

**(Chapter – 15) (Statistics)**

(Class – IX)

**EXERCISE 15.1**

**Q.1.** In a cricket match, a batswoman hits a boundary 6 times out of 30 balls she plays. Find the probability that she did not hit a boundary.

**Sol.** Total number of balls played by the batswoman = 30, Boundaries hit = 6

No. of balls in which she did not hit any boundary =  $30 - 6 = 24$

$$\therefore P(\text{she did not hit a boundary}) = \frac{\text{No. of balls in which she did not hit any boundary}}{\text{Total number of balls played}} = \frac{24}{30} = \frac{4}{5}$$

**Q.2.** 1500 families with 2 children were selected randomly, and the following data were recorded. :

|                                    |            |            |            |
|------------------------------------|------------|------------|------------|
| <b>Number of girls in a family</b> | <b>2</b>   | <b>1</b>   | <b>0</b>   |
| <b>Number of families</b>          | <b>475</b> | <b>814</b> | <b>211</b> |

Compute the probability of a family, chosen at random, having

(i) 2 girls

(ii) 1 girl

(iii) No girl

Also check whether the sum of these probabilities is 1.

$$\text{Sol. (i) } P(\text{a family having 2 girls}) = \frac{\text{No. of families having 2 girls}}{\text{Total no. of families}} = \frac{475}{1500} = \frac{19}{60}$$

$$\text{(ii) } P(\text{a family having 1 girl}) = \frac{\text{No. of families having 1 girl}}{\text{Total no. of families}} = \frac{814}{1500} = \frac{407}{750}$$

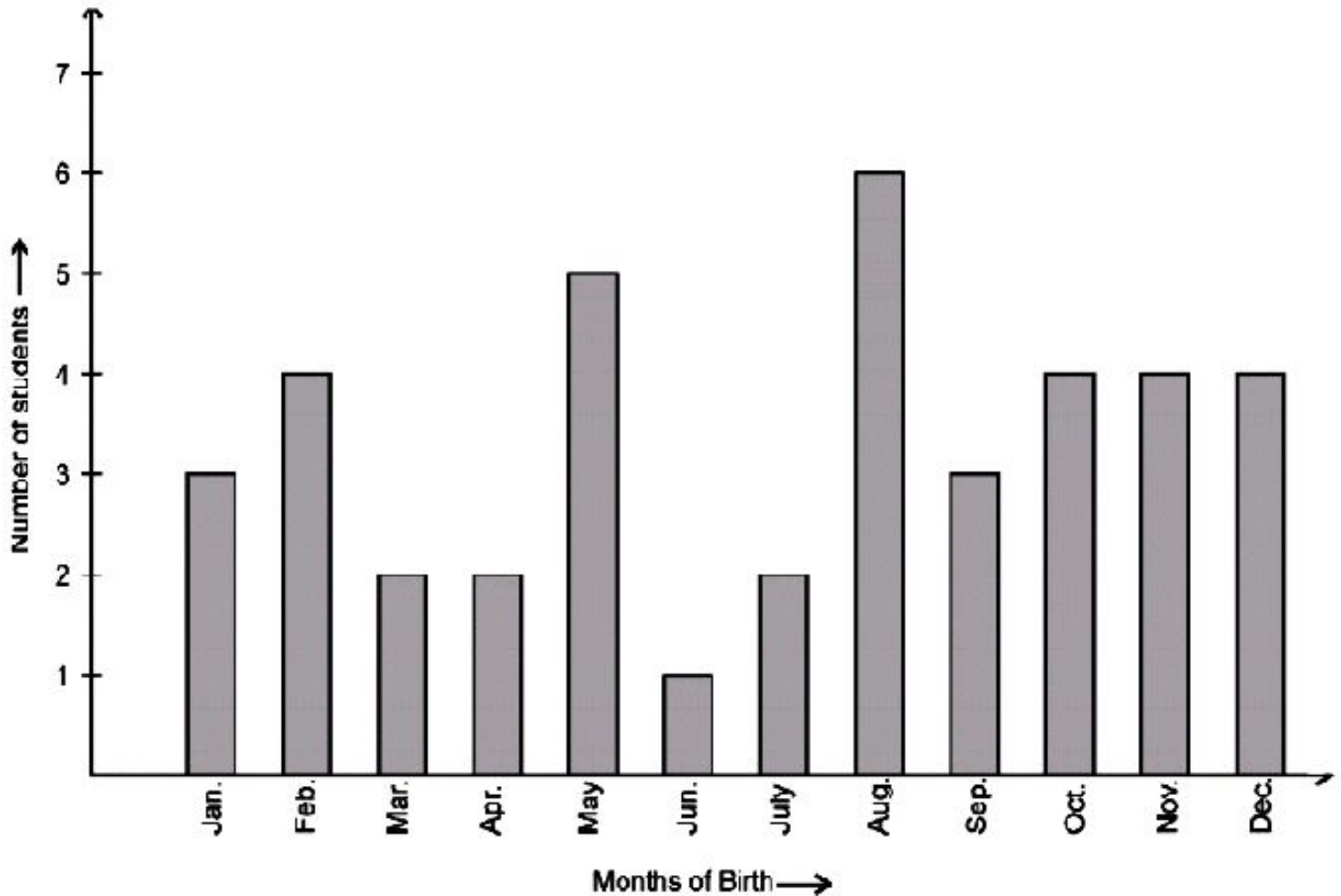
$$\text{(iii) } P(\text{a family having no girl}) = \frac{\text{No. of families having no girl}}{\text{Total no. of families}} = \frac{211}{1500}$$

