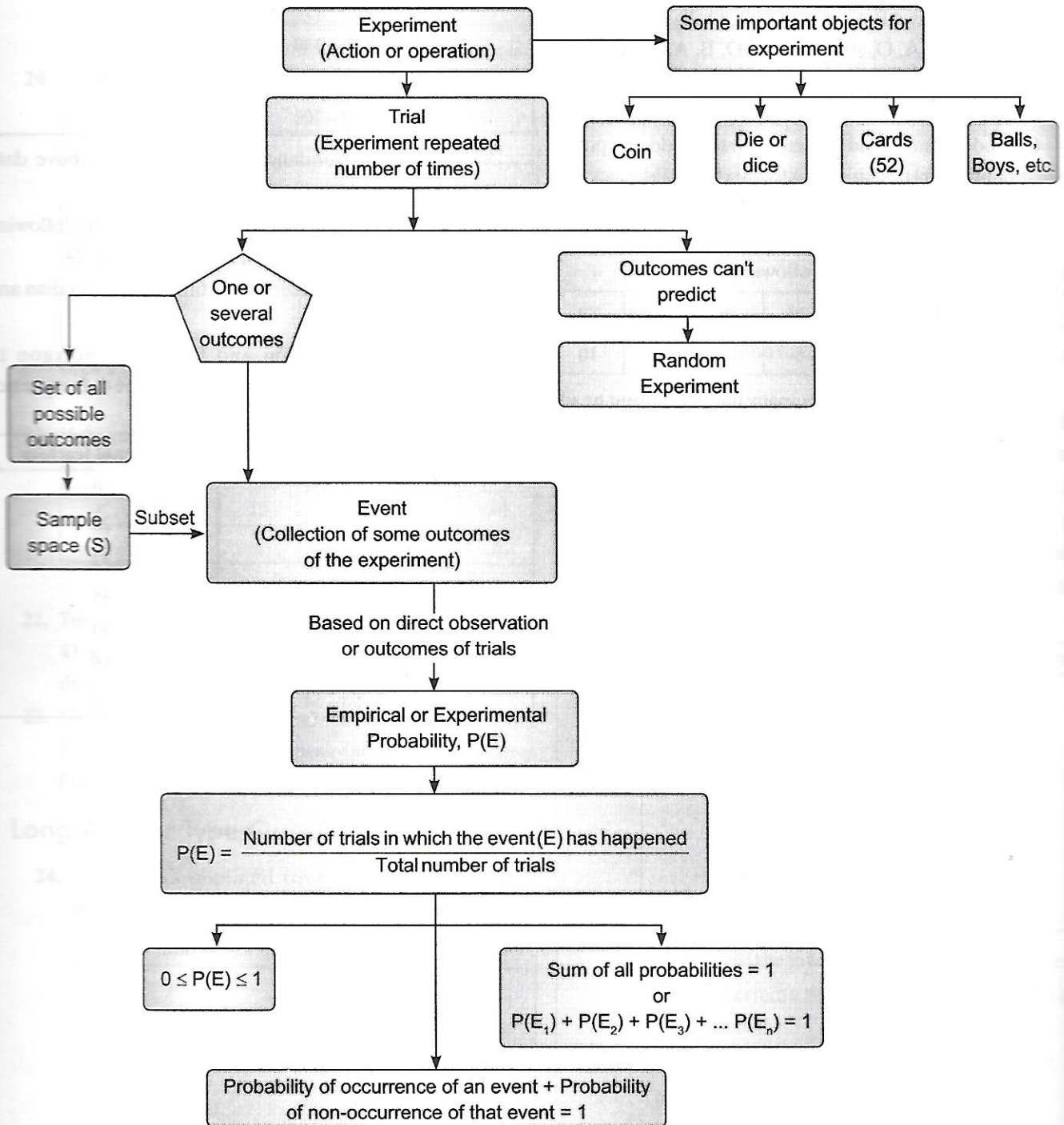


Probability—an Experimental Approach



● **Number of Experiments:**

(i) When a coin is tossed,

$$P(\text{getting a head}), \quad P(H) = \frac{\text{Number of heads}}{\text{Total number of trials}}$$

