RD SHARMA Solutions for Class 9 Maths Chapter 25 - Probability

Chapter 25 - Probability Exercise 25.16

Question 1

The probability of an impossible event is
(a) 1
(b) 0
(c) less than 0
(d) greater than 1

Solution 1

The probability of an impossible event is always zero since the chances of occurring of that event is zero.
Hence, correct option is (b).

Question 2

The probability of a certain event is
(a) 0
(b) 1
(c) greater than 1
(d) less than 0

Solution 2

The chances of occuring of an certain event is always 100%.

$$\text{Probability} = \frac{\text{No. of Favorable cases}}{\text{Total No. of cases}}$$

Thus, for a certain event,
number of favorable cases = Total number of cases
$\Rightarrow$ Probability = 1
Hence, correct option is (b).

Question 3

The probability an event of a trial is
(a) 1
(b) 0
(c) less than 1
(d) more than 1

Solution 3

$$\text{Probability of an event} = \frac{\text{No. of favorable cases}}{\text{Total No. of cases}}$$

Since number of favourable cases can not be greater than total number of cases,
probability < 1
Hence, correct option is (c).

Question 4

Which of the following cannot be probability of an event?

(a) $\frac{1}{3}$

(b) $\frac{3}{5}$

(c) $\frac{5}{3}$

(d) 1

Solution 4

The probability of an event always lies between 0 and 1.

Since $\frac{5}{3} > 1$, it cannot be the probability of an event.

Hence, correct option is (c).

Question 5

Two coins are tossed simultaneously. The probability of getting atmost one head is

(a) $\frac{1}{4}$

(b) $\frac{3}{4}$

(c) $\frac{1}{2}$

(d) $\frac{1}{4}$

Solution 5

If two coins are tossed simultaneously, then possible cases are HH, TH, HT, TT

Total number of cases = 4

Number of favorable cases (atmost one head) = (HT, TH, TT) = 3

Now, probability of getting atmost one Head $= \frac{3}{4}$

Hence, correct option is (b).

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Question 6

A coin is tossed 1000 times, if the probability of getting a tail is 3/8, how many times head is obtained?

(a) 525

(b) 375

(c) 625

(d) 725

Solution 6

Probability of getting a tail $= \frac{3}{8}$

$\Rightarrow$ Probability of getting a head $= 1 - \frac{3}{8} = \frac{5}{8}$

Also, probability of getting a head $= \frac{\text{No. of Heads obtained}}{\text{Total no. of trials}}$

$\Rightarrow \frac{5}{8} = \frac{\text{No. of Heads obtained}}{1000}$

$\Rightarrow$ No. of Heads obtained $= \frac{5}{8} \times 1000 = 625$

Hence, correct option is (c).

Question 7

A dice is rolled 600 times and the occurrence of the outcomes 1, 2, 3, 4, 5 and 6 are given below:

Outcome	1	2	3	4	5	6
frequency	200	30	120	100	50	100

The probability of getting a prime number is

(a) $\frac{1}{3}$

(b) $\frac{2}{3}$

(c) $\frac{49}{60}$

(d) $\frac{39}{125}$

Solution 7

Prime numbers in 1, 2, 3, 4, 5, 6 are : 2, 3, 5

Number of times 2, 3, 5 occur = 30 + 120 + 50 = 200

Total number of cases = 200 + 30 + 120 + 100 + 50 + 100 = 600

Required Probability $= \frac{\text{Cases when we obtained (2, 3, 5)}}{\text{Total No. of cases}} = \frac{200}{600} = \frac{1}{3}$

Hence, correct option is (a).

Question 8

The percentage of attendance of different classes in a year in a school is given below:

Class:	X	IX	VIII	VII	VI	V
Attendance:	30	62	85	92	76	55

What is the probability that the class attendance is more than 75%?

(a) $\frac{1}{6}$

(b) $\frac{1}{3}$

(c) $\frac{5}{6}$

(d) $\frac{1}{2}$

Solution 8

Total number of classes = 6

Number of classes having attendance > 75% = VIII, VII, VI = 3

$\Rightarrow$ Required Probability $= \frac{3}{6} = \frac{1}{2}$

Hence, correct option is (d).

