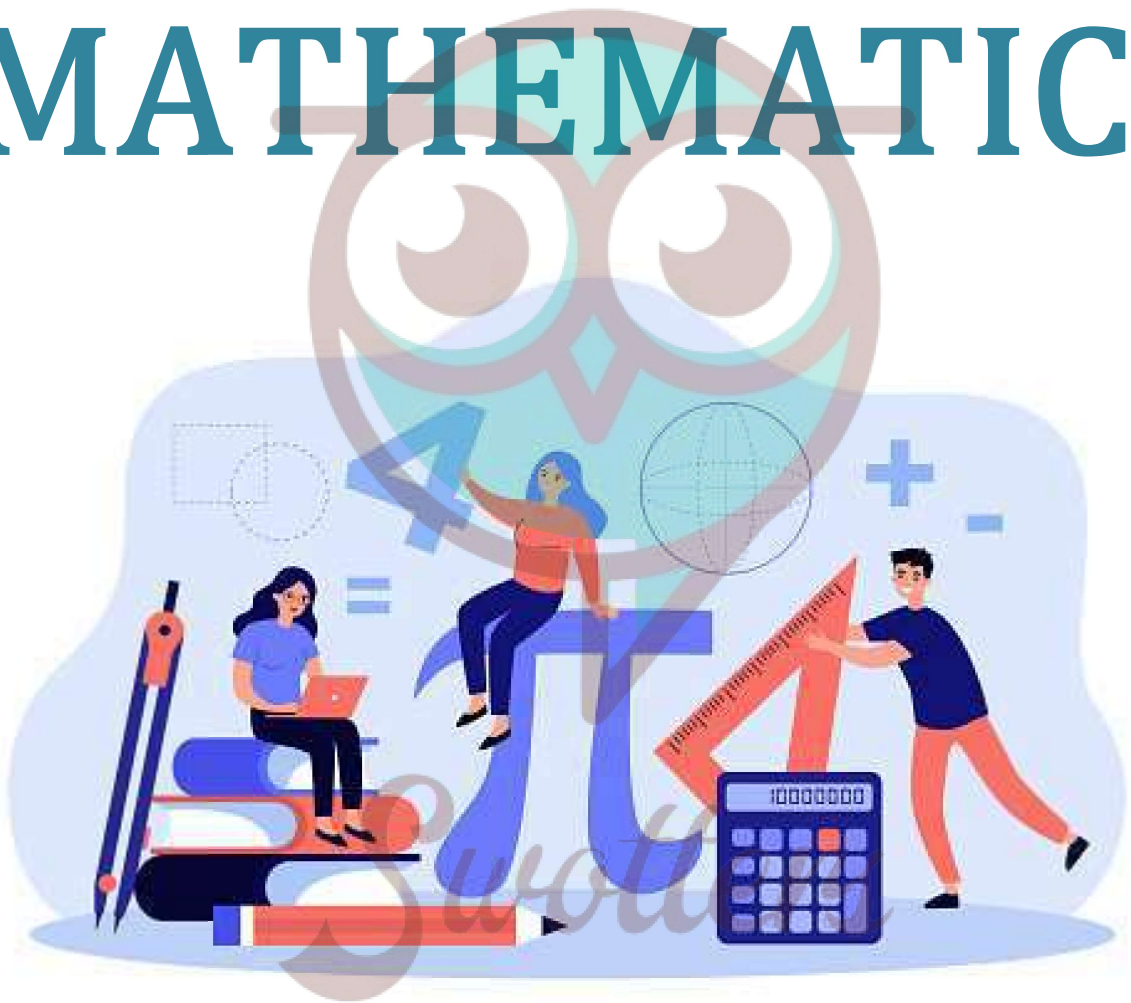# MATHEMATICS

Important Questions

Multiple Choice questions-

Question 1. Which of the following cannot be the empirical probability of an event?

