

**Exercise – 25.1**

1. A coin is tossed 1000 times with the following frequencies:

Head: 455, Tail: 545

Compute the probability for each event.

**Sol:**

It is given that the coin is tossed 1000 times. The total number of trials is 1000.

Let us denote the event of getting head and of getting tail by E and F respectively. Then number of trails in which the E happens = 455

$$\text{So, probabilites of } E = \frac{\text{Number of Event head}}{\text{Total no.of trails}}$$

$$\text{i.e., } p(E) = \frac{455}{1000} = 0.455$$

Similarly, the probability of the event getting a

$$\text{Tail} = \frac{\text{Number of Tails}}{\text{Total number of Trials}}$$

$$\text{i.e., } p(E) = \frac{545}{1000} = 0.545$$

Note: we note that  $P(A) + P(B) = 0.48 + 0.52$

Therefore, A and B are the only two opposite outcomes.

2. Two coins are tossed simultaneously 500 times with the following frequencies of different outcomes:

Two heads : 95 times

One tail : 290 times

No head : 115 times

Find the probability of occurrence of each of these events.

**Sol:**

$$\text{WKT, } \text{probabilty}(E) = \frac{\text{Number of trails which the event happens}}{\text{Total number of Trials}}$$

$$P(\text{getting two heads}) = \frac{95}{500} = 0.19$$

$$P(\text{getting one tail}) = \frac{290}{500} = 0.58$$

$$P(\text{getting no head}) = \frac{115}{500} = 0.23$$

3. Three coins are tossed simultaneously 100 times with the following frequencies of different outcomes:

Outcome:	No head	One head	Two heads	Three heads
Frequency:	14	38	36	12

If the three coins are simultaneously tossed again, compute the probability of:

- (i) 2 heads coming up. (ii) 3 heads coming up.  
 (iii) at least one head coming up. (iv) getting more heads than tails.  
 (v) getting more tails than heads.

**Sol:**

Out come	No head	One head	Two heads	Three heads
Frequency	14	38	36	12

$$(i) \text{ Probability of 2 heads coming up} = \frac{\text{Favorable outcome}}{\text{Total outcome}}$$

$$= \frac{36}{100} = 0.36$$

$$(ii) \text{ Probability of 3 heads coming up} = \frac{\text{Favorable outcome}}{\text{Total outcome}}$$

$$= \frac{12}{100}$$

$$= 0.12$$

$$(iii) \text{ Probability of at least one head coming up} = \frac{\text{Favorable outcome}}{\text{Total outcome}}$$

$$= \frac{38+36+12}{100}$$

$$= \frac{86}{100} = 0.86$$

$$(iv) \text{ Probability of getting more than heads and tails} = \frac{\text{Favorable outcome}}{\text{Total outcome}}$$

$$= \frac{36+12}{100} = \frac{48}{100} = 0.48$$

$$(v) \text{ Probability of getting more tails than heads}$$

$$= \frac{14+38}{100} = \frac{52}{100} = 0.52.$$

4. 1500 families with 2 children were selected randomly and the following data were recorded:

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

If a family is chosen at random, compute the probability that it has:

- (i) No girl (ii) 1 girl (iii) 2 girls

- (iv) at most one girl      (v) more girls than boys

**Sol:**

It is given that

Total number of families =  $475 + 814 + 211 = 1500$ .

- (i) No. of families having no girl = 211

$$\text{Required probability} = \frac{\text{No. of families having no girl}}{\text{Total number of families}}$$

$$= \frac{211}{1500} = 0.1406$$

- (ii) Number of families having 1 girl = 814

$$\text{Required probability} = \frac{\text{No. of families having one girl}}{\text{Total number of families}}$$

$$= \frac{814}{1500} = \frac{407}{750} = 0.5426$$

- (iii) Number of families having 2 girl = 475

$$\text{Required probability} = \frac{\text{No. of families having 2 girl}}{\text{Total number of families}}$$

$$= \frac{475}{1500} = 0.3166.$$

- (iv) Number of families having at the most one girl =  $211 + 814 = 1025$ .

$$\text{Required probability} = \frac{\text{Number of families having atmost one girl}}{\text{Total number of families}}$$

$$= \frac{1025}{1500} = 0.6833$$

- (v) Probability of families having more girls than boys

$$= \frac{\text{Number of families having more girls than Boys}}{\text{Total number of families}}$$

$$= \frac{475}{1500} = 0.31$$

5. In a cricket match, a batsman hits a boundary 6 times out of 30 balls he plays.

Find the probability that on a ball played:

- (i) he hits boundary      (ii) he does not hit a boundary.

**Sol:**

Number of times batsman hits a boundary = 6

Total number of balls played = 30.

