



## MATHS

### BOOKS - PRADEEP PUBLICATION

### PROBABILITY

#### Example

1. If  $E_1$  and  $E_2$  are two independent events associated with an experiment, then show that

$E_1^c$  and  $E_2^c$  are also independent.



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2. If  $E_1$  and  $E_2$  are two independent events associated with an experiment, then show that

$$P(E_1 \cup E_2) = 1 - P(E_1^c)P(E_2^c)$$



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3. Given  $P(A + B) = \frac{5}{6}$ ,  $P(AB) = \frac{1}{3}$  and  $P(B^c) = \frac{1}{2}$ .

Determine  $P(A)$  and  $P(B)$  and show that  $A$  and  $B$  are independent events.



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4. If  $P(A)=0.8$ ,  $P(B)=0.5$  and  $P(B/A)=0.4$  find  $P(A / B)$



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5. If A and B are two events such that  $P(A) = \frac{1}{2}$ ,  $P(B) = \frac{1}{3}$  and  $P(A \cap B) = \frac{1}{4}$ , then find

$$P(B/A)$$

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6. If A and B are two events such that  $P(A) = \frac{1}{2}$ ,  $P(B) = \frac{1}{3}$  and  $P(A \cap B) = \frac{1}{4}$ , then find

$$P(A/B)$$

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7. If A and B are two events such that  $P(A) = \frac{1}{2}$ ,  $P(B) = \frac{1}{3}$  and  $P(A \cap B) = \frac{1}{4}$ , then find

$$P(A' / B')$$

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8. If A and B are events such that  $P\left(\frac{A}{B}\right) = P\left(\frac{B}{A}\right)$ , then

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9. Events A and B are such that  $P(A) = \frac{1}{2}$ ,  $P(B) = \frac{7}{12}$  and  $P(\text{not A or not B}) = \frac{1}{4}$ . State whether A and B are independent.

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10. If  $P(A) = \frac{7}{13}$ ,  $P(B) = \frac{9}{13}$  and  $P(A \cap B) = \frac{4}{13}$ , evaluate  $P(A | B)$

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11. If  $E_1$  and  $E_2$  are independent events associated with an experiment such that  $P(E_1) = P_1$  and  $P(E_2) = P_2$ . Find  $P(E_1 \text{ and } E_2)$ .



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12. If  $E_1$  and  $E_2$  are independent events associated with an experiment such that  $P(E_1) = P_1$  and  $P(E_2) = P_2$ . Find  $P(E_1 \text{ but not } E_2)$ .



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13. If  $E_1$  and  $E_2$  are independent events associated with an experiment such that  $P(E_1) = P_1$  and  $P(E_2) = P_2$ . Find  $P(E_1 \text{ and } E_2)$ .



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14. If  $E_1$  and  $E_2$  are independent events associated with an experiment such that  $P(E_1) = P_1$  and  $P(E_2) = P_2$ . Find  $P(E_1 \text{ and } E_2)$ .



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15. If  $E_1$  and  $E_2$  are independent events associated with an experiment such that  $P(E_1) = P_1$  and  $P(E_2) = P_2$ . Find  $P(E_1 \text{ or } E_2)$ .



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16. If  $A$  and  $B$  are independent events s.t.  $P(A) = 0.35$  and  $P(A \cup B) = 0.60$ . Find  $P(B)$ .

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**17.** 10% of the bulbs produced in a factory are red colour and 2% are red and defective. If one bulb is picked up at random, determine the probability of its being defective if it is red.

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**18.** A card is drawn from a well shuffled pack of 52 cards. The outcome is noted and the pack is again reshuffled without replacing the card. Another card is then drawn. What is the probability that the first card is a spade and the second is a black king?

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19. The odds against a certain event are 5 to 2, the odds in favour of another event independent of the former are 6 to 5. find the probability that at least one of the events happens.