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

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

(c) 0

(d) 1

Question 2. In a survey of 364 children aged 19-36 months, it was found that 91 liked to eat potato chips. If a child is selected at random, the probability that he/she does not like to eat potato chips is:

(a) 0.25

(b) 0.50

(c) 0.75

(d) 0.80

Question 3. In a sample study of 640 people, it was found that 512 people have a high school certificate. If a person is selected at random, the probability that the person has a high school certificate is:

(a) 0.5

(b) 0.6

(c) 0.7

(d) 0.8

Question 4. The probability that a number selected at random from the numbers 1, 2, 3, …, 15 is a multiple of 4 is

(a) $\frac{4}{15}$

(b) $\frac{2}{15}$

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

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

Question 5. When a die is thrown, the probability of getting an odd number less than 4 is

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

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

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

(d) 0

Question 6. A bag contains 16 cards bearing number 1, 2, 3 …., 16 respectively. One card is drawn at random. What is the probability that a number is divisible by 3?

(a) $\frac{3}{16}$

(b) $\frac{5}{16}$

(c) $\frac{11}{16}$

(d) $\frac{13}{16}$

Question 7. In a cricket match a batsman hits a boundary 4 times out of the 32 balls he plays. In a given ball, what is the probability that he does not hit the ball to the boundary?

(a) $\frac{7}{8}$

(b) $\frac{1}{8}$

(c) $\frac{1}{7}$

(d) $\frac{6}{7}$

Question 8. The sum of the probabilities of all events of a trial is

(a) 1

(b) Greater than 1

(c) Less than 1

(d) Between 0 and 1

Question 9. A die is thrown 300 times and odd numbers are obtained 153 times. Then the probability of getting an even number is
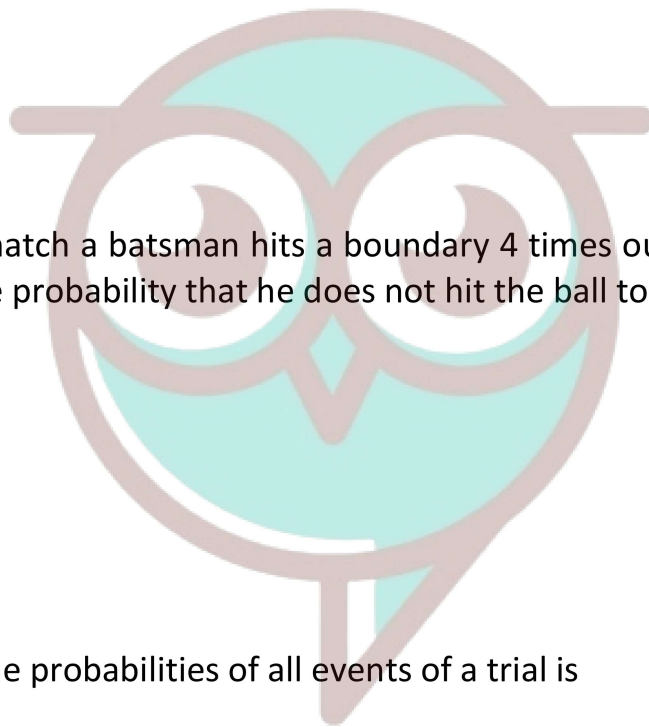
(a) $\frac{153}{300}$

(b) $\frac{147}{300}$

(c) $\frac{174}{300}$

(d) $\frac{147}{153}$

Question 10. Two coins are tossed 1000 times and the outcomes are recorded as below:

No. of heads	2	1	0
Frequency	200	550	250

The probability of getting at the most one head is:

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

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

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

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

Very Short:

1. The blood groups of some students of Class IX were surveyed and recorded as below:

Blood Group	A	B	AB	O
No. of Students	19	6	13	12

   If a student is chosen at random, find the probability that he/she has blood group A or AB

2. A group of 80 students of Class X are selected and asked for their choice of subject to be taken in Class XI, which is recorded as below:

Stream	PCM	PCB	Commerce	Humanities	Total
Number of Students	29	18	21	12	80

   If a student is chosen at random, find the probability that he/she is a student of either commerce or humanities stream.