$$\text{and } P(\text{getting a tail}), \quad P(T) = \frac{\text{Number of tails}}{\text{Total number of trials}}$$

$$\text{Also,} \quad P(H) + P(T) = 1$$

(ii) When a die is tossed,

$$P(E) = \frac{\text{Number of outcomes having a particular number of die}}{\text{Total number of times the die is rolled (thrown)}}$$

$$\text{and } P(E_1) + P(E_2) + P(E_3) + P(E_4) + P(E_5) + P(E_6) = 1$$

Where

$$P(E_1) = \text{Probability of an event of getting outcome 1.}$$

$$P(E_2) = \text{Probability of an events of getting outcome 2 and so on.}$$

Note: • In the similar way, one can find the probability of other experiments.

- Probability of an event can be any fraction from 0 to 1.

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

- The empirical (or experimental) probability depends on the number of trials undertaken and the number of times the outcomes occurs in these trials.

➤ SOLVED QUESTIONS BASED ON EXERCISE 15.1

Very Short Answer Type Questions [1 Mark]

1. Write the formula for finding the empirical probability of an event.

Sol. The empirical (or experimental) probability $P(E)$ of an event E is given by

$$P(E) = \frac{\text{Number of trials in which the event (E) has happened}}{\text{Total number of trials}}$$

2. Find the probability of head coming up when a coin is tossed once.

Sol. Total outcomes = 2

Number of head coming up = 1

$$\therefore \text{Probability (head coming up)} = \frac{1}{2}$$

3. Write the sample space of a coin tossed three times.

Sol. $S(E) = \{HHH, TTT, HHT, HTH, THH, TTH, THT, HTT\}$

\therefore Total number of sample space = 8

4. A card is drawn at random from a well shuffled pack of 52 cards. Find the probability that the card drawn is a red card.

Sol. Total number of red cards in a well shuffled pack of 52 cards = 26

$$\therefore P(\text{drawing a red card}) = \frac{26}{52} = \frac{1}{2}$$

Short Answer Type Questions I [2 Marks]

5. There are 13 girls and 15 boys in a line. If one student is chosen at random, then find the probability that he is a boy. [CBSE 2014]

Sol. Total number of students = 13 + 15 = 28

Number of boys = 15

$$\therefore P(\text{a boy}) = \frac{15}{28}$$

6. 1000 families with 2 children were surveyed, and the following data were recorded:

Number of girls in a family	0	1	2
Number of families	111	614	275

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

(i) exactly 1 girl

(ii) exactly 2 girls [CBSE 2015]

Sol. Total number of families = 1000

(i) Number of families that have exactly 1 girl = 614

$$\therefore P(\text{a family that has exactly one girl}) = \frac{614}{1000} = 0.614$$

(ii) Number of families that have exactly 2 girls = 275

$$\therefore P(\text{family that has exactly 2 girls}) = \frac{275}{1000} = 0.275$$

7. On one page of a telephone directory, there were 200 telephone numbers. The frequency distribution of their unit place digit is given in the following table:

Digit	0	1	2	3	4	5	6	7	8	9
Frequency	22	26	22	22	20	10	14	28	16	20

What is the probability of a number chosen at random, that the digit in its unit place is 4?

Sol. P(digit 4 in the unit place of a telephone number)

$$\begin{aligned}
 &= \frac{\text{Frequency of 4}}{\text{Total number of selected telephone numbers}} \\
 &= \frac{20}{200} = \frac{1}{10} = 0.1
 \end{aligned}$$

8. If the probability of winning a game is 0.4, what is the probability of losing it? [CBSE 2015]

Sol. We know that $P(E) + P(\text{not } E) = 1$

i.e. $P(\text{winning a game}) + P(\text{losing a game}) = 1$

$$\begin{aligned}
 \Rightarrow P(\text{losing a game}) &= 1 - P(\text{winning a game}) \\
 &= 1 - 0.4 = 0.6
 \end{aligned}$$

Hence, probability of losing the game = 0.6

9. Two coins are tossed simultaneously 200 times and the following outcomes are recorded:

HH	HT/TH	TT
56	110	34

What is the empirical probability of occurrence of at least one head in the above case?

