CHAPTER 13
PROBABILITY

SAY 2018

1. a) A coin is tossed 3 times. Find the probability distribution of the number of heads. (3)
   b) A bag contains 5 black and 6 white balls. 4 balls of the same colour (black or white) are added to the bag, shuffled well and one ball is drawn. If the ball obtained is white, what is the probability that the balls added are black? (3)

MARCH 2018

2. a) The probability distribution of a random variable is given by P(x). What is $\sum P(x)$? (1)
   b) The following is a probability distribution function of a random variable.

x	−5	−4	−3	−2	−1	0	1
P(x)	k	2k	3k	4k	5k	7k	8k
	2	3	4	5			
	9k	10k	11k	12k			

   i) Find k (2)
   ii) Find P($x > 3$) (1)
   iii) Find P($-3 < x < 4$) (1)
   iv) Find P($x < -3$) (1)

SAY 2017

3. A man is known to be speak truth 3 out of 4 times.

   a) Write the probability that he speaks truth. (1)

   b) He throws a die.

   i) Find the probability that he reports that "it is a six" (2)

   ii) If the reports "it is six". Find the probability that it is actually not a six. (2)

OR

Let x denote the number of study hours of a person during a randomly selected day. The probability distribution is given below:

x	0	1	2	3	4
P(x)	0.1	K	2k	2k	k

a) Find K. (1)
b) Find the probability that he studies at least two hours. (4)

MARCH 2017

4. a) If A and B are two events such that $A \subset B$ and $P(A) \neq 0$ then $P(A/B)$ is

   a) $\dfrac{P(A)}{P(B)}$ b) $\dfrac{P(B)}{P(A)}$

   c) $\dfrac{1}{P(A)}$ d) $\dfrac{1}{P(A)}$ (1)

   b) There are two identical bags. Bag 1 contains 3 red and 4 black balls while Bag II contains 5 red and 4 black balls. One ball is drawn at random from one of the bags.
   i) Find the probability that the ball drawn is red. (2)
   ii) If the ball drawn is red what is the probability that it was drawn from bag I? (2)

OR

Consider the following probability distribution of a random variable X.

X	0	1	2	3	4
P(X)	$\dfrac{1}{16}$	$\dfrac{2}{16}$	K	$\dfrac{5}{16}$	$\dfrac{1}{16}$

i) Find the value of K (1)
ii) Determine the Mean and Variance of X. (4)

SAY 2016

5. a) If $P(A) = \dfrac{7}{13}, P(B) = \dfrac{9}{13}$ and

$P(A \cap B) = \dfrac{4}{13}$ then $P(A/B)$ is

i) $\dfrac{9}{4}$ ii) $\dfrac{16}{13}$

iii) $\dfrac{4}{9}$ iv) $\dfrac{11}{13}$ (1)

b) Probability of solving a specific problem

independently by A and B are $\dfrac{1}{2}$ and $\dfrac{1}{3}$

respectively. If both try to solve the problem
independently, then

i) Find the probability that the problem is
solved.   (2)

ii) Find the probability that exactly one of
them solves the problem.   (2)

OR

A die thrown 6 times. If getting an odd number is
a success.

i) Find probability of success and failure.
(1)

ii) Find the probability of 5 successes.
(2)

iii) Find the probability of atleast 5
successes.   (2)

MARCH 2016

6. a) If $P(A) = 0.3, P(B) = 0.4,$ then the value of
$P(A \cup B)$ where A and B are independent
events is
i) 0.48   ii) 0.51
iii) 0.52   iii) 0.58   (1)

b) A card from a pack of 52 cards is lost. Form
the remaining cards of the pack, two cards are
drawn and are found to be diamonds. Find the
probability of the lost card being a diamond.
(4)

OR

A pair of dice is thrown 4 times. If getting a
doublet is considered as a success.
i) Find the probability of getting a doublet
(1)

ii) Hence, find the probability of two
successes.   (4)

JUNE 2015

7. a) A die is thrown thrice. Find the probability
of getting an odd number atleast once.   (2)

b) Two cards are drawn successively   with
replacement from a pack of 52 cards. Find the
probability distribution of the number
of aces.   (3)

OR

a) If $P(A) = 0.8, P(B = 0.5)$ and
$P(B/A) = 0.4$, then find $P(A \cup B)$.   (2)

b) If a fair coin is tossed 10 times, then find the
probability of getting exactly 6 heads.   (3)