3. A box contains 50 bolts and 150 nuts. On checking the box, it was found that half of the bolts and half of the nuts are rusted. If one item is chosen at random, find the probability that it is rusted.

4. A dice is rolled number of times and its outcomes are recorded as below:

Outcome	1	2	3	4	5	6
Frequency	35	45	50	38	53	29

   Find the probability of getting an odd number.

5. The probability of guessing the correct answer to a certain question is x2 If probability of not guessing the correct answer is $\frac{2}{3}$, then find x.

6. A bag contains x white, y red and z blue balls. A ball is drawn at the random, then what is the probability of drawing a blue ball.

Short Questions:

1. 750 families with 3 children were selected randomly and the following data recorded:

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

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

(i) no boy child

(ii) no girl child

2. If the probability of winning a race of an athlete is $\frac{1}{6}$ less than the twice the probability of losing the race. Find the probability of winning the race.

3. Three coins are tossed simultaneously 150 times with the following frequencies of different outcomes:

Number of tails	0	1	2	3
Frequency	25	30	32	63

Compute the probability of getting:

(i) At least 2 tails

(ii) Exactly one tail

4. The table shows the marks obtained by a student in 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% or more in the next unit test. Also, the probability that student get less than 70%.

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

Long Questions:

1. Three coins are tossed simultaneously 250 times. The distribution of various outcomes is listed below:

(i) Three tails: 30,

(ii) Two tails: 70,

(iii) One tail: 90,

(iv) No tail: 60

Find the respective probability of each event and check that the sum of all probabilities is

2. A travel company has 100 drivers for driving buses to various tourist destination. Given below is a table showing the resting time of the drivers after covering a certain distance (in km).

Distance (in km)	After 80 km	After 115 km	After 155 km	After 200 km
No. of drivers	13	47	30	10

What is the probability that the driver was chosen at random?

(a) takes a halt after covering 80km.

(b) takes a halt after covering 115km.

(c) takes a halt after covering 155km.

(d) takes a halt after crossing 200km.

3. A company selected 2300 families at random and surveyed 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 ₹)	Vehicles per Family			
	0	1	2	Above 2
Less than 7000	10	140	25	0
7000 – 10000	0	295	27	12
10000 – 13000	1	525	39	11
13000 – 16000	2	449	29	25
16000 or more	1	539	82	88

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

(i) earning ₹7000 – ₹13000 per month and owning exactly 1 vehicle.

(ii) owning not more than one vehicle. (iii) earning more than ₹13000 and owning 2 or more than 2 vehicles. (iv) owning no vehicle

4. A survey of 2000 people 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 242.

Type IV → Action, Romantic, Comedy and Family

Age group	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:

(a) in 18-29 years of age and likes type II movies

(b) above 50 years of age and likes all types of movies

(c) in 30-50 years and likes type I movies.:

5. In a kitchen, there are 108 utensils, consisting of bowls, plates, and glasses. The ratio of bowls, plates the glasses is 4:2:3. A utensil is picked at random. Find the probability that:

(i) it is a plate.

(ii) it is not a bowl.

Assertion and Reason Questions-

1. In these questions, a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

a) Assertion and reason both are correct statements and reason is correct explanation for assertion.

b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

c) Assertion is correct statement but reason is wrong statement.

d) Assertion is wrong statement but reason is correct statement.

Assertion: A die is thrown. Let E be the event that number appears on the upper face is less than 1, then P (E) = $\dfrac{1}{6}$

Reason: Probability of impossible event is 0.

2. In these questions, a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

a) Assertion and reason both are correct statements and reason is correct explanation for assertion.

b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

c) Assertion is correct statement but reason is wrong statement.

d) Assertion is wrong statement but reason is correct statement.

Assertion: A coin is tossed two times. Probability of getting at least two heads is $\frac{1}{4}$.

Reason: When a coin is tossed two times, then the sample space is {*HH, HT, TH, TT*}.