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20. A coin is tossed thrice and all eight outcomes are assumed equally likely. In which of the following cases are the events A and B independent? A: "the first throw results in head" B: "the last throw results in tail"



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21. A coin is tossed thrice and all eight outcomes are assumed equally likely. In which of the following cases are the events A



and B independent? A: " the number of heads is two" B:"the last throw results in head"



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**22.** A coin is tossed thrice and all the eight outcomes are assumed to be equally likely. In which of the following cases are the events  $E_1$  and  $E_2$  independent?

$E_1$ : 'the number of heads is odd'  $E_2$ : 'the number of tail is odd'.



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**23.** For a biased dice, the probabilities of outcomes are given as under

$$P(1) = P(2) = 0.2, P(3) = P(5) = P(6) = 0.1 \text{ and } P(4) = 0.3$$

.

The die is tossed two times. Let A and B the events, same number each time and a total score is 10 or more respectively. Determine whether or not A and B are independent.



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**24.** In part (ii), For a loaded die, the probabilities of outcomes are given as under :  $P(1)=P(2)=P(3)=P(4)=P(5)=P(6)=1/6$ . the die is thrown two times. Let A and B be the events, same number each times, and a total score is 10 or more, respectively. Determine if the dice were fair, whether or not the events A and B would be independent.



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25. A die is thrown. If E is the event 'the number appearing is a multiple of 3' and F be the event 'the number appearing is even' then find whether E and F are independent ?



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26. An unbiased die is thrown twice. Let the event A be 'odd number on the first throw' and B the event 'odd number on the second throw'. Check the independence of the events A and B.



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27. The probability of student A passing an examination is  $\frac{3}{5}$  and of student B passing is  $\frac{4}{5}$ . Assuming the two events: 'A

passes', 'B passes', as independent find the probability of:

both students passing the examination.



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**28.** The probability of student A passing an examination is  $\frac{3}{5}$  and of student B passing is  $\frac{4}{5}$ . Assuming the two events: 'A

passes', 'B passes', as independent find the probability of:

both students passing the examination.



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**29.** The probability of student A passing an examination is  $\frac{3}{5}$  and of student B passing is  $\frac{4}{5}$ . Assuming the two events: 'A

passes', 'B passes', as independent find the probability of:

neither of the two passing the examination.



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**30.** The probability of student A passing an examination is  $\frac{3}{5}$  and of student B passing is  $\frac{4}{5}$ . Assuming the two events: 'A passes', 'B passes', as independent find the probability of: neither of the two passing the examination.



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**31.** A university has to select an examiner from a list of 50 persons, 20 of them are women and 30 men, 10 of them knowing Hindi and 40 not, 15 of them being teacher and the remaining 35 not. What is the probability of the two university selecting a Hindi knowing women teacher?



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**32.** A committee of 4 students is selected at random from a group consisting 8 boys and 4 girls. Given that there is at least one girl in the committee, calculate the probability that there are exactly 2 girls in the committee.



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**33.** In a school, there are 1000 students, out of which 430 are girls. It is known that out of 430, 10% of the girls study in class XII. What is the probability that a student chosen randomly studies in Class XII given that the chosen student is a girl?



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**34.** Find the probability of drawing a diamond card in each of two consecutive draws of a single card from a well shuffled pack of cards if

the first card is replaced before the second one is taken out.



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**35.** Find the probability of drawing a diamond card in each of two consecutive draws of a single card from a well shuffled pack of cards if

the first one is not replaced.



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**36.** Three cards are drawn successively, without replacement from a pack of 52 well shuffled cards. What is the probability that first two cards are kings and the third card drawn is an ace?

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**37.** Find the chance of drawing 2 white balls in succession from a bag containing 3 red and 5 white balls, the balls drawn first not being replaced.

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**38.** An urn contains 10 black and 5 white balls. Two balls are drawn from the urn one after the other without replacement.



What is the probability that both drawn balls are black?



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**39.** A bag contains 5 red marbles and 3 black marbles. Three marbles are drawn one by one without replacement. What is the probability that at least one of three marbles drawn be black if the first marble is red?