Sol. Total number of possible outcomes with at least one head = $56 + 110 = 166$

Total number of outcomes = 200

$$\therefore P(\text{getting at least one head}) = \frac{166}{200} = 0.83$$

Short Answer Type Questions II [3 Marks]

10. A bag contains 12 balls out of which x balls are white. If one ball is taken out from the bag, find the probability of getting a white ball. If 6 more white balls are added to the bag and the probability now for getting a white ball is double the previous one, find the value of x . [CBSE 2012; HOTS]

Sol. Total number of balls = 12

Number of white balls = x

$$\therefore P(\text{getting a white ball}) = \frac{x}{12} = P(E_1)$$

Now, 6 more white balls are added in that bag

$$\therefore \text{Total number of balls} = 12 + 6 = 18$$

$$\therefore P(\text{getting a white ball}) = \frac{6+x}{18} = P(E_2)$$

According to the given condition,

$$P(E_2) = 2P(E_1)$$

$$\frac{6+x}{18} = 2 \times \frac{x}{12} \Rightarrow \frac{6+x}{18} = \frac{x}{6}$$

$$\Rightarrow 6 + x = 3x$$

$$\Rightarrow 2x = 6$$

$$\Rightarrow x = 3$$

11. A die is rolled 300 times and following outcomes are recorded:

Outcomes	1	2	3	4	5	6
Frequency	42	60	55	53	60	30

Find the probability of getting a number (i) more than 4 (ii) less than 3

Sol. (i) Number of possible outcomes to get a number more than 4 = $60 + 30 = 90$

Total number of times die rolled = 300

$$\therefore P(\text{getting a number more than 4}) = \frac{90}{300} = \frac{3}{10} = 0.3$$

(ii) Number of possible outcomes to get a number less than 3 = $42 + 60 = 102$

$$\therefore P(\text{getting a number less than 3}) = \frac{102}{300} = \frac{17}{50} = 0.34$$

12. A purse contains a number of ₹ 1, ₹ 2 and ₹ 5 coins as given below:

₹ 1	₹ 2	₹ 5
10	14	14

If from the purse a coin is taken out at random, then find the probability that the coin

(i) is not a ₹ 1 coin

(ii) is a ₹ 3 coin

[CBSE 2013]

Sol. Total number of coins = 10 + 14 + 14 = 38

(i) Total number of ₹ 1 coin = 10

$$\therefore P(\text{₹ 1 coin}) = \frac{10}{38}$$

But
$$P(\text{not a ₹ 1 coin}) = 1 - P(\text{₹ 1 coin})$$

$$= 1 - \frac{10}{38} = \frac{28}{38} = \frac{14}{19}$$

(ii) Since there is no outcome favourable to choose ₹ 3 coin,

$$\therefore P(\text{a ₹ 3 coin}) = \frac{0}{38} = 0$$

13. A box has 4 red balls and 12 black balls. Find the probability that the selected ball is (i) a red ball

(ii) a black ball, chosen at random from the box. Also, prove that sum of these two probabilities is 1.

Sol. Total number of balls in the box = 4 + 12 = 16

(i) Number of red balls = 4

$$\therefore P(\text{a red ball}) = \frac{4}{16} = \frac{1}{4}$$

(ii) Number of black balls = 12

$$\therefore P(\text{a black ball}) = \frac{12}{16} = \frac{3}{4}$$

$$\text{Consider } P(\text{a red ball}) + P(\text{a black ball}) = \frac{1}{4} + \frac{3}{4} = \frac{4}{4} = 1$$

Hence proved

Long Answer Type Questions [4 Marks]

14. The daily cost of milk (in ₹) supplied to 25 houses in a locality are given below:

Cost (in ₹)	Number of houses
40 – 50	4
50 – 60	5
60 – 70	3
70 – 80	5
80 – 90	2
90 – 100	6

If one house is chosen at random, find the probability that

- (i) the milk bill of the house lies between ₹ 60 and ₹ 80.
- (ii) house is paying at most ₹ 69, for the milk bill.
- (iii) the milk bill of the house is below ₹ 50.