Question 9

A bag contains 50 coins and each coin is marked from 51 to 100. One coin is picked at random. The probability that the number on the coin is not a prime number, is

(a) $\frac{1}{5}$

(b) $\frac{3}{5}$

(c) $\frac{2}{5}$

(d) $\frac{4}{5}$

Solution 9

Prime numbers from 51 to 100:

53, 59, 61, 67, 71, 73, 79, 83, 89, 97

$\Rightarrow$ Number of prime numbers = 10

$\Rightarrow$ Number of non – prime numbers = 50 − 10 = 40

Total numbers = 50

Thus, probability of getting non – prime number $= \frac{40}{50} = \frac{4}{5}$

Hence, correct option is (d).

Question 10

In a football match, Ronaldo makes 4 goals from 10 penalty kicks. The probability of converting a penalty kick into a goal by Ronaldo, is

(a) $\frac{1}{4}$

(b) $\frac{1}{6}$

(c) $\frac{1}{3}$

(d) $\frac{2}{5}$

Solution 10

Probability that Ronaldo makes a goal $= \frac{\text{Number of gools made in all kicks}}{\text{Total number of Kics}} = \frac{4}{10} = \frac{2}{5}$

Hence, correct optin is (d).

Chapter 25 - Probability Exercise Ex. 25.1

Question 1

A coin is tossed 1000 times with the following frequencies:

Head : 455, Tail : 545

Compute the probability for each event.

Solution 1

Since the coin is tossed 1000 times, the total number of trials is 1000. Let us call the events of getting a head and of getting a tail as E and F, respectively. Then, the number of times E happens, i.e., the number of times a head come up, is 455.

So, the probability of $E = \frac{\text{Number of heads}}{\text{Total number of trials}}$

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

Similarly, the probability of the event of getting a tail $= \frac{\text{Number of tails}}{\text{Total number of trials}}$

i.e., $P(F) = \frac{545}{1000} = 0.545$

Note that in the example above, P(E) + P(F) = 0.455 + 0.545 = 1 and E and F are the only two possible outcomes of each trial.

Question 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.

Solution 2

We know that:

$$\text{Probability of an event} = \frac{\text{Number of trials in which the event happens}}{\text{Total number of trials}}$$

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

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

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

Question 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.

Solution 3

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

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

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

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

$$= \frac{12}{100} = 0.12$$

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

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

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

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

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

$$= \frac{48}{100} = 0.48$$

(v) Probability of getting more tails than heads $= \frac{14 + 38}{100}$

$$= \frac{52}{100} = 0.52$$

Question 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	211	814	475

families:			

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

Solution 4

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

(i) Number of families having no girl = 211

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

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

(ii) Number of families having 1 girl = 814

$$\text{Required probability} = \frac{\text{Number of families having 1 girls}}{\text{Total number of families}}$$

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

(iii) Number of families having 2 girls = 475

$$\text{Required probability} = \frac{\text{Number of families having 2 girls}}{\text{Total number of families}}$$

$$= \frac{475}{1500} = \frac{19}{60} = 0.3166$$

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

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

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

(v) Number of families having more girls than boys = 475

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

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

Question 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.

Solution 5

Number of times batsman hits a boundary = 6

Total number of balls played = 30

∴ Number of times that the batsman does not hit a boundary = 30 − 6 = 24

(i) P(he hits a boundary)

$$= \frac{\text{Number of times when he hits boundary}}{\text{Total number of balls played}}$$

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

(ii) P(he does not hit a boundary)

$$= \frac{\text{Number of times when he does not hit boundary}}{\text{Total number of balls played}}$$

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

Question 6

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

Units 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.

Solution 6

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

The number of times A happens is 3

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

(ii) Let B 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 C be the event of getting a distinction

The number of times C happens is 1

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

Question 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
No. of students:	135	65

Find the probability that a student chosen at random

(i) likes mathematics

(ii) Does not like it.

