Find the probability that a student chosen at random
(i) likes statistics, (ii) does not like statistics.

Sol. (i) p (a student likes statistics) = $\frac{Number\ of\ students\ who\ like\ statistics}{Total\ number\ of\ students}$

$$= \frac{135}{200} = 0.675$$

(ii) P (a students does not like statistics)

$$= \frac{Number\ of\ students\ who\ dislike\ statistics}{Total\ number\ of\ students}$$

$$= \frac{65}{200} = 0.325$$

Que 4. Two dice are thrown simultaneously 500 times. Each time the sum of two numbers appearing on their tops is noted and recorded as given in the following table:

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

If the dice are thrown once more, what is the probability of getting a sum
(i) more than 10?
(ii) less than or equal to 5?
(iii) between 8 and 12?

Sol. (i) P (getting a sum more than 10)

= P (getting a sum of 11) + P (getting a sum of 12)

$$= \frac{28}{500} + \frac{15}{500} + \frac{28+15}{500} = \frac{43}{500} = 0.086 = 0.09$$

(ii) P (getting a sum less than or equal to 5)

= P (getting a sum of 5) + P (getting a sum of 4) + P (getting a sum of 3)

$$= \frac{55}{100} + \frac{42}{500} + \frac{30}{500} + \frac{14}{500} = \frac{141}{500} = 0.282$$

(iii) P (getting a sum between 8 and 12)

= P (getting a sum of 9) + P (getting a sum of 10) + P (getting a sum of 11)

$$= \frac{53}{500} + \frac{46}{500} + \frac{28}{500} + \frac{127}{500} = 0.254$$

Que 5. A recent survey found that the ages of workers in a factory are distributed as follows:

Age (in years)	20 – 29	30 – 39	40 – 49	50 – 59	60 and above
Number of workers	38	27	86	46	3

If a person is selected at random, find the probability that the person is:

(i) 40 years or more.

(ii) under 40 years.

(iii) under 60 but over 39 years.

Sol. Total number of workers = 38 + 27 + 86 + 46 + 3 = 200

(i) P (Person is 40 years or more) = P (person having age 40 to 49 years)
+ P (person having age 50 to 59 years)
+ P (person having age 60 and above)

$$= \frac{86}{200} + \frac{46}{200} + \frac{3}{200}$$

$$= \frac{135}{200} = 0.675 = 0.68$$

(ii) P (person is under 40 years) = P (person having age 20 to 29 years)
+ P (person having age 30 to 39 years)

$$= \frac{38}{200} + \frac{27}{200}$$

$$= \frac{65}{200} = 0.325 = 0.33$$

(iii) P (person having age under 60 but over 39 years)

= P (person having age 40 to 49 years)
+ P (person having age 50 to 59 years)

$$= \frac{86}{200} + \frac{46}{200} = \frac{132}{200} = 0.66$$

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

Number of defective parts	0	1	2	3	4	5	6	7	8	9	10	11	12	13
Days	50	32	22	18	12	12	10	10	10	8	6	6	2	2

Determine the probability that tomorrow output will have
(i) no defective part, (ii) at least one defective,
(iii) not more than 5 defective parts.

Sol. (i) P (no defective part) = $\frac{50}{200} = 0.25$

(ii) P (at least one defective part) = 1 – p (no defective part)

= 1 – 0.25 = 0.75

(iii) P (not more than 5 defective parts)

= P (no defective part) + P (1 defective part) + P (2 defective parts)
+ P (3 defective parts) + P (4 defective parts) + P (5 defective parts)

$$= \frac{50}{200} + \frac{32}{200} + \frac{22}{200} + \frac{18}{200} + \frac{12}{200} + \frac{12}{200}$$

$$= \frac{146}{200} = 0.73$$

Que 7. A tyre manufacturing company kept a record of the distance covered before a tyre needed to be replaced. The table shown the result of 1000 cases.

Distance (in km)	Less than 4,000	4,000 to 9,000	9,001 to 14,000	More than 14,000
Frequency	20	210	325	445

If someone buys a tyre of this company, what is the probability that:
(i) it will need to be replaced before it has covered 4000 km?
(ii) it will last more than 9000 km?
(iii) it will need to be replaced after it has covered somewhere 4000 km and 14000 km?