[CBSE 2013]

Sol. Total number of houses = 25

(i) Total number of houses paying the milk bill between ₹ 60 and ₹ 80
 $= 3 + 5 = 8$

$$\therefore P(\text{milk bill between ₹ 60 and ₹ 80}) = \frac{8}{25}$$

(ii) The number of houses paying at most ₹ 69 for milk = $4 + 5 + 3 = 12$

$$\therefore P(\text{milk bill at most ₹ 69}) = \frac{12}{25}$$

(iii) The number of houses paying the bill for milk below ₹ 50 = 4

$$\therefore P(\text{milk bill below ₹ 50}) = \frac{4}{25}$$

15. Two coins are tossed 729 times and the outcomes are recorded below:

Outcomes	Frequency
No tail	189
One tail	297
Two tails	243

Find the probability of each event. Also, find the probability that at least one tail will come.

[CBSE 2015]

Sol. Total number of outcomes = 729

The probability of each event is given by

$$\begin{aligned} P(\text{no tail}) &= \frac{\text{Frequency of no tail}}{\text{Total number of trials}} \\ &= \frac{189}{729} = \frac{7}{27} \end{aligned}$$

$$\begin{aligned} P(\text{one tail}) &= \frac{\text{Frequency of one tail}}{\text{Total number of trials}} \\ &= \frac{297}{729} = \frac{11}{27} \end{aligned}$$

$$\begin{aligned} P(\text{two tails}) &= \frac{\text{Frequency of two tails}}{\text{Total number of trials}} \\ &= \frac{243}{729} = \frac{1}{3} \end{aligned}$$

Number of possible outcomes for getting at least one tail = $297 + 243 = 540$

$$\therefore P(\text{getting at least one tail}) = \frac{540}{729} = \frac{20}{27}$$

16. A parent has collected data of number of schools based on the monthly fees, so that he can choose the school for admission of his child. The data is as follows:

Monthly fees of schools (in ₹)	250 – 500	500 – 750	750 – 1000	1000 – 1250	1250 – 1500	1500 – 1750	1750 – 2000
Number of schools	14	16	18	12	14	8	8

If a school is selected at random, find the probability that the school is having

- (i) minimum fee.
- (ii) maximum fee.
- (iii) fee less than ₹ 1000.
- (iv) fee ₹ 1000 or more but less than ₹ 1500.

[CBSE 2015, 2016]

Sol. Total number of schools = 14 + 16 + 18 + 12 + 14 + 8 + 8 = 90

(i) Number of schools having minimum fee (in the range ₹ 250 – ₹ 500) = 14

$$\therefore P(\text{school having minimum fee}) = \frac{14}{90} = \frac{7}{45}$$

(ii) Number of schools having maximum fee (in the range ₹ 1750 – ₹ 2000) = 8

$$\therefore P(\text{schools having maximum fee}) = \frac{8}{90} = \frac{4}{45}$$

(iii) Number of schools having fee less than ₹ 1000 = 14 + 16 + 18 = 48

$$\therefore P(\text{schools having fee less than ₹ 1000}) = \frac{48}{90} = \frac{24}{45} = \frac{8}{15}$$

(iv) Number of schools having fees ₹ 1000 or more but less than ₹ 1500 = 12 + 14 = 26

$$\therefore P(\text{school having fee ₹ 1000 or more but less than ₹ 1500}) = \frac{26}{90} = \frac{13}{45}$$

17. The given table shows the marks obtained by 50 students out of 100 in history examination.

Marks obtained	Number of students
0 – 25	9
25 – 50	8
50 – 75	23
75 – 100	10
Total	50

A student is chosen at random.

- (i) Find the probability that he has obtained 75 or more marks.
- (ii) If 50% are passing marks, find the probability of the students failing in history examination.
- (iii) Find the probability that the student has obtained less than 75 marks.

