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 $\frac{8}{25}$.