

CHAPTER 13 PROBABILITY

SUBJECT: MATHEMATICS

MAX. MARKS : 40

CLASS : XII

DURATION : 1½ hrs

General Instructions:

- All questions are compulsory.
- This question paper contains 20 questions divided into five Sections A, B, C, D and E.
- Section A comprises of 10 MCQs of 1 mark each. Section B comprises of 4 questions of 2 marks each. Section C comprises of 3 questions of 3 marks each. Section D comprises of 1 question of 5 marks each and Section E comprises of 2 Case Study Based Questions of 4 marks each.
- There is no overall choice.
- Use of Calculators is not permitted

SECTION – A

Questions 1 to 10 carry 1 mark each.

1. If $P(A) = 1/4$, $P(B) = 1/3$ and $P(A \cap B) = 1/5$, then $P(\overline{B} / \overline{A}) = ?$
(a) 11/15 (b) 11/45 (c) 37/45 (d) 37/60

2. If the following table represents a probability distribution for a random variable X:

X	1	2	3	4	5	6
P(X)	0.1	2k	K	0.2	3k	0.1

The value of k is:

- (a) 0.01 (b) 0.1 (c) 1/1000 (d) 25
3. A dice is tossed thrice. The probability of getting an odd number at least once is:
(a) 7/8 (b) 1/3 (c) 3/8 (d) 1/8
4. Two numbers are selected at random from integers 1 through 9. If the sum is even, what is the probability that both numbers are odd?
(a) 5/8 (b) 1/6 (c) 4/9 (d) 2/3
5. A card is picked at random from a pack of 52 playing cards. Given that the picked card is a queen, the probability of this card to be a card of spade is
(a) 1/3 (b) 4/13 (c) 1/4 (d) 1/2
6. If A and B are two independent events with $P(A) = 3/5$ and $P(B) = 4/9$, then find $P(\overline{A} \cap \overline{B})$.
(a) 1/9 (b) 2/9 (c) 1/3 (d) 4/9
7. If $P(A) = \frac{4}{5}$, and $P(A \cap B) = \frac{7}{10}$, then $P(B | A)$ is equal to
(a) $\frac{1}{10}$ (b) $\frac{1}{8}$ (c) $\frac{7}{8}$ (d) $\frac{17}{20}$
8. If $P(A) = 0.4$, $P(B) = 0.8$ and $P(B/A) = 0.6$ then $P(A \cup B)$ is equal to
(a) 0.24 (b) 0.3 (c) 0.48 (d) 0.96

In the following questions 9 and 10, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

- Both Assertion (A) and Reason (R) are true and Reason(R) is the correct explanation of assertion (A).
- Both Assertion (A) and Reason (R) are true but Reason(R) is not the correct explanation of assertion (A).
- Assertion (A) is true but reason (R) is false.
- Assertion (A) is false but reason (R) is true.

- 9. Assertion (A):** Given that E and F are events such that $P(E) = 0.6$, $P(F) = 0.3$ and $P(E \cap F) = 0.2$, then $P(E|F) = 2/3$
Reason (R): Given that E and F are events such that $P(E) = 0.6$, $P(F) = 0.3$ and $P(E \cap F) = 0.2$, then $P(E|F) = 1/3$
- 10. Assertion (A):** Two coins are tossed simultaneously. The probability of getting two heads, if it is known that at least one head comes up, is $\frac{1}{3}$
Reason (R): Let A and B be two events with a random experiment then $P(A/B) = \frac{P(A \cap B)}{P(B)}$

SECTION – B

Questions 11 to 14 carry 2 marks each.

- 11.** A problem in Mathematics is given to three students whose chances of solving it are $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}$. Find the probability that the problem is solved.
- 12.** The random variable X can take only the values 0, 1, 2, 3. Given that: $P(X = 0) = P(X = 1) = P$ and $P(X = 2) = P(X = 3)$ such that $\sum P_i x_i^2 = 2 \sum P_i x_i$, find the value of P.
- 13.** An urn contains 10 black and 5 white balls. Two balls are drawn from the urn one after the other without replacement, then find the probability that both drawn balls are black.
- 14.** In a hostel, 60% of the students read Hindi newspaper, 40% read English newspaper and 20% read both Hindi and English newspaper. A student is selected at random.
 (a) If she reads Hindi newspaper, find the probability that she reads English newspaper.
 (b) If she reads English newspaper, find the probability that she reads Hindi newspaper.

SECTION – C

Questions 15 to 17 carry 3 marks each.

- 15.** In a group of 50 scouts in a camp, 30 are well trained in first aid techniques while the remaining are well trained in hospitality but not in first aid. Two scouts are selected at random from the group. Find the probability distribution of number of selected scouts who are well trained in first aid.
- 16.** An urn contains 5 white and 8 white black balls. Two successive drawing of three balls at a time are made such that the balls are not replaced before the second draw. Find the probability that the first draw gives 3 white balls and second draw gives 3 black balls.
- 17.** Two numbers are selected at random (without replacement) from first 7 natural numbers. If X denotes the smaller of the two numbers obtained, find the probability distribution of X.

SECTION – D

Questions 18 carry 5 marks.

- 18.** There are three coins, one is a two headed coin (having head on both the faces), another is a biased coin that comes up heads 75% of the time and the third is an unbiased coin. One of the three coins is chosen at random and tossed. If it shows head. What is probability that it was the two headed coin?

SECTION – E (Case Study Based Questions)

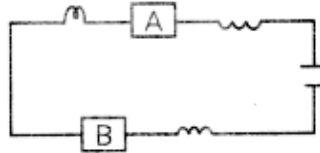
Questions 19 to 20 carry 4 marks each.

- 19. Case-Study 1: Read the following passage and answer the questions given below.**
 An electric circuit includes a device that gives energy to the charged particles constituting the current, such as a battery or a generator; devices that use current, such as lamps, electric motors, or

computers; and the connecting wires or transmission lines.



An electric circuit consists of two subsystems say A and B as shown below:



For previous testing procedures, the following probabilities are assumed to be known.

$P(A \text{ fails}) = 0.2$, $P(B \text{ fails alone}) = 0.15$, $P(A \text{ and } B \text{ fail}) = 0.15$

Based on the above information answer the following questions:

- (a) What is the probability that B fails? [1]
- (b) What is the probability that A fails alone? [1]
- (c) Find the probability that the whole of the electric system fails? [2]

OR

Find the conditional probability that B fails when A has already failed. [2]

20. Case-Study 2: Read the following passage and answer the questions given below.

In a town, it's rainy one-third of the day. Given that it is rainy, there will be heavy traffic with probability $1/2$. Given that it is not rainy, there will be heavy traffic with probability $1/4$. If it's rainy and there is heavy traffic, I arrive late for work with probability $1/2$. On the other hand, the probability of being late is reduced to $1/8$ if it is not rainy and there is no heavy traffic. In other situations (rainy and no heavy traffic, not rainy and heavy traffic), the probability of being late is $1/4$. You pick a random day.



Based on the above information, answer the following questions:

- (i) What is the probability that it's not raining and there is heavy traffic and I am not late?
- (ii) What is the probability that I am late?
- (iii) Given that I arrived late at work, what is the probability that it rained that day?

OR

(iii) If $P(\text{not } A) = 0.7$, $P(B) = 0.7$ and $P(B/A) = 0.5$, then find the $P(A/B)$