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**40.** A bag contains 4 white and 6 black balls. One ball is drawn and laid aside without noticing its colour. Another ball is then drawn. What is the probability that the second ball is black?



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**41.** A bag contains 4 white balls and 2 black balls. Another bag contains 3 white balls and 5 black balls. If one ball is drawn from each bag, find the probability that one is white and one is black.



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**42.** A bag contains 4 white balls and 2 black balls. Another bag contains 3 white balls and 5 black balls. If one ball is drawn from each bag, find the probability that both are white.



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**43.** Two balls are drawn from an urn containing 2 white, 3 red and 4 black balls one by one without replacement. What is the probability that both the balls are of same colour?



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**44.** Two balls are drawn from an urn containing 2 white, 3 red and 4 black balls one by one without replacement. What is the probability that atleast one ball is red?



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45. A bag contains 4 yellow and 5 red balls and another bag contains 6 yellow and 3 red balls . A ball is drawn from the first bag and without seeing its colour, it is put into the second bag . Find the probability that if now a ball is drawn from the second bag, it is yellow in colour .



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46. A problem is given to three children, whose chances of solving it are  $\frac{1}{3}$ ,  $\frac{1}{5}$  and  $\frac{1}{6}$ , what is the probability that : At least one of them may solve. it.



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47. An urn contains 25 balls numbered 1 to 25. suppose an odd number is considered a success. Two balls drawn from the urn with replacement. Find the probability of getting two successes.



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48. An urn contains 25 balls numbered 1 to 25. suppose an odd number is considered a success. Two balls drawn from the urn with replacement. Find the probability of getting exactly one success.



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**49.** An urn contains 25 balls numbered 1 to 25. suppose an odd number if considered a success. Two balls drawn from the urn with replacement. Find the probability of getting atleast one success.



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**50.** An urn contains 25 balls numbered 1 to 25. suppose an odd number if considered a success. Two balls drawn from the urn with replacement. Find the probability of getting two success.



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51. Ten cards numbered 1 to 10 are placed in a box, mixed up thoroughly and then one card is drawn randomly. If it is known that the number on the drawn card is more than 3, what is the probability that it is an even number?



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52. A speaks truth in 60% of the cases, while B in 90% of the cases. In what percentage are they likely to contradict each other in stating the same fact? In the case of contradiction do you think , the statement of B will carry more weight as he speaks truth in more number of case than A?



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53. A speaks truth in 70 % of the cases and B in 80 % of the cases. In what percent of cases are they likely to agree in stating the fact ? Do you think, when they agree mean both are speaking truth ?

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54. Let  $E_1, E_2, E_3, \dots, E_n$  be independent events with respective probability  $P_1, P_2, P_3, \dots, P_n$  find the probability that none of them occurs.

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55. Let  $E_1, E_2, E_3, \dots, E_n$  be independent events with respective probability  $P_1, P_2, P_3, \dots, P_n$  find the probability that none of them occurs.

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56. Two persons throw a dice alternately till one of them gets a 'six' and wins the game. Find their respective probabilities of winning.

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57. A coin is tossed once. If the shows head, it is tossed again and if it shows tail, then a dice is tossed. Let  $E_1$  be the event

with first toss results into a tail and  $E_2$ , the event: the dice shows a number greater than 4. find  $P(E_2 / E_1)$ .



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**58.** A die is thrown three times. Events A and B are defined as below: A : 4 on the third throw B : 6 on the first and 5 on the second throw Find the probability of A given that B has already occurred.



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**59.** A bag contains 3 red and 4 black balls and another bag has 4 red and 2 black balls. One bag is selected, each of the two bags being equally likely to be selected. From the selected bag, a ball is drawn, each ball in the bag being equally likely to be drawn.

Let  $E_1$  be the event: 'the first bag is selected',  $E_2$ , the event the second bag is selected and  $E_3$ , the event: 'a red ball is drawn'.  
find  $P(E_1)$ ,  $P(E_2)$ ,  $P(E_3/E_1)$  and  $(E_3/E_2)$ .