Case Study Questions-

1. Read the Source/ Text given below and answer these questions:

Three coins are tossed simultaneously 200 times with the following frequencies of different outcomes given in the table. Read the data given in the table carefully.

Outcome	3 tails	2 tails	1 tail	no tail
Frequency	20	68	82	30

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

i. Getting less than 3 tails:

    a. 0.9

    b. 0.1

    c. 0.01

    d. 0.02

ii. Exactly 2 Heads:

    a. 0.68

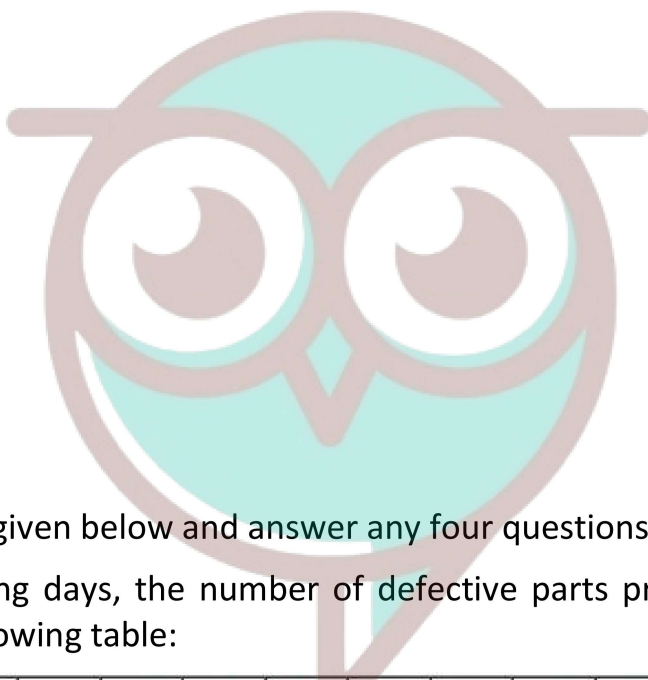   b. 0.41

    c. 0.34

    d. 0.5

iii. Exactly 1 head:

    a. 0.68

    b. 0.86

    c. 0.34

    d. 0.11

iv. At least 1 tail:

    a. 0.58

    b. 0

    c. 1

    d. 0.85

 v. All heads:

    a. 0.51

    b. 0.55

    c. 0.9

    d. 0.15

2. Read the Source/ Text given below and answer any four questions:

Over the past 200 working days, the number of defective parts produced by a machine in a factory 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's output will have.