[CBSE 2016]

Sol. Total number of students = 50

(i) Number of students who has obtained 75 or more marks = 10

$$\therefore P(\text{a student has obtained 75 or more marks}) = \frac{10}{50} = \frac{1}{5}$$

(ii) Number of students who has obtained less than 50% marks = 9 + 8 = 17

$$\therefore P(\text{a student failing in history examination}) = \frac{17}{50}$$

(iii) Number of students who has obtained less than 75 marks = 9 + 8 + 23 = 40

$$\therefore P(\text{a student has obtained less than 75 marks}) = \frac{40}{50} = \frac{4}{5}$$

PRACTICE QUESTIONS BASED ON EXERCISE 15.1

1. A die is rolled 250 times and its outcomes are recorded as follows:

Outcomes	1	2	3	4	5	6
Frequency	40	45	35	38	52	40

Find the probability of getting:

- (i) an even number.
 (ii) a multiple of 3. [CBSE 2015]
2. 1500 families were surveyed and following data was recorded about their maids at homes:

Type of maids	Only part time	Only full time	Both part time and full time	None
Number of maids	860	370	250	20

A family is selected at random. Find the probability that the selected family has:

- (i) both type of maids.
 (ii) only part time maids. [CBSE 2015, 2016]
3. 750 families with 3 children were surveyed and following data were recorded:

Number of girls in a family	0	1	2	3
Number of families	120	220	310	100

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

- (i) no boy. (ii) no girl. [CBSE 2016]
4. In a medical examination of students of a class, the following blood groups were recorded:

Blood group	A	AB	B	O
Number of students	15	12	3	10

A student is selected at random from the class. Find the probability that the student has AB as his blood group. [CBSE 2016]

5. In an experiment, a coin is tossed 600 times. if the tail turns up 240 times, find the experimental probability of getting (i) a head. (ii) a tail.
6. A group of 50 students of class X are selected and asked for their choice of subjects to be taken in class XI, which is recorded as follows:

Stream	PCM	PCB	Commerce	Humanities	Total
Number of students	19	8	11	12	50

If a student is chosen at random, find the probability that he/she is:

- (i) a student of science stream.
 (ii) a student of humanities stream.
7. In a bag, there are 100 bulbs out of which 30 are defective ones. A bulb is taken out of the bag at random. Find the probability of the selected bulb to be a good one.
8. The runs scored by a batsman in 80 one-day matches are as follows:

Runs	20 – 29	30 – 39	40 – 49	50 – 59	60 – 69	70 – 79	80 – 89	90 – 99
Number of matches	1	1	8	13	20	22	12	3

What is the probability that in the next match, the batsman will score

- (i) at least 70 runs.
 (ii) at most 59 runs. [CBSE 2016]
9. Given below is the frequency distribution table of salary (in ₹) of 80 workers in a factory:

Salary (in ₹)	1000 – 2000	2000 – 3000	3000 – 4000	4000 – 5000	5000 – 6000
Number of workers	8	14	20	24	14

Find the probability that the salary of a worker selected at random is

- (i) less than ₹ 4000.
 (ii) more than or equal to ₹ 3000.
 (iii) more than or equal to ₹ 2000 but less than ₹ 5000. [CBSE 2013]
10. The following data shows the actual weights of 10 boxes of dry fruits distributed on the occasion of Diwali: 4.798 kg, 4.795 kg, 4.801 kg, 4.805 kg, 4.810 kg, 4.825 kg, 4.798 kg, 4.800 kg, 4.805 kg and 4.817 kg. A box is chosen at random. Find the probability that
- (i) its weight is more than 4 kg 800 g.
 (ii) its weight is 4.800 kg or less than it. [CBSE 2014]
11. A box contains 70 bolts and 130 nuts. On checking the box, it was found that half of the bolts and half of the nuts are rusted. if one of them is chosen at random, find the probability that it is rusted.

12. The probability of guessing the correct answer to a certain question is $\frac{x}{2}$. If the probability of not guessing the correct answer is $\frac{4}{5}$, then find the value of x . [HOTS]

13. The probability of winning a race of an athlete is $\frac{1}{5}$ less than the thrice the probability of losing the race. Find the probability of winning the race. [HOTS]

14. A die was rolled 200 times and the number of times, 5 turns up was noted. If the experimental probability calculated from this information is $\frac{3}{8}$, then how many times 5 turns up? Justify your answer.