MARCH 2015

8. (a) For two independent events A and B, which of
the following pair of events need
not be independent?
(i) A', B' (ii) A, B'
(iii) A', B (iv) $A - B, B - A$ (1)

(b) If $P(A) = 0.6$, $P(B) = 0.7$　and

$P(A \cup B) = 0.9$, then find $P\left(\dfrac{A}{B}\right)$ and

$P\left(\dfrac{B}{A}\right)$.　　　　　　　　　(1)

9. The probability distribution of a random variable X taking values 1,2,3,4,5 is given
   (a) Find the value of P　　　　　　(1)
   (b) Find the mean of X　　　　　　(1)
   (c) Find the variance of X　　　　(2)

JUNE 2014

10. There are two identical boxes. Box I contains 5 red and 4 black balls, while box II contains 3 red 3 black balls. A person chooses a box at random and takes out a ball.

    a) Find the probability that the ball drawn is red.
    　　　　　　　　　　　　　　　　(2)

    b) If the ball drawn is black, what is the probability that it is drawn from Box II.　　(3)

    OR

    Two balls are drawn at random with replacement from a box containing 10 black and 8 red balls. Find the probability that
    a) Both balls are red.　　　　　　(2)
    b) One of them is black and the other is red.　(3)

MARCH 2014

11. a) A and B are two events such that P(A) =0.8, P(B)= 0.5 and P(B/A)=0.4, then find P(A/B).　　　　　　　　(2)
    b) Find the mean and variance of the number obtained on a throw of an unbiased die.　(3)

    OR

a) Two events E and F are such that P(E) =0.6, P(F)=0.2 and $P(E \cup F) = 0.68$.
   Are E and F independent?　　　　(2)

b) A die is thrown 6 times. If getting an odd number' is a success, what is the probability of getting?
   i)　5 successes?
   ii)　At least 5 successes?
   iii)　At most 5 successes?　　　　(3)

SAY 2013

No question asked.

MARCH 2013

12.　A and B try to solve a problem independently.

   The probability that A solves the problem is $\dfrac{1}{2}$

   and that B solves the problem is $\dfrac{1}{3}$. Find the

   probability that:

   a) Find both of them solve that problem.　(2)
   b) The problem is solved.　　　　　(3)

    OR

If A and B are two independent events, then

a) Prove that A and B are independent events.
   　　　　　　　　　　　　　　　　(2)

b) Show that the probability of occurrence of atleast one of A and B is $1 - P(A')P(B')$
   　　　　　　　　　　　　　　　　(3)

SAY 2012

13. a)　i)　If A and B are independent events, prove that A' and B' are also independent events.　　　　　　　　(3)
    　　ii)　A box contains 30 deflective and 30 non-defective bulbs. Two balls are drawn at

random. The events A and B are defined as follows:

A: "the first bulb is defective".

B: "the second bulb is non-deflective".

Find P(A) and P(B) . Prove that A and B are independent events.   (2)

OR

b) In a factory which manufactures bulbs machines X,Y and Z manufactures respectively. 25%, 35% and 40% of the bulbs. Of their outputs 1, 2 and 3 percent are respectively defective bulbs. A bulb is drawn at random and is found to be deflective. What is the probability that it is manufactured by the machine Y?   (5)

MARCH 2012

14. a) Two balls are drawn at random with replacement from a box containing 10 black and 8 red balls. Find the probability that one of them is black and the other is red.   (2)

   b) Find the probability of getting 5 exactly twice in 7 throws of a die.   (3)

OR

a) A die is tossed thrice. Find the probability of getting an odd number at least once.   (3)

b) Bag I contains 3 red and 4 black balls while another bag II contains 5 red and 6 black balls. One ball is drawn at random from one of the bags and it is found to be red. Find the probability that it was drawn from Bag II.
                                                     (3)

SAY 2011

15. a) If X is a random variable whose possibilities $p_1, p_2, ..., p_n$ respectively,

   then $E(X) =$ …………..   (1)

   b) A husband and interview for two vacancies in

the same post. The probability of husband's section is $\frac{1}{7}$ and that of wife's section is $\frac{1}{5}$.