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**60.** A and B are two independent events. The probability that both A and B occur is  $\frac{1}{6}$  and the probability that neither of them occurs is  $\frac{1}{3}$ . Find the probability of the occurrence of A.

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**61.** If A and B are two independent events such that :  
 $P(\bar{A} \cap B) = \frac{2}{15}$  and  $P(A \cap \bar{B}) = \frac{1}{6}$ , then find  
 $P(A)$  and  $P(B)$ .

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**62.** A box containing 2 Black, 4 White and 3 Red balls. One ball is drawn at random from the box and kept aside. From the remaining balls in the another ball is drawn and kept beside the first. The process is repeated till all the balls are drawn from the box. The probability that the balls drawn from the box are in the sequence 2 Black, 4 White and 3 Red, is



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**63.** Urn A contains 6 red and 4 white balls and urn B contains 4 red and 6 white balls. One ball is drawn at random from urn A and placed in urn B. Then a ball is drawn from urn B and placed in urn A. Now, if one ball is drawn from urn A, the probability that it is red, is



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**64.** A bag contains 3 white and 5 black balls. A ball is drawn at random. Find the chance that it is a black ball.



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**65.** In a multiple choice questions there are four alternative answers, of which one or more correct. A candidate will get marks in the question only if the ticks all the correct answers. The candidate decides to tick answers at random. If the is allowed upto three chances to answer the question, find the probability that he will get marks in the questions.



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**66.** Two persons throw a dice alternately till one of them gets a 'six' and wins the game. Find their respective probabilities of winning.



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**67.** A and B throw a pair of dice alternately. A wins the game if he gets a total of 6 and B wins if he gets a total of 7. If A starts the game, find the probability of winning the game by A in third row of pair of dice.



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**68.** An anti-air craft gun can take maximum four at an enemy plane, moving away from it. The probabilities of hitting the

plane at first, second, third and fourth shot are 0.4, 0.3, 0.2 and 0.1 respectively. What is the probability that the gun hits the plane? Do you agree with us that the success will raise the morale of Indian Army?



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**69.** A coin is tossed twice, what is the probability that: one head and one tail occurs?



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**70.** In a purse there are 10 coins, all shillings except one, which is a sovereign in another purse, there are 10 coins, all shilings. Nine coins are taken from the former purse and put into the latter, and then nine coins are taken from the latter and put

into the former. find the chance that the sovereign is still in the first purse.



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**71.** A bag contains 4 red and 3 black balls. A second bag contains 2 red and 4 black balls. One bag is selected at random. From the selected bag, one ball is drawn. Find the probability that the ball drawn is red.



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**72.** Bag I contains 4 black and 6 red balls, bag II contains 7 black and 3 red balls and bag III contains 5 black and 5 red balls. One bag is chosen at random and a ball is drawn from it which is



found to, be red. Find the probability that the ball is drawn from bag II.



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**73.** A person has undertaken a construction job. The probabilities are 0.65 that there will be strikes 0.80, that the construction job will be completed on time if there is no strike, and 0.32 that the construction job will be completed on time if there is a strike. Determine the probability that the construction job will be completed on time.



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**74.** A company has two plants to manufacture scooters. Plant-1 manufactures 70% of the scooters and Plant-2 manufactures

30%. At plant-1, 80% of the scooters are rated of standard quantity and at plant-2, 90% of the scooters are rated of standard quality. A scooter is chosen at random and is found to be of standard quality. find the probability that it has come from plant-2.



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**75.** Suppose that the reliability of a HIV test is specified as follows: Of people having HIV, 90% of the test detect the disease but 10% go undetected. Of people free of HIV, 99% of the test are judged HIV-free but 1% are diagnosed as showing HIV+ive. From a large population of which only 0.1% have HIV, one person is selected at random, given the HIV test, and the pathologist reports him/her as HIV+ive. What is the probability that the person actually has HIV?