15. The following table shows the marks obtained by a student in five different unit tests out of 50:

Unit test	I	II	III	IV	V
Marks (out of 50)	34	35	36	34	37

Find the probability that the student gets 70% marks or more in the next unit test. Also, find the probability that the student gets less than 70% marks. [CBSE 2014]

16. A die is thrown once. Find the probability of getting an odd number.
17. The marks obtained by 30 students in a competitive exam are given below:

Marks	Number of students
70	3
58	5
61	4
52	7
65	6
75	2
68	3

One student is chosen at random. Find the probability that

- (i) the student scores more than 65 marks.
 (ii) the marks scored by the student is an odd number.
18. In a kitchen, there are 54 utensils consisting of bowls, plates and glasses. The ratio of bowls, plates and glasses is 3 : 1 : 2. A utensil is picked at random. Find the probability that:

- (i) it is a plate.
 (ii) it is not a bowl. [CBSE 2014; HOTS]

Value Based Questions

1. The following data shows the number of passengers vehicle drivers involved in accidents for a particular city was obtained by selecting 2000 drivers at random.

Age group of drivers (in years)	Number of accidents in one year				
	0	1	2	3	more than 3
18 – 25	395	150	120	60	30
26 – 50	520	100	70	25	25
Above 50	390	50	40	10	15

Find the probability of the following events for a driver selected at random from the city:

- (i) being 18 – 25 years of age and having 2 accidents in one year.
 (ii) being 26 – 50 years of age and having two or more accidents in one year.
 (iii) having no accidents in one year.
 (iv) which value would you like to learn from the data given?
2. On the occasion of Independence day celebration, the students of a school were asked to grow 100 plants in five different places. The number of plants survived is as follows:

Number of places	A	B	C	D	E
Number of plants survived	62	75	58	81	42

- (i) What is the probability of
 (a) more than 60 plants survived in a place?
 (b) less than 60 plants survived in a place?
 (ii) Which mathematical concept is used in above situation?
 (iii) Which values are depicted from the given data that you would like to learn?
3. The following table gives the result of study conducted by the department of environment and energy, New Delhi to find out the concentration of air pollutant, sulphur dioxide in parts per million (ppm) of a city for some days:

Concentration of sulphur dioxide (in ppm)	0.00 – 0.05	0.05 – 0.10	0.10 – 0.15	0.15 – 0.20	0.20 – 0.25
Number of days	5	6	8	7	4

(i) Find the probability of the concentration of this air pollutant in the interval of 0.10 – 0.15 on any of these days.

(ii) What values are shown here by?

4. On the occasion of Gandhi Jayanti, a social welfare organisation distributed clothes and sweets to the

orphans. If 80 orphans received clothes out of 100, then

(i) Find the probability of getting

(a) clothes (b) not getting clothes by a orphan, if selected at random

(ii) What value is depicted by this activity?

INTEGRATED EXERCISE

Very Short Answer Type Questions [1 Mark]

1. What is the range in which probability of an event lie?
2. In an experimental probability, can the probability of an event be greater than 1? Justify your answer.
3. What does the probability represents?
4. In an experiment, what is the sum of probabilities of different events for all possible outcomes?
5. Can the experiment probability of an event be a negative number? If not, why? [NCERT Exemplar]
6. A bag contains x white, y red and z blue balls. A ball is drawn at the random. Find the probability of drawing a blue ball from the bag. [CBSE 2012]
7. In a single throw of two dices, what is the probability of getting a sum of 9?

Short Answer Type Questions I [2 Marks]

8. Three coins are tossed simultaneously 60 times with the following frequencies as shown in table:

Number of heads	0	1	2	3
Frequency	27	18	5	10

Find the sum of the probabilities of getting 2 heads and no head respectively.

9. A coin is tossed 50 times and the head appears 22 times. If we toss the coin randomly, what is the probability of getting neither a head nor a tail? [HOTS]
10. 80 bulbs are selected at random from a lot and their life time (in hours) recorded in the form of frequency table is given below:

Lifetime (in hours)	300	500	700	900	1000
Frequency	10	12	23	25	10

Find the probability that bulb selected randomly from the lot has lifetime less than 900 hours.