Sol. The total number of trials = 1000

(i) P (tyre to be replaced before it covers 4000 km) = $\frac{20}{1000} = 0.02$

(ii) The frequency of a tyre that will last more than 9000 km = 325 + 445 = 770

∴ P (tyre will last for more than 9000 km) = $\frac{770}{1000} = 0.77$

(iii) The frequency of a tyre that requires replacement between 4000 km and 14000 km
= 210 + 325 = 535

So, P (tyre requiring replacement between 4000 km and 14000 km)
$= \frac{535}{1000} = 0.535$

Que 8. Bulbs are packed in cartons each containing 40 bulbs. Seven hundred cartons were examined for defective bulbs and the results are given in the following table.

Number of defective bulbs	0	1	2	3	4	5	6	More than 6
Frequency	400	180	48	41	18	8	3	2

One carton was selected at random. What is the probability that it has:
(i) No defective bulb?
(ii) Defective bulbs from 2 to 6?
(iii) Defective bulbs less than 4?

Sol. (i) P (a carton has no defective bulb) = $\frac{400}{700} = \frac{4}{7}$

(ii) P (defective bulbs from 2 to 6) = P (2 defective bulbs)
+ P (3 defective bulbs + P (4 defective bulbs)
+ P (5 defective bulbs) + P (6 defective bulbs)

$= \frac{48}{700} + \frac{41}{700} + \frac{18}{700} + \frac{8}{700} + \frac{3}{700} = \frac{118}{700} = \frac{59}{350}$

(iii) P (defective bulbs less than 4) = P (no defective bulb) + P (1 defective bulb)
+ P (2 defective bulbs) + P (3 defective bulbs)

$= \frac{400}{700} + \frac{180}{700} + \frac{48}{700} + \frac{41}{700} = \frac{669}{700}$

Que 9. Cards with number 1, 2, 3, ……., 100 are placed in a box and mixed thoroughly. One card is drawn. What is the probability that the card drawn is
(i) a prime number less than 30?

(ii) a multiple of 5 and 7?
(iii) a multiple of 5 or 7?

Sol. Favourable cards are 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, i.e., 10.

P (prime number less than 30) = $\frac{10}{100}$ or $\frac{1}{10}$

(ii) Favourable cards are 35, 70.
P (card is a multiple of 5 and 7) = $\frac{2}{100}$ or $\frac{1}{50}$

(iii) Favourable cards are 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100, 7, 14, 21, 28, 42, 49, 56, 63, 77, 84, 91, 98 i.e., 32 P (card is a multiple of 5 or 7) = $\frac{32}{100}$ or $\frac{8}{25}$.

HOTS (Higher Order Thinking Skills)

Que 1. In cricket match, a batsman hits a boundary 12 times out of 48 balls he plays. Find the probability that he does not hit a boundary in the next ball.

Sol. Let E be the event 'the batsman hits a boundary'.

Then, $\bar{E}$ is the event 'the batsmen does hit a boundary'.

$\therefore$ P (E) = $\frac{12}{48} = \frac{1}{4}$

$\Rightarrow$ P ($\bar{E}$) = 1 – P(E) = 1 - $\frac{1}{4} = \frac{3}{4}$

Que 2. An Insurance company selected 2000 drivers at random in a particular city to find a relationship between age and accidents. The data obtained are given in the following table:

Age of drivers (in years)	**Accidents in one year**				
	0	1	2	3	Over 3
18 – 29	440	160	110	61	35
30 – 50	505	125	60	22	18
Above 50	360	45	35	15	9

Find the probabilities of the following events for a driver chosen at random from the city:

(i) Being 18-29 years of age having exactly 3 accidents in one years.

(ii) Being 30-50 years of age and having one or more accidents in a years.

(iii) Having no accident in one years.

Sol. Total number of drivers = 2000

(i) Number of drivers who are 18-29 years old and have exactly 3 accidents in one years is 61

So, P (driver is 18-29 years old with exactly 3 accidents) = $\frac{61}{2000}$

= 0.0305 ≈ 0.031

(ii) Number of drivers having 30-50 years of age and having one or more accidents in one year

= 125 + 60 + 22 + 18 = 225

So, P (driver is 30-35 years of age and having one or more accidents)

= $\frac{225}{2000}$ = 0.1125 = 0.113

(iii) Number of drivers having no accident in one year = 440 + 505 + 360

= 1305

So, P (drivers with no accident) = $\frac{1305}{2000}$ = 0.6525 = 0.653

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

Test	I	II	III	IV	V	VI
percentage of marks	52	60	65	75	80	72

Find the probability that in the next test the student gets

(i) more than 70% marks, **(ii) less than 70% marks,**

(iii) at least 60% marks.