Solution 7

Opinion:	Like	Dislike
No. of students:	135	65

(i) Probability that a student likes mathematics $= \frac{\text{Favourable outcome}}{\text{Total outcome}}$

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

(ii) Probability that a student does not like mathematics $= \frac{\text{Favourable outcome}}{\text{Total outcome}}$

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

Question 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 for blood donation. Find the probability that the blood group of the student chosen is:

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

Solution 8

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

(i) The probability of a student of blood group $A = \frac{\text{Favourable outcome}}{\text{Total outcome}}$

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

(ii) The probability of a student of blood group $B = \frac{\text{Favourable outcome}}{\text{Total outcome}}$

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

(iii) The probability of a student of blood group $AB = \frac{\text{Favourable outcome}}{\text{Total outcome}}$

$$= \frac{3}{30} = 0.1$$

(iv) The probability of a student of blood group $O = \frac{\text{Favourable outcome}}{\text{Total outcome}}$

$$= \frac{12}{30} = 0.4$$

Question 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.

Solution 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

$$\text{The probability of a bag having weight more than 5 kg of flour} = \frac{\text{Favourable outcome}}{\text{Total outcome}}$$

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

Question 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.

Solution 10

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	6	3	4	4	4

$$\text{The probability that a students was born in August} = \frac{\text{Favourable outcome}}{\text{Total outcome}}$$

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

Question 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.

Solution 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

Total no. of days = 30

The probability of concentration of SO_2 in the interval 0.12 – 0.16

$$= \frac{\text{Favourable outcome}}{\text{Total outcome}}$$

$$= \frac{2}{30} = 0.06$$

Question 12

A company 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	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	29	25
16000 or more	1	579	82	88

If a family is chosen, find the probability that the family 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 vehicle.

(v) Owning not more than 1 vehide.

(vi) Owning at least one vehide.

Solution 12

(i) The probability that the family is earning Rs 10000 – 13000 per month and owning exactly 2 vehicles.

$$= \frac{\text{Favourable outcome}}{\text{Total outcome}} = \frac{29}{2400}$$

(ii) The probability that the family is earning Rs 16000 or more per month and owning exactly one vehicle

$$= \frac{\text{Favourable outcome}}{\text{Total outcome}} = \frac{579}{2400}$$

(iii) The probability that the family is earning less than Rs 7000 per month and does not own any vehicles

$$= \frac{\text{Favourable outcome}}{\text{Total outcome}} = \frac{10}{2400} = \frac{1}{240}$$

(iv) The probability that the family is earning Rs 13000 – 16000 per month and owning more than 2 vehicle

$$= \frac{\text{Favourable outcome}}{\text{Total outcome}} = \frac{25}{2400} = \frac{1}{96}$$

(v) The probability that the family is owning not more than 1 vehide

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

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

$$= \frac{\text{Favourable outcome}}{\text{Total outcome}}$$

$$= \frac{160+305+535+469+579+25+27+29+29+82+0+2+1+25+88}{2400} = \frac{2356}{2400} = \frac{589}{600}$$

Question 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.

Solution 13

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

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

$$= \frac{\text{Favourable outcome}}{\text{Total outcome}} = \frac{14}{400} = \frac{7}{200}$$

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

$$= \frac{\text{Favourable outcome}}{\text{Total outcome}} = \frac{14+56+60+86+74}{400} = \frac{290}{400} = \frac{29}{40}$$

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

$$= \frac{\text{Favourable outcome}}{\text{Total outcome}} = \frac{74+62+48}{400} = \frac{184}{400} = \frac{23}{50}$$

Question 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.

Solution 14

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

$$= \frac{\text{Favourable outcome}}{\text{Total outcome}} = \frac{3+4}{30} = \frac{7}{30}$$

(ii) The probability that his wages are at least Rs 210

$$= \frac{\text{Favourable outcome}}{\text{Total outcome}} = \frac{4+3}{30} = \frac{7}{30}$$

(iii) The probability that his wages are more than or equal to 150 but less than Rs 210.

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