What is the probability that only one is selected?   (3)

16. a)

For any two events A and B , write an expression for P(A/B).   (1)

b) In a bulb factory, machines A,B and C manufacture 60%, 30%, and 10% bulbs respectively. 1%, 2% and 3% of the bulbs produced by A,B and C respectively. A bulb is drawn at random form the total production and found to be defective. Find the probability that this bulb has been produced by machine A.   (3)

OR

a) Write the probability function of the Binomial distribution.   (1)

b) Five defective bulbs are accidentally mixed with 20 good ones. It is not possible to just look at a bulb and tell whether or not it is defective. Find the probability distribution of the number of defective bulbs if 3 bulbs are drawn at random.   (3)

MARCH 2011

17. A class has 15 students whose ages are 14, 17, 15, 14, 21, 17, 19, 20, 16, 18, 20, 17, 16, 19 and 20 years. One student is selected such that each has the same chance of being selected; the age X of the selected student is recorded.

   (a) Write the probability distribution of X.   (2)

   (b) Find E(X).   (1)

   (c) Find Var(X).   (2)

OR

   (a) An unbiased die is thrown twice. Let A be event "odd number on the first throw" and B be the event "odd number on the second throw". Check the independence of A and B.
                                                     (2)

(b) If P(A)=0.8, P(B)=0.5 and P(B/A)=0.4, find

(i) $P(A \cap B)$ (1)

(ii) P(A/B) and

(iii) $P(A \cup B)$ (2)

SAY 2010

18. a) State and prove the theorem of total probability. (3)

b) If a fair coin is tossed 10 times, what is the probability that the outcome is exactly six heads?

OR

The probability distribution of a random variable X is given below:

a) Find k (1)

b) Find the variance of the random variable. (3)

19. Suppose 10 cards numbered 1 to 10 are placed in a box and shuffled and one card is drawn at random.

a) If A is the event that the number on the card is even, then write A. (1)

b) If B is the event that the number on the card is more than 3, find P(A/B). (3)

MARCH 2010

20. a) A and B are two events such that $P(A') = 0.3, P(B) = 0.4$ and $P(A \cap B) = 0.1$, then

$P(A \cap B') = \ldots\ldots\ldots.$ (1)

b) The probability that A solves a problem $\frac{1}{2}$ and the probability that B solve the problem is $\frac{1}{3}$. If both try to solve the problem independently. Find the probability, find the probability that:

a) The problem is solved. (1)

b) None of them solve the problem. (1)

c) Exactly one of them solves the problem. (2)

JUNE 2009

21. a) A and B independently try to solve a problem. Probability that A solves the problem is $\frac{1}{3}$ and B solves the problem is $\frac{1}{4}$. Find the probability that:

i) Both of them solve the problem. (1)

ii) The problem is solved (2)

(c) Find the probability distribution of the number of Heads in three tosses of a fair coin. (2)

MARCH 2009

22. a) What is meant by mutually exclusive events. (1)

b) Find the probability of drawing a one rupee coin form a purse with two compartments one of which contains 3 fifty paise and 2 one rupee coins and the other 2 fifty paise and 3 one rupee coins. (3)

MARCH 2008

23. A card is drawn from a well-shuffled pack of cards.

a) What is the probability that the card drawn is an ace? (2)

b) If the first card is not replaced and a second card is drawn, what is the probability that both are aces? (2)

c) If the first card is replaced and a second card is drawn, what is the probability that both are aces? (2)

MARCH 2007

24. Let A and B be two independent events such that $P(A) = \frac{1}{7} \, and \, P(B) = \frac{1}{5}$ find

a) $P(A \cap B)$ (1)

b) $P(A \cup B)$ (1)

c) $P\left(\left(A\cap\overline{B}\right)\cup\left(B\cap\overline{A}\right)\right)$ (2)

25. Find the probability distribution of the number
    doublets in two throws of a pair of dice.   (4)

MARCH 2006

26. In a single throw of 3 dice, the probability of
    getting the same number on all the dice is
    a) 1/216   b) 1/36
    b) c) 1/6   d) 1/18   (1)

27. Find the probability that a leap year will contain
    53 Sundays.   (2)

28. The probability of A,B, C solving a problem are
    $\dfrac{1}{3}$, $\dfrac{2}{7}$ and $\dfrac{3}{8}$ respectively. If all the three try to

    solve the problem simultaneously, find the
    probability that: (5)
    a) Exactly one of them will solve the problem.
    b) The problem will be solved.

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