Sol. (i) Number of tests in which the student scored more than 70% marks = 3

∴ P (more than 70% marks) = $\frac{3}{6} = \frac{1}{2}$

(ii) Number of tests in which the student scored less than 70% marks = 3

∴ P(less than 70% marks) = $\frac{3}{6} = \frac{1}{2}$

(iii) Number of tests in which the student scored at least 60% marks = 5

∴ P (at least 60% marks) = $\frac{5}{6}$

Value Based Questions

Que 1. A survey was conducted on 50 persons of a society to find whether they title them as honest (H), courageous (C), creative (Cr), cooperative (Co) or patriotic (P). The following data was obtained:

P	H	H	Co	H	Cr	C	C	Cr	P
Co	P	H	Cr	P	P	C	Cr	P	H
H	Cr	Co	C	C	Co	P	P	H	Co
P	H	C	H	Co	C	C	P	Co	C
Co	P	Cr	P	P	P	H	Co	P	Cr

Construct a frequency distribution table for the above data.
Which social value amongst the above values is the most important according to you for the development of a society? Justify your answer.

Sol.

Value Traits	Tally Marks	Number of Persons
Honest	𝍸 𝍸	10
Courageous	𝍸 ||||	9
Creative	𝍸 ||	7
Cooperative	𝍸 ||||	9
Patriotic	𝍸 𝍸 𝍸	15
	Total	50

Each value with justification is correct. (Write yourself)

Que 2. The following data on the number of girls to the nearest ten per thousand boys in different sections of the society is given below:

Section	Number of girls per thousand boys
Scheduled Case (SC)	940
Scheduled Tribe (Tribe)	970
Non-SC/ST	920
Backward districts	950
Non-backward districts	920
Rural	930
Urban	910

(i) Represent the above information by a bar graph.
(ii) Write two conclusions you can arrive at from the graph, with justification.
Is gender equity important? How will relate it with social development?

Sol. (i)

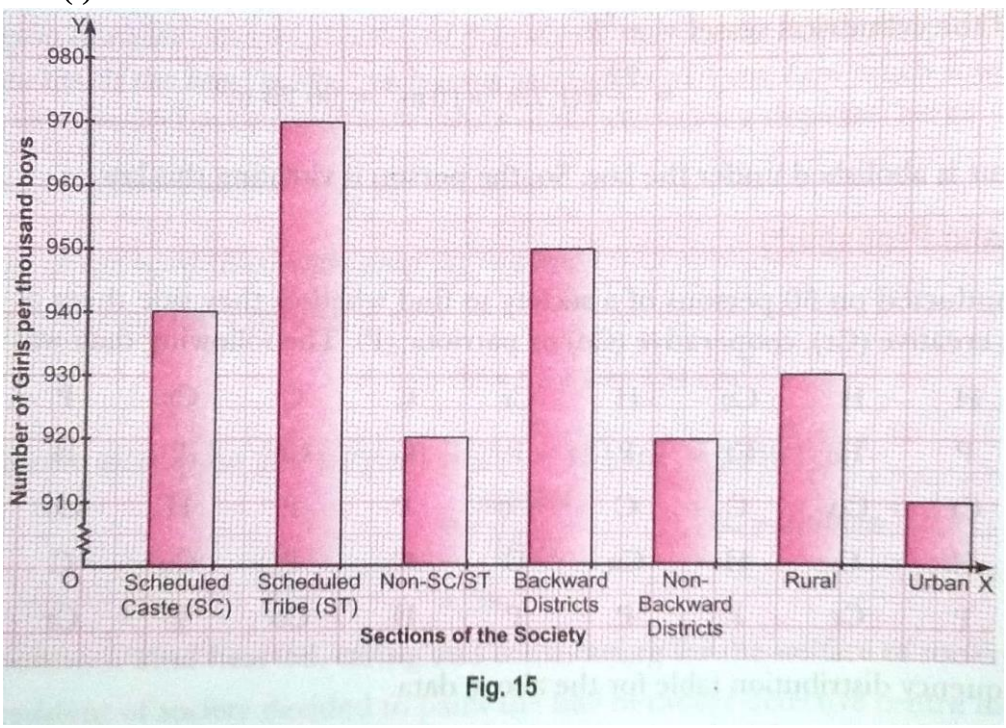

Fig. 15

(ii) The gender equity exists most in scheduled tribe and least in urban areas.
Yes, gender equity leads to economic growth which, in turn, helps in the development of a society.