  i. No. defective part

    a. 0.25

    b. 0

    c. 0.50

    d. 0.025

  ii. At least one defective part

    a. 0.50

    b. 0.75

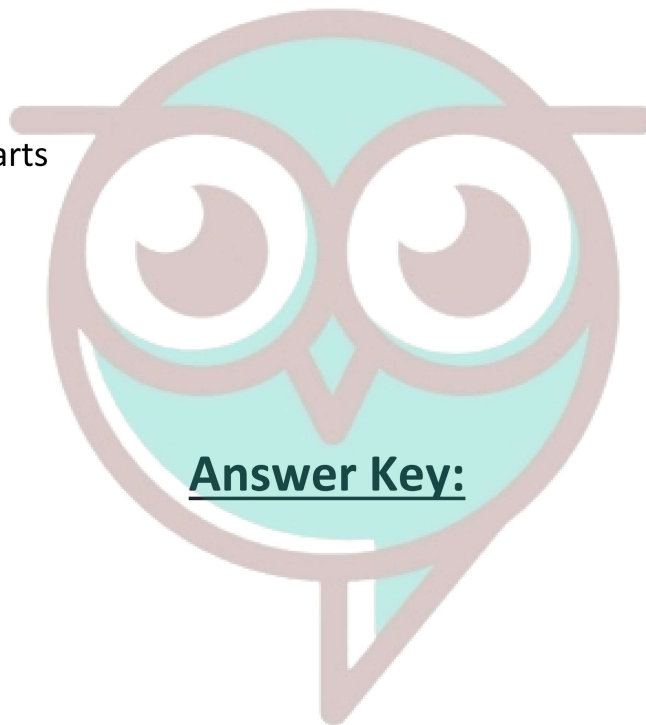   c. 0.32

    d. 0.01

iii. Not more than 5 defective parts

a. 0.12

b. 0.75

c. 0.73

d. 0.60

iv. More than 13 defective parts

a. 0

b. 1

c. -1

d. 0.2

v. At most 3 defective parts

a. -0.12

b. 0.50

c. 0.18

d. 0.61

Answer Key:

MCQ:

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

2. (c) 0.75

3. (d) 0.8

4. (c) $\frac{1}{5}$

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

6. (b) $\frac{5}{16}$

7. (a) $\frac{7}{8}$

8. (a) 1

9. (b) $\frac{147}{300}$

10. (c) $\frac{4}{5}$

Very Short Answer:

1. Here,

total number of students = 19 + 6 + 13 + 12 = 50

Number of students has blood group A or AB = 19 + 13 = 32

Required probability = $\frac{38}{50} = \frac{16}{25}$

2. Here, total number of students = 80

Total number of students of Commerce or Humanities stream = 33

Required probability = $\frac{33}{80}$

3. Total number of nuts and bolts in the box = 150 + 50

= 200

Number of nuts and bolts rusted = $\frac{1}{2} \times 200 = 100$

P(a rusted nut or bolt) = $\frac{100}{200} = \frac{1}{2}$

4. Total number of outcomes = 250

Total number of outcomes of getting odd numbers = 35 + 50 + 53 = 138

∴ P(getting an odd number) = $\frac{138}{250} = \frac{69}{125}$

5. Here, probability of guessing the correct answer = $\frac{x}{2}$

And probability of not guessing the correct answer = $\frac{x}{2}$

Now, $\frac{x}{2} + \frac{2}{3} = 1$

⇒ 3x + 4 = 6

⇒ 3x = 2

⇒ x = $\frac{2}{3}$

6. Number of blue balls = Z

Total balls = x + y + Z

∴ P(a blue ball) = $\frac{z}{x+y+z}$

Short Answer:

Ans: 1. (i) P(no boy child) = $\frac{100}{750} = \frac{2}{15}$

and P (no girl child) = $\frac{120}{750} = \frac{4}{25}$

Ans: 2. Let probability of winning the race be p

∴ Probability of losing the race = 1- p

According to the statement of question, we have

$p = 2 (1 - p) - \dfrac{1}{6}$

$\Rightarrow 6p = 12 - 12p - 1$

$\Rightarrow 18p = 11$

$\Rightarrow p = \dfrac{11}{18}$.

Hence, probability of winning the race is $\dfrac{11}{18}$.

Ans: 3. Here, total number of chances = 150

(i) Total number of chances having at least 2 tails = 32 + 63 = 95

∴ Required probability $= \dfrac{95}{150} = \dfrac{19}{30}$.

(ii) Total number of chances having exactly one tail = 30

∴ Required probability $= \dfrac{30}{150} = \dfrac{1}{5}$.

Ans: 4. Here, the marks are out of 50, so we first find its percentage (i.e., out of 100)

Unit Test	I	II	III	IV	V
Marks (Out of 100)	68	70	72	68	74

Total number of outcomes = 5

Probability of getting 70% or more marks $= \dfrac{3}{5}$.

Probability of getting less than 70% $= \dfrac{2}{5}$.