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76. 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.

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77. Coloured balls are distributed in four boxes as shown in the following table:

Box	Colour			
	Black	White	Red	Blue
I	3	4	5	6
II	2	2	2	2
III	1	2	3	1
IV	4	3	1	5

A box is selected at random and then a ball is randomly drawn

from the selected box. The colour of the ball is black. What is the probability that ball drawn is from box III?

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**78.** A pack of playing cards was found to contain only 51 cards. If the first 13 cards which are examined are all red, what is the probability that the missing card is black.

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**79.** A card from a pack of 52 playing cards is lost. From the remaining cards of the pack, three cards are drawn at random (without replacement) and are found to be all spades. Find the probability that the lost card being a spade.

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**80.** A man is known to speak the truth 3 out of 4 times. He throws a die and reports that it is a six. Find the probability that it is actually a six.



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**81.** A factory has three machines X, Y and Z producing 1000, 2000 and 3000 bolts per day respectively. The machine X produces 1% defective bolts, Y produces 1.5% and Z produces 2% defective bolts. At the end of a day, a bolt is drawn at random and is found defective. what is the probability that the defective bolt is produced by the machine X?



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**82.** In a factory which manufactures bolts, machines A, B and C manufacture respectively 30%, 50% and 20% of the bolts. Of their outputs 3, 4, 1 percent respectively are defective bolts. A bolt is drawn at random from the product and is found to be defective. Find the probability that this is not manufactured by machine B.



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**83.** Give three identical boxes I, II and III, each containing two coins. In box I both coins are gold coins, in box II both are silver coins and in box III there is one gold and one silver coin. A person chooses a box at random and takes out a coin. If the coin is of gold, what is the probability that the other coin in the box is also of gold?



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**84.** There are three coins. One of the two headed coin another is a biased coin that comes up heads 75% of the times and the third is also a biased coin tht comes up tails 40% of the times. One of the three coins is chosen at random and tossed, and it shows head. what is the probability that it is a two headed coin?



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**85.** In a set of 10 coins, 2 coins with heads on both sides. A coin is selected at random from this set and tossed five times. Of all the five times, the result was head, find the probability that the selected coin had heads on both sides.



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**86.** A bag contains 2 red and 3 black balls. One ball is drawn and then put back in the bag. The process is repeated three times. Every time the ball drawn happens to be red we say that the saw has resulted in a success. Let  $X$  denote the number of success recorded in 3 draws. show that  $X$  can be considered as random variable and exhibit it as a function one the sample space of the experiment.



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**87.** A person plays a game of tossing a coin thrice. For each head he is given Rs 2 by the organiser of the game and for each tail he has to give Rs 1.50 to the organiser. Let  $X$  denote the amount gained or lost by the person. Show that ' $X$ ' is a random variable and exhibit it as a function on the sample space of the experiment.





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**88.** A dice is tossed twice. A success is getting an even number on a toss. Find the probability distribution of the number of success. Also draw the table of this probability distribution.



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**89.** Three cards are drawn successively with replacement from well- shuffled deck of 52 cards. A random variable  $X$  denotes the number of spades in three cards. Determine the probability distribution of  $X$  .



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**90.** Find the probability distribution of the random variable  $X$  which denotes the number of times 'a total of 9' appears in two throws of a pair of dice. Sketch its graph.



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**91.** Find the probability distribution of number of doublets in 2 throws a pair of dice.



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**92.** A box contains 12 bulbs of which 3 are defective. A sample of 3 bulbs is selected from the box. Let  $X$  denotes the number of defective bulbs in the sample, find the probability distribution of  $X$ .



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**93.** Let  $X$  denotes the number of hours you study during a randomly selected schoold day. The probabildity  $X$  can take the value of  $x$  is given by

$$P(X = x) = \begin{cases} 0.1 & \text{if } x = 0 \\ kx & \text{if } x = 1 \text{ or } 2 \\ k(5 - x) & \text{if } x = 3 \text{ or } 4 \\ 0 & \text{otherwise} \end{cases}$$

where  $k$  is some unknown constant

Find the value of  $k$ .