Que 3. The percentage of salary donated by twelve different households to an orphanage every month are: 2, 5, 3, 5, 6, 1, 2, 4, 3, 5, 2, 2

Find the mean, median and mode of the data.
What qualities do the persons of these households possess?

Sol. Mean = $\frac{Sum\ of\ the\ observations}{Number\ of\ observation}$

$$= \frac{2+5+3+5+6+1+2+4+3+5+2+2}{12} = \frac{40}{12} = 3.3$$

Mean percentage of salary donated = 3.3%
Arranging the data in ascending order, we get
1, 2, 2, 2, 2, 3, 3, 4, 5, 5, 5, 6

The maximum occurring observation = 2
∴ Modal percentage of salary donated = 2%

$$Median = \frac{\left(\frac{n}{2}\right)^{th}\ observation + \left(\frac{n}{2}+1\right)^{th}\ observation}{2}$$

$$= \frac{6^{th} observation + 7^{th} observation}{2} = \frac{3+3}{2} = 3$$

∴ Medan percentage of salary donated = 3%
Social service, kind, caring.

Que 4. Tanya a class IX student received cash award of ₹10,000 (Ten thousand) in the singing competition. Her father advised her to make a budget plan for spending this amount. She made the following plan:

S.No.	Head	Amount
1	Donation to temple	200
2	Tuition fee to needy child	100
3	Welfare of senior citizen	500
4	Welfare of street children	800
5	Saving in bank	4000
6	Books for family library	2000
7	Picnic for family	1000
8	Gift to grandparents	1100
9	Tea party to friend	300
	Total	10,000

Make a bar graph for the above data.
From the above information answer the following questions:
1. Which mathematical concepts have been covered in this?
2. How will you rate her budget plan? In your opinion which head has been given (i) more than it deserved and (ii) less than it deserved?
3. Which values are depicted in her plant?

Sol.

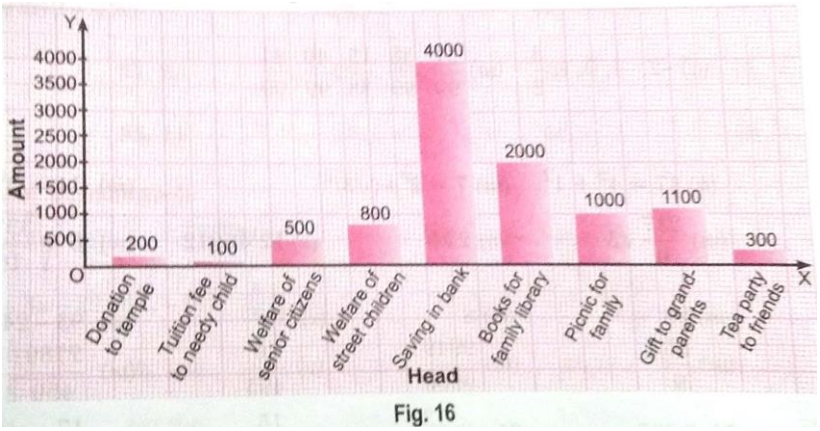

Fig. 16

1. Statistics 2. Do yourself 3. Respect for elders, kind, socially active.

Que 5. Out of 125 houses in a locality, 45 donate some part of their income every month to a charitable. Organisation. Find the probability that a household chosen at random does not donate every month.
How does donation to charitable organisations help in the development of society?
What social values do these 45 households possess?

Sol. $\frac{16}{25}$**,** Charitable organisations provide help to needy persons, so donating them means channelising the funds in the right way and hence, developing the society. Such households are socially active, generous and responsible citizens.

Que 6. At a petrol pump, it was found that out of 50 vehicles that came there, 22 asked for petrol and the remaining used other fuels.
(a) Find the probability that the next vehicle that will come, will ask for petrol.
(b) How can we save petrol?

Sol. (a) $\frac{11}{25}$
(b) By using more of public transport wherever possible and using substitutes of petrol such as diesel and CNG.