Ans: 5. Total number of books = 700

(i) P(no defective books) $= \dfrac{400}{700} = \dfrac{4}{7}$

(ii) P(more than 0 but less than 4 defective books) $= \dfrac{269}{700}$

13 (iii) P(more than 4 defective books) = $\dfrac{13}{700}$

Long Answer:

Ans: 1. Here, the total number of chances = 250

Total number of three tails = 30

$\therefore$ P(of three tails) $= \dfrac{30}{250} = \dfrac{3}{25}$

(ii) Total number of two tails = 70

$\therefore$ P(of two tails) $= \dfrac{70}{250} = \dfrac{7}{25}$

(iii) Total number of one tail = 90

$\therefore$ P(of one tail) $= \dfrac{90}{250} = \dfrac{9}{25}$

(iv) Total number of no tail = 60

$\therefore$ P(of no tail) $= \dfrac{60}{250} = \dfrac{6}{25}$

Now, sum of all probabilities $= \dfrac{3}{25} + \dfrac{7}{25} + \dfrac{9}{25} + \dfrac{6}{25} = \dfrac{25}{25} = 1$

Ans: 2. Total number of drivers = 100

(a) P (takes a halt after covering 80km) $= \dfrac{13}{100}$

(b) P (takes a halt after covering 115km) $= \dfrac{60}{100} = \dfrac{3}{5}$

(c) P (takes a halt after covering 155km) $= \dfrac{90}{100} = \dfrac{9}{10}$

(d) P (takes a halt after crossing 200km) $= \dfrac{10}{100} = \dfrac{1}{10}$

Ans: 3. Here, we have a total number of families = 2300

(i)   Number of families earning ₹ 7000 to ₹ 13000 per month and owning exactly 1 vehicle = 295 + 525 = 820

∴ Required probability = $\frac{820}{2300}$ = $\frac{41}{115}$

(ii) Number of families owning not more than one vehicle = 1962

∴ Required probability = $\frac{1962}{2300}$ = $\frac{981}{1150}$

(iii) Number of families earning more than ₹ 13000 and owning 2 or more than 2 vehicles = 224

∴ Required probability = $\frac{224}{2300}$ = $\frac{56}{575}$

(iv) Number of families owning no vehicle = 14

∴ Required probability = $\frac{14}{2300}$ = $\frac{7}{1150}$

Ans: 4. (a) Let E_1 be the event, between the age group (18 - 29) years and liking type II movies

Favorable outcomes to event E_1 = 160

∴ P(E_1) = $\frac{160}{2000}$ = $\frac{160}{2000}$

(b) Let E_2 be the event, of age group above 50 years and like all types of movies

Favorable outcomes to event E_2 = 9

∴ P(E_2) = $\frac{9}{2000}$

(c) Let E_3 be the event, between age group (30 - 50) years and liking type I movies

Favorable outcomes to event E_3 = 505

∴ P(E_3) = $\frac{505}{2000}$ = $\frac{101}{400}$

Ans: 5. Total utensils in the kitchen = 108

Let number of bowls be 4x, number of plates be 2x and number of glasses be 3x

∴ 4x + 2x + 3x = 108

9x = 108

x = $\frac{108}{9}$ = 12

Thus, number of bowls = 4 × 12 = 48

Number of plates = 2 × 12 = 24

Number of glasses = 3 × 12 =

(i) P (a plate) = $\frac{24}{108}$ = $\frac{2}{9}$

(ii) P (not a bowl) = $\frac{24+36}{108}$ = $\frac{60}{108}$ = $\frac{5}{9}$

Assertion and Reason Answers-

1. d) Assertion is wrong statement but reason is correct statement.

Explanation: When a die is thrown, then number of outcomes are 1, 2, 3, 4, 5, 6

P(number appear on the upper face is less than 1)=0

2. a) Assertion and reason both are correct statements and reason is correct explanation for assertion.

Explanation: Number of total outcomes when a coin is tossed 2 times i.e., {HH, HT, TH, TT} = 4

P(getting at least two heads) = $\dfrac{1}{4}$

Case Study Answers-

1.

(i)	(a)	0.9
(ii)	(b)	0.41
(iii)	(c)	0.34
(iv)	(d)	0.85
(v)	(d)	0.15

2.

i	a	0.25
ii	b	0.75
iii	c	0.73
iv	a	0
v	d	0.61