[NCERT Exemplar]

11. What is the probability, that a leap year selected at random will contain 53 Sundays? [HOTS]
12. A card is drawn from a well shuffled pack of 52 cards. What is the probability that the card is not a diamond?
13. The probability of guessing the correct answer to a certain question is $\frac{x}{2}$. If the probability of not guessing the correct answer is $\frac{3x}{2}$, then find the value of x . [HOTS]

Short Answer Type Questions II [3 Marks]

14. Fifty seeds were selected at random from each of 5 bags of seeds, and were kept under standardised conditions favourable to germination. After 20 days, the number of seeds which had germinated in each collection were counted and recorded as follows:

Bag	1	2	3	4	5
Number of seeds germinated	40	48	42	39	41

What is the probability of germination of

- (i) more than 40 seeds in a bag?
 - (ii) 49 seeds in a bag?
 - (iii) more that 35 seeds in a bag?
15. A shopping centre car parking has space for 15 buses, 350 cars and 35 motorbikes. All vehicles have an equal chance of leaving at any time. Find the probability that the next vehicle to leave will be
 - (i) a bus or a car.
 - (ii) a motorbike.
 - (iii) not a car.
 16. A card is drawn at random from a well shuffled pack of 52 cards. Find the probability in percentage of drawing (i) a club. (ii) a king or an ace. (iii) not a spade.
 17. 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) 3? (ii) more than 10?
 (iii) less than or equal to 5?
 (iv) between 8 and 12?

18. A recent survey found that the ages of workers in a factory is distributed as follows:

Age (in years)	Number of workers
20 – 29	38
30 – 39	27
40 – 49	86
50 – 59	46
60 and above	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) having age from 30 to 39 years.
 (iv) under 60 but over 39 years.
19. 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	Days
0	50
1	32
2	22
3	18
4	12
5	12
6	10
7	10
8	10
9	8
10	6
11	6
12	2
13	2

Determine the probability that tomorrow output will have

- (i) no defective parts.
 (ii) at least one defective part.
 (iii) not more than 5 defective parts.
 (iv) more than 13 defective parts. [NCERT Exemplar]
20. The king, queen and jack of clubs are removed from a deck of 52 cards and then well shuffled. One card is selected from the remaining card. Find the probability of getting:
- (i) a heart (ii) a king (iii) the 10 of hearts.
21. A die is thrown 400 times with the frequencies for the outcomes 1, 2, 3, 4, 5 and 6 as given in table.

Outcome	1	2	3	4	5	6
Frequency	72	65	70	71	63	59

Find the probability of

- (i) getting a number less than 3.
 (ii) getting an outcome 6.
 (iii) getting a number more than 4.

Long Answer Type Questions [4 Marks]

22. The following table shows the number of persons visiting the good-living pavilion in a trade fair during different times of the day:

Time	Number of persons
9 a.m. – 11 a.m.	175
11 a.m. – 1 p.m.	125
1 p.m. – 3 p.m.	225
3 p.m. – 5 p.m.	200
5 p.m. – 7 p.m.	120

Find the probability that the randomly chosen person visited the pavilion

- (i) after 1 p.m. but before 5 p.m.
 (ii) between 9 a.m. to 1 p.m.
 (iii) after 5 p.m.
 (iv) between 3 p.m. and 5 p.m. [CBSE 2014]
23. A travel company has 100 drivers for driving buses to various tourist destinations. Given below is a table showing the resting time of the drivers after covering a certain distance (in km):

Distance (in km)	After 75 km	After 115 km	After 150 km	After 200 km
Number of drivers	13	47	30	10

What is the probability that driver chosen at random:

- (i) takes a halt after covering 80 km.
- (ii) takes a halt after covering 115 km.
- (iii) takes a halt after covering 155 km.
- (iv) takes a halt after covering 200 km.