$\therefore$  Number of times that batsman does not hit a boundary =  $30 - 6 = 24$ .

$$(i) \quad \text{Probability (he hits a boundary)} = \frac{\text{No. of times he hits boundary}}{\text{Total No. of balls played}}$$

$$= \frac{6}{30} = \frac{1}{5}$$

$$(ii) \quad P(\text{he does not hits a boundary}) = \frac{\text{No. of times he hits boundary}}{\text{Total No. of balls played}}$$

$$= \frac{24}{30} = \frac{4}{5}$$

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

Unit test:	I	II	III	IV	V
Percentage of marks obtained:	69	71	73	68	76

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

**Sol:**

- (i) Let E be the event of getting more than 70% marks

The number of times E happens is 3

$$\therefore P(A) = \frac{3}{5} = 0.6$$

- (ii) Let F be the event of getting less than 70% marks

The number of times B happens is 2

$$\therefore P(B) = \frac{2}{5} = 0.4$$

- (iii) Let G be the event of getting a distinction

The number of G happens is 1.

$$\therefore P(C) = \frac{1}{5} = 0.2.$$

7. To know the opinion of the students about Mathematics, a survey of 200 students was conducted. The data is recorded in the following table:

Opinion:	Like	Dislike
Number of students:	135	65

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

**Sol:**

Opinion	Like	Dislike
No. of students	135	65

- (i) Probability that a student likes mathematics

$$= \frac{\text{Favorable outcome}}{\text{Total outcome}} = \frac{135}{200}$$

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

- (ii) Probability that a student does not like mathematics

$$= \frac{\text{Favorable outcome}}{\text{Total outcome}} = \frac{65}{200} = 0.325$$

8. The blood groups of 30 students of class IX 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,

A student is selected at random from the class from blood donation. Find the probability that the blood group of the student chosen is:

- (i) A      (ii) B      (iii) AB      (iv) O

**Sol:**

Blood group	A	B	O	AB	Total
No. of students	9	6	12	3	30

- (i) Probability of a student of blood group A =  $\frac{\text{Favorable outcome}}{\text{Total outcome}}$

$$= \frac{9}{30} = 0.3$$

- (ii) Probability of a student of blood group B =  $\frac{\text{Favorable outcome}}{\text{Total outcome}}$

$$= \frac{6}{30} = 0.2.$$

- (iii) The probability of a student of blood group

$$AB = \frac{\text{Favorable outcome}}{\text{Total outcome}} = \frac{3}{30}$$

$$= 0.1$$

- (iv) The probability of a student of blood group

$$O = \frac{\text{Favorable outcome}}{\text{Total outcome}} = \frac{12}{30} = 0.4.$$

9. 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:**

It is given that

Eleven bags of wheat flour, each marked 5kg, actually contained the following weights

4.97, 5.05, 5.08, 5.03, 5.00, 5.06, 5.08, 4.98, 5.04, 5.07, 5.00

Probability (Bag having more than 5kg of flour)

$$= \frac{\text{No. of bags having more than 5kg}}{\text{Total no. of bags}}$$

$$= \frac{7}{11}.$$

10. Following table shows the birth month of 40 students of class IX.

Jan	Feb	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec
3	4	2	2	5	1	2	5	3	4	4	4

Find the probability that a student was born in August.

**Sol:**

The birth month of 40 students of class IX

Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
3	4	2	2	5	1	2	6	3	4	4	4

$$\text{Probability (Students was born in August)} = \frac{\text{Favorable outcome}}{\text{Total outcome}}$$

$$= \frac{6}{40} = \frac{3}{20}.$$

11. Given below is the frequency distribution table regarding the concentration of sulphur dioxide in the air in parts per million of a certain city for 30 days.

Conc. of $SO_2$	0.00-0.04	0.04-0.08	0.08-0.12	0.12-0.16	0.16-0.20	0.20-0.24
No. of days	4	8	9	2	4	3

Find the probability of concentration of sulphur dioxide in the interval 0.12-0.16 on any of these days.

**Sol:**

Given that

The frequency distribution table regarding the concentration of sulphurdioxide in the air in parts per million of a certain city for 30 days is as follows

Conc of $SO_2$	0.00–0.04	0.04–0.08	0.08–0.12	0.12–0.16	0.16–0.20	0.20–0.24
No. of days	4	8	9	2	4	2

Total number of days = 30.

Probability of concentration of  $SO_2$  in the internal 0.12–0.16 is

$$= \frac{\text{Favourable outcome}}{\text{Total outcome}} = \frac{2}{30} = 0.06.$$

12. Companies selected 2400 families at random and survey them to determine a relationship between income level and the number of vehicles in a home. The information gathered is listed in the table below:

Monthly income (in Rs)	Vehicles per family			
	0	1	2	Above2
Less than 7000	10	160	25	0
7000-10000	0	305	27	2
10000-13000	1	535	29	1
13000-16000	2	469	29	25
16000 or more	1	579	82	88

If a family is chosen, find the probability that the family is:

- earning Rs 10000- 13000 per month and owning exactly 2 vehicles.
- earning Rs 16000 or more per month and owning exactly 1 vehicle.
- earning less than Rs 7000 per month and does not own any vehicle.
- earning Rs 13000-16000 per month and owning more than 2 vehicle.
- owning not more than 1 vehicle
- owning at least one vehicle.