$$\text{Sum of the probabilities in all three cases} = \frac{19}{60} + \frac{407}{750} + \frac{211}{1500} = \frac{475 + 814 + 211}{1500} = \frac{1500}{1500} = 1$$

**Q.3.** In a particular section of Class IX, 40 students were asked about the months of their birth and the following graph was prepared for the data so obtained. Find the probability that a student of the class was born in August.

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**Sol.** Total number of students considered = 40

No. of students born in August = 6

$$\therefore P(\text{a student was born in August}) = \frac{\text{No. of students born in August}}{\text{Total no. of students considered}} = \frac{6}{40} = \frac{3}{20}$$

**Q.4.** Three coins are tossed simultaneously 200 times with the following frequencies of different outcomes :

|                  |         |         |        |         |
|------------------|---------|---------|--------|---------|
| <b>Outcome</b>   | 3 heads | 2 heads | 1 head | No head |
| <b>Frequency</b> | 23      | 72      | 77     | 28      |

If the three coins are simultaneously tossed again, compute the probability of 2 heads coming up.

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**Sol.** Total number of tosses = 200  
No. of times 2 heads occur = 72

$$\therefore P(2 \text{ heads coming up}) = \frac{\text{No. of times 2 heads occur}}{\text{Total no. of tosses}} = \frac{72}{200} = \frac{9}{25}$$

**Q.5.** An organisation selected 2400 families at random and surveyed them to determine a relationship between income level and the number of vehicles in a family. The information gathered is listed in the table below :

| Monthly income<br>in (Rs) | Vehicles per family |     |    |         |
|---------------------------|---------------------|-----|----|---------|
|                           | 0                   | 1   | 2  | Above 2 |
| Less than 7000            | 10                  | 160 | 25 | 0       |
| 7000 – 10000              | 0                   | 305 | 27 | 2       |
| 10000 – 13000             | 1                   | 535 | 29 | 1       |
| 13000 – 16000             | 2                   | 469 | 59 | 25      |
| 16000 or more             | 1                   | 579 | 82 | 88      |

Suppose a family is chosen. Find the probability that the family chosen is

- (i) earning Rs 10000 – 13000 per month and owning exactly 2 vehicles.
- (ii) earning Rs 16000 or more per month and owning exactly 1 vehicle.
- (iii) earning less than Rs 7000 per month and does not own any vehicle.
- (iv) earning Rs 13000 – 16000 per month and owning more than 2 vehicles.
- (v) owning not more than 1 vehicle.

**Sol.** Total no. of families considered = 2400

(i) P(a family earning Rs 10000 – 13000 per month and owning exactly 2 vehicles)

$$= \frac{\text{No. of families earning Rs 10000 – 13000 per month and owning 2 vehicles}}{\text{Total no. of families}} = \frac{29}{2400}$$

(ii) P (a family earning Rs 16000 or more per month and owning exactly 1 vehicle)

$$= \frac{\text{No. of families earning Rs 16000 or more per month and owning 1 vehicle}}{\text{Total no. of families}} = \frac{579}{2400} = \frac{193}{800}$$

(iii) P(a family earning less than Rs 7000 per month and does not own any vehicle)

$$= \frac{\text{No. of families earning less than Rs 7000 per month and does not own any vehicle}}{\text{Total no. of families}} = \frac{10}{2400} = \frac{1}{240}$$

(iv) P(a family earning Rs 13000 – 16000 per month and owing more than 2 vehicles)

$$= \frac{\text{No. of families earning Rs 13000 – 16000 per month and owning more than 2 vehicles}}{\text{Total no. of families}} = \frac{25}{2400} = \frac{1}{96}$$

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(v) P (a family owning 0 vehicle or 1 vehicle)

– P (a family not owning more than 1 vehicle)

$$= \frac{10 + 0 + 1 + 2 + 1 + 160 + 305 + 535 + 469 + 579}{2400} = \frac{2062}{2400} = \frac{1031}{1200}$$

**Q.6.** Following table shows the performance of two sections of students in Mathematics test of 100 marks.

| 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                  |
| <b>Total</b> | <b>90</b>          |

(i) Find the probability that a student obtained less than 20% in the mathematics test.

(ii) Find the probability that a student obtained marks 60 or above.