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**94.** Let  $X$  denotes the number of hours you study during a randomly selected schoold day. The probabildity  $X$  can take the value of  $x$  is given by

$$P(X = x) = \begin{cases} 0.1 & \text{if } x = 0 \\ kx & \text{if } x = 1 \text{ or } 2 \\ k(5 - x) & \text{if } x = 3 \text{ or } 4 \\ 0 & \text{otherwise} \end{cases}$$

where k is some unknown constant

What is the probability that you study for

atleast two hours?



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**95.** Let X denotes the number of hours you study during a randomly selected schoold day. The probabildity X can take the value of x is given by

$$P(X = x) = \begin{cases} 0.1 & \text{if } x = 0 \\ kx & \text{if } x = 1 \text{ or } 2 \\ k(5 - x) & \text{if } x = 3 \text{ or } 4 \\ 0 & \text{otherwise} \end{cases}$$

where k is some unknown constant

What is the probability that you study for

exactly two hours?



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**96.** Let  $X$  denotes the number of hours you study during a randomly selected schoold day. The probabildity  $X$  can take the value of  $x$  is given by

$$P(X = x) = \begin{cases} 0.1 & \text{if } x = 0 \\ kx & \text{if } x = 1 \text{ or } 2 \\ k(5 - x) & \text{if } x = 3 \text{ or } 4 \\ 0 & \text{otherwise} \end{cases}$$

where  $k$  is some unknown constant

What is the probability that you study for atmost two hours?



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**97.** Find the mean and variance of the random variable  $X$ , whose probability distribution is given by the following table:

<b>X</b>	-2	-1	0	1	2	3
<b>P(X)</b>	0.10	0.20	0.30	0.20	0.15	0.05

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98. A discrete random variable  $X$  has the following the probability distribution:

<b>X</b>	0.5	1	1.5	2
<b>P(X)</b>	$k$	$k^2$	$2k^2$	$k$

Determine the value of  $k$ .

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99. A discrete random variable  $X$  has the following the probability distribution:

<b>X</b>	<b>0.5</b>	<b>1</b>	<b>1.5</b>	<b>2</b>
<b>P(X)</b>	<b>k</b>	<b>k<sup>2</sup></b>	<b>2k<sup>2</sup></b>	<b>k</b>

Determine the mean of the distribution.

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**100.** The probability distribution of a random variable X is given as under:

<b>X</b>	<b>1</b>	<b>2</b>	<b>4</b>	<b>2k</b>	<b>3k</b>	<b>5k</b>
<b>P(X)</b>	<b><math>\frac{1}{2}</math></b>	<b><math>\frac{1}{5}</math></b>	<b><math>\frac{3}{25}</math></b>	<b><math>\frac{1}{10}</math></b>	<b><math>\frac{1}{25}</math></b>	<b><math>\frac{1}{25}</math></b>

Calculate the value of k if  $E(X)=2.94$ .

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101. The probability distribution of a random variable  $X$  is given as under:

<b><math>X</math></b>	<b>1</b>	<b>2</b>	<b>4</b>	<b><math>2k</math></b>	<b><math>3k</math></b>	<b><math>5k</math></b>
<b><math>P(X)</math></b>	<b><math>\frac{1}{2}</math></b>	<b><math>\frac{1}{5}</math></b>	<b><math>\frac{3}{25}</math></b>	<b><math>\frac{1}{10}</math></b>	<b><math>\frac{1}{25}</math></b>	<b><math>\frac{1}{25}</math></b>

given  $E(x)=2.94$  Calculate variance of  $X$ .



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102. Two cards are drawn with replacement from a well shuffled deck of 52 cards. Find  $\mu$  and  $\sigma$  for the number of aces.