**Sol:**

- The probability that the family is earning Rs 10000-13000 per month and owning exactly 2 vehicles

$$= \frac{\text{Favorable outcomes}}{\text{Total outcome}} = \frac{29}{2400}$$

- The probability that the family is earning Rs 16000 or more per month and owning exactly one vehicle =  $\frac{\text{Favorable outcomes}}{\text{Total outcome}} = \frac{579}{2400}$

- The probability that the family is earning less than Rs 7,000 per month and does not own any vehicle =  $\frac{\text{Favorable outcomes}}{\text{Total outcome}}$

$$= \frac{10}{2400} = \frac{1}{240}$$

- The probability that the family is earning Rs 13,000 – 16,000 per month and owning more than 2 vehicle =  $\frac{\text{Favorable outcomes}}{\text{Total outcome}} = \frac{25}{2400} = \frac{1}{96}$

- The probability that the family is owning not more than 1 vehicle

$$= \frac{\text{Favorable outcomes}}{\text{Total outcome}} = \frac{10 + 0 + 1 + 2 + 1 + 160 + 305 + 535 + 469 + 579}{2400}$$

$$= \frac{2062}{2400} = \frac{1031}{1200}$$

- (vi) The probability that the family is owning at-least one vehicle

$$\begin{aligned}
 &= \frac{\text{Favorable outcomes}}{\text{Total outcome}} \\
 &= \frac{160 + 305 + 535 + 469 + 579 + 25 + 27 + 29 + 29 + 82 + 0 + 2 + 1 + 25 + 88}{2400} \\
 &= \frac{2356}{2400} = \frac{589}{600}
 \end{aligned}$$

13. The following table gives the life time of 400 neon lamps:

Life time (in hours)	300-400	400-500	500-600	600-700	700-800	800-900	900-1000
No. of lamps	14	56	60	86	74	62	48

A bulb is selected at random. Find the probability that the life time of the selected bulb is:

- (i) less than 400  
 (ii) between 300 to 800 hours  
 (iii) at least 700 hours.

**Sol:**

Life time	300-400	400-500	500-600	600-700	700-800	800-900	900-1000
(in hours)	14	56	60	86	74	62	48

- (i) The probability that the life time of the selected bulb is less than 400

$$\begin{aligned}
 &= \frac{\text{Favorable outcomes}}{\text{Total outcome}} \\
 &= \frac{14}{400} = \frac{7}{200}
 \end{aligned}$$

- (ii) The probability that the life time of the selected bulb is between 300 – 800 hours

$$\begin{aligned}
 &= \frac{\text{Favorable outcomes}}{\text{Total outcome}} \\
 &= \frac{14 + 56 + 60 + 86 + 74}{400} \\
 &= \frac{290}{400} = \frac{29}{40}
 \end{aligned}$$

- (iii) The probability that the life time of the selected bulb is at least 700 hours

$$\begin{aligned}
 &= \frac{\text{Favorable outcomes}}{\text{Total outcome}} = \frac{74 + 62 + 48}{400} = \frac{184}{400} = \frac{23}{50}
 \end{aligned}$$



14. Given below is the frequency distribution of wages (in Rs) of 30 workers in a certain factory:

Wages (in Rs)	110-130	130-150	150-170	170-190	190-210	210-230	230-250
No. of workers	3	4	5	6	5	4	3

A worker is selected at random. Find the probability that his wages are:

- (i) less than Rs 150
- (ii) at least Rs 210
- (iii) more than or equal to 150 but less than Rs 210.

**Sol:**

Wages (in Rs)	110-130	130-150	150-170	170-190	190-210	210-230	230-250
No. of workers	3	4	5	6	5	4	3

Total no. of workers = 30.

(i) The probability that his wages are less than Rs 150 =  $\frac{\text{Favorable outcomes}}{\text{Total outcome}}$

$$= \frac{3+4}{30} = \frac{7}{30}$$

(ii) The probability that his wages are at least Rs 210 =  $\frac{\text{Favorable outcomes}}{\text{Total outcome}}$

$$= \frac{4+3}{30} = \frac{7}{30}.$$

The probability that his wages are more than or equal to 150 but less than Rs 200

$$= \frac{\text{Favorable outcomes}}{\text{Total outcome}} = \frac{5+6+5}{30} = \frac{16}{30} = \frac{8}{15}$$