**Sol.** (i) Total no. of students = 90

$$\begin{aligned} P(\text{a student obtained less than 20\%}) &= \frac{\text{No. of students who obtained less than 20\%}}{\text{Total no. of students}} \\ &= \frac{7}{90} \end{aligned}$$

(ii) P (a student obtained 60 marks or above)

$$= \frac{\text{No. of students who obtained 60 marks or more}}{\text{Total number of students}} = \frac{15 + 8}{90} = \frac{23}{90}$$

**Q.7.** 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 it.

**Sol.** (i) P (a student likes statistics) =  $\frac{\text{No. of students who like statistics}}{\text{Total no. of students}} = \frac{135}{200} = \frac{27}{40}$



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$$\begin{aligned} \text{(ii) P (a student does not like statistics)} &= \frac{\text{No. of students who do not like statistics}}{\text{Total no. of students}} \\ &= \frac{65}{200} = \frac{13}{40} \end{aligned}$$

**Q.8.** The distance (in km) of 40 engineers from their residence to their place of work were found as follows :

|    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|
| 5  | 3  | 10 | 2  | 25 | 11 | 13 | 7  | 12 | 31 |
| 19 | 10 | 12 | 17 | 18 | 11 | 32 | 17 | 16 | 2  |
| 7  | 9  | 7  | 8  | 3  | 5  | 12 | 15 | 18 | 3  |
| 12 | 14 | 2  | 9  | 6  | 15 | 15 | 7  | 6  | 12 |

What is the empirical probability that an engineer lives :

- (i) less than 7 km from her place of work?
- (ii) more than or equal to 7 km from her place of work?
- (iii) within  $\frac{1}{2}$  km from her place of work?

**Sol.** Total no. of engineers = 40

Let us arrange the data in ascending order as follows :

2, 2, 3, 3, 3, 5, 5, 6, 6, 7, 7, 7, 7, 8, 9, 9, 10, 10, 11, 11, 12, 12, 12, 12, 12, 13, 14, 15, 15, 15, 16, 17, 17, 18, 18, 19, 20, 25, 31, 32.

(i) P (an engineer lives less than 7 km from her place of work)

$$= \frac{\text{No. of engineers who live less than 7 km from their place of work}}{\text{Total no. of engineers}} = \frac{9}{40}$$

(ii) P (an engineer lives more than or equal to 7 km from her work place)

$$= \frac{\text{No. of engineers who live more than or equal to 7 km from their work place}}{\text{Total no. of engineers}} = \frac{31}{40}$$

(iii) P (an engineer lives within  $\frac{1}{2}$  km from her place of work)

$$= \frac{\text{No. of engineers who live within } \frac{1}{2} \text{ km from their place of work}}{\text{Total no. of engineers}} = \frac{0}{40} = 0$$

**Questions 9 and 10 are activities, so students should perform these activities on their own.**

**Q.11.** Eleven bags of wheat flour, each marked 5 kg, actually contained the following weights of flour (in kg) :

4.97 5.05 5.08 5.03 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.

**Sol.** Total no. of bags examined = 11

$$\text{P (a bag weighing more than 5 kg)} = \frac{\text{No. of bags which weigh more than 5 kg}}{\text{Total no. of bags}} = \frac{7}{11}$$

**Q.12.** A study was conducted to find out the concentration of sulphur dioxide in the air parts per million (ppm) of a certain city. The data obtained for 30 days is as follows :

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|      |      |      |      |      |      |
|------|------|------|------|------|------|
| 0.03 | 0.08 | 0.08 | 0.09 | 0.04 | 0.17 |
| 0.16 | 0.05 | 0.02 | 0.06 | 0.18 | 0.20 |
| 0.11 | 0.08 | 0.12 | 0.13 | 0.22 | 0.07 |
| 0.08 | 0.01 | 0.10 | 0.06 | 0.09 | 0.18 |
| 0.11 | 0.07 | 0.05 | 0.07 | 0.01 | 0.04 |

Using this table, find the probability of the concentration of sulphur dioxide in the interval 0.12 – 0.16 on any of these days.

**Sol.** Total no. of days = 30

P(concentration of sulphur dioxide in the interval 0.12 – 0.16 in a day)

$$= \frac{\text{No. of days on which the concentration was in the interval 0.12 – 0.16}}{\text{Total no. of days}} = \frac{2}{30} = \frac{1}{15}$$

**Q.13.** The blood groups of 30 students of Class VIII are recorded as follows :

A, B, O, O, AB, O, A, O, B, A, O, B, A, O, O, A, AB, O, A, A, O, O, AB, B, A, O, B, A, B, O

Use this table to determine the probability that a student of this class, selected at random, has blood group AB.

**Sol.** Total no. of students = 30

$$\begin{aligned} \text{P (a student has blood group AB)} &= \frac{\text{No. of students which have the blood group AB}}{\text{Total no. of students}} \\ &= \frac{3}{30} = \frac{1}{10} \end{aligned}$$