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**103.** Two cards are drawn simultaneously (or successively without replacement) from a well shuffled pack of 52 cards. Find the mean, variance and standard deviation of the number of kings.

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**104.** Find the mean and standard deviation of the probability distribution of the number obtained when a card is drawn at random from a set of 7 cards numbered 1 to 7.

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**105.** There are 5 cards numbered 1 to 5, one number on one card. Two cards are drawn at random without replacement. Let

$X$  denote the sum of the numbers on the two cards drawn. Find the mean and variance of  $X$ .

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**106.** A dice is thrown thrice. Find the mean and variance of the number of times a 'six' is obtained.

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**107.** Find the probability distribution of the number of heads when three coins are tossed.

Also find the mean number of heads in the above case.

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**108.** A pair of dice is rolled twice. Let  $X$  denote the number of times, 'a total of 9 is obtained'. Find the mean and variance of the random variable  $X$ .



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**109.** Find the probability distribution of the maximum of the two scores obtained when a dice is thrown twice. Determine also the mean of the distribution.



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**110.** Two numbers are selected at random from first six positive integers. Let  $X$  denote the larger of the two numbers obtained.

Find the probability distribution of  $X$ . find the mean and variance of this distribution.



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**111.** On one of 8 identical slips of paper, it is written 0, on the other it is written 3, on three of them it is written 1 on the top of the remaining three it is written 2. slips are folded and mixed thoroughly. One slip is drawn at random. If  $X$  is the number on the slip, find the probability distributoin of  $X$ . also find the mean and variance.



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**112.** Suppose 10000 tickets are sold in a lottery each for Rs.1. first prize is of Rs. 3000 and the second prize is of Rs. 2000. There

are three 3rd prizes of Rs.500 each. If you buy one ticket, what is your expectation?



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**113.** Determine the binomial distribution whose mean is 10 and whose standard deviation is  $2\sqrt{2}$ .



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**114.** A pair of dice is thrown 200 times. If getting a sum of 9 is considered a success, find the mean and the variance of the number of success.



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**115.** A dice is thrown 3 times. If getting 'six' is considered a success, find the probability of 3 successes.



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**116.** A die is thrown 3 times. If getting an multiple of 3 is considered a success, find the probability of at least 2 successes.



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**117.** Two dice are thrown 6 times. 'A total of 7' is considered as success. Find the probability of atleast 4 successes.



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**118.** If eight fair coins are tossed, what is the probability that there are exactly 3 heads.



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**119.** If eight fair coins are tossed, what is the probability that there are not more than 3 heads?



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**120.** If a fair coin is tossed 10 times, find the probability of: exactly six heads



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**121.** An unbiased coin is tossed 10 times. Find by using binomial distribution, the probability of getting atleast six heads.



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**122.** An unbiased coin is tossed 10 times. Find by using binomial distribution, the probability of getting atmost six heads.



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**123.** A pair of dice is thrown 5 times. If getting a doublet is considered a success, find the probability of 2 successes.



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**124.** There are 6% defective items in a large bulk of items. Find the probability that a sample of 8 items will include not more than one (or less than two) defective item.



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**125.** Ten eggs are drawn successively with replacement from a lot containing 10% defective eggs. Find the probability that there is at least one defective egg.



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**126.** From a lot of 15 bulbs which include 5 defectives, a sample of 4 bulbs is drawn one by one with replacement. Find the

probability distribution of the number of defective bulbs. Hence, find the mean of the distribution.



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**127.** A die is thrown again and again until three sixes are obtained. Find the probability of obtaining the third six in the sixth throw of the die.



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**128.** Four cards are drawn successively with replacement from a well shuffled deck of 52 cards. What is the probability that all the four cards are spades?



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**129.** Four cards are drawn successively with replacement from a well shuffled deck of 52 cards. What is the probability that only 3 cards are spades?

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**130.** Five cards are drawn successively with replacement from a well shuffled deck of 52 cards. What is the probability that none is a spade?

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**131.** A coin is tossed 5 times. What is the probability that head appears on odd number of times?