[CBSE 2016]

24. A school organised an adventure camp for students to Kanatal. The following table shows the participation of students in different types of adventure activities:

Types of activities	Type I	Type II	Type III	Type IV	All
Number of students	75	62	55	36	22

Where

Type I: trekking

Type II: trekking and mountain climbing

Type III: trekking, mountain climbing and rapling

Type IV: trekking, rapling and rafting

Find the probability that the student chosen at random participated in

- (i) Type III activity.
- (ii) all the activities.
- (iii) Type I activity.
- (iv) Type II and type IV activities.

[CBSE 2016]

25. In a school library, a student finds that in a book shelf, there are 20 English books, 30 literature books, 25 language books and 10 Mathematics books. Find the probability of each book chosen at random. Find the sum of all probabilities.

ASSESS YOURSELF

- What is the probability of a sure event?
- If $P(E) = 0.37$, then what is $P(\text{not } E)$?
- Two coins are tossed simultaneously. List all the possible outcomes.
- A coin is tossed 500 times with the following frequencies:
head : 235, tail = 265
A coin is tossed once again. Find the probability of getting a tail.
- The marks obtained by 80 students of a class in a test of maximum marks 100 are given below:

Marks	Number of students
0 – 15	6
15 – 30	13
30 – 45	17
45 – 60	24
60 – 75	16
75 and above	4

A student of class is selected at random. Find the probability that he get less than 45% marks.

- In a store, 13 bags of coal powder each contained the following weights of powder (in kg): 7.97, 7.05, 6.03, 7.00, 6.06, 6.08, 6.04, 6.00, 6.98, 7.15, 7.23, 6.94, 7.12 kg. Find the probability that any of these bags chosen at random contains more than 7.1 kg of coal powder.

[CBSE 2015]

- In a sample study of 420 persons, it was found that 240 persons were private sector employee. If a person is selected at random, find the probability that the person is a government employee.
- In a football match, a goalkeeper of a team can stop a goal 32 times out of 40 shots by another team. Find the probability that the team can make a goal.
- The record of a weather station shows that out of the past 150 consecutive days its weather forecasts were correct 90 times.
 - What is the probability that on a given day it was correct ?
 - What is the probability that it was not correct on a given day ?
- Two coins are tossed simultaneously for 540 times. The number of times '2 tails' appeared was three times 'no tail' appeared and number of times '1 tail' appeared is double the number of times 'no tail' appeared. Find the probability of getting two tails.
- A tyre manufacturing company kept a record of the distance covered before a tyre needed to be replaced. The table shows the results of 1000 cases.

Distance (in km)	less than 4000	4000 to 9000	9001 to 14000	more than 14000
Frequency	20	210	325	445

If you buy 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 between 4000 km and 14000 km?

12. Books are packed in piles each containing 20 books. Thirty five piles were examined for defective books and the result are given in the following table:

Number of defective books	0	1	2	3	4	5	6	Above 6
Frequency	400	180	48	41	18	8	3	2

One pile was selected at random, what is the probability that it has:

- (i) no defective book.
- (ii) more than 0 but less than 4 defective books.
- (iii) more than 4 defective books.

13. A die is thrown 400 times, the frequency of outcomes 1, 2, 3, 4, 5 and 6 are noted in frequency distribution table given below:

Outcomes	1	2	3	4	5	6
Frequency	75	60	65	70	68	62

Find the probability of occurrence of

- (i) an odd number.
- (ii) a prime number.

14. The weekly pocket expenses of students are given in the table:

Pocket expenses (in ₹)	145	140	159	171	158	147	165
Number of students	7	4	10	6	3	8	12

Find the probability of pocket money expenses of a student

- (i) is ₹ 159.
- (ii) more than ₹ 159.
- (iii) less than ₹ 159.

15. A survey of 2000 persons of different age groups was conducted to find out their preference in watching different types of movies:

Type I: Family

Type II: Comedy and family

Type III: Romantic, Comedy and family

Type IV: Action, Romantic, Comedy and family

Age group of drivers (in years)	Type I	Type II	Type III	Type IV	All
18 – 29	440	160	110	61	35
30 – 50	505	125	60	22	18
Above 50	360	45	35	15	9

Find the probability that a person chosen at random is

- (i) in 18–29 years of age and likes Type II movies.
- (ii) above 50 years of age and likes all types of movies.
- (iii) in 30–50 years and likes Type I movies.