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**132.** A bag contains 7 red, 4 white and 5 black balls. If four balls are drawn one by one the replacement, what is the probability that  
atleast one is white?



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**133.** A bag contains 7 red, 4 white and 5 black balls. If four balls are drawn one by one the replacement, what is the probability that  
only two are white?



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**134.** A bag contains 7 red, 4 white and 5 black balls. If four balls are drawn one by one the replacement, what is the probability that only two are white?



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**135.** A bag contains 7 red, 4 white and 5 black balls. If four balls are drawn one by one the replacement, what is the probability that atleast one is white?



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**136.** Five dice are thrown 729 times. How many times do you expect that at least four dice to show five or six?



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**137.** An experiment succeeds thrice as often as it fails. Find the probability that in the next five trials, there will be at least 3 successes.



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**138.** A coin is thrown 10 times and getting a head is considered a success. Find the mean and the standard deviation of the number of success.



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**139.** If the sum of the mean and variance of a binomial distribution of 5 trials is  $\frac{35}{16}$ , find the distribution.



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**140.** The sum of mean and variance of a binomial distribution is 15 and their product is 54. find the distribution.



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**141.** For 6 trials of an experiment. Let X be a binomial variate which satisfies the relation  $9P(X=4)=P(X=2)$

Find the probability of success.



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**142.** True/False:

The probability of losing a game is 0.7. The probability of winning the game is 0.3.



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**143.** One hundred identical coins, each with probability  $p$  of showing up a head are tossed once. if  $0 < p < 1$  and the probability of heads showing on 50 coins is equal to that of showing on 51 coins, then find the value of  $p$ .



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**144.** How many times must a fair coin be tossed so that the probability of getting at least one head is more than 80%?





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**145.** Find the minimum number of tosses of a pair of a dice, so that the probability of getting the sum of the digits on the dice equal to 7 on atleast one toss, is greater than 0.95. (Given  $(\log_{10})2 = 0.3010$ ,  $(\log_3)3 = 0.4771$ )

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**146.** The probability of a shooter hitting a target is  $\frac{3}{4}$ . How many minimum number of times must he/she fire so that the probability of hitting the target at least once is more than 0.99?

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147. A man takes a step forward with probability 0.4 and backwards with probability 0.6 find the probability that at the end of eleven steps he is one step away from the starting point.



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148. Describe the distribution  $B\left(4, \frac{1}{3}\right)$ . Also find the mean and variance.



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## Exercise

1. A dice is rolled twice in succession. Find the probability of a number greater than 4 on each throw.



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2. There are two independent events  $E_1$  and  $E_2$  and  $P(E_1) = 0.30$ ,  $P(E_2) = 0.60$  find the probability that both  $E_1$  and  $E_2$  occur.



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3. There are two independent events  $E_1$  and  $E_2$  and  $P(E_1) = 0.30$ ,  $P(E_2) = 0.60$  find the probability that both  $E_1$  and  $E_2$  occur.



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4. There are two independent events  $E_1$  and  $E_2$  and  $P(E_1) = 0.30$ ,  $P(E_2) = 0.60$  find the probability that one and only one event happens.



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5. There are two independent events  $E_1$  and  $E_2$  and  $P(E_1) = 0.30$ ,  $P(E_2) = 0.60$  find the probability that at least one of  $E_1$  and  $E_2$  happens.



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6. Let  $E_1$  and  $E_2$  be two independent events such that  $P(E_1) = \rho_1$  and  $P(E_2) = \rho_2$ . Describe in words, the events

probabilities are

$$\rho_1\rho_2.$$



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7. Let  $E_1$  and  $E_2$  be two independent events such that  $P(E_1) = \rho_1$  and  $P(E_2) = \rho_2$ . Describe in words, the events probabilities are

$$\rho_1\rho_2.$$



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8. Let  $E_1$  and  $E_2$  be two independent events such that  $P(E_1) = \rho_1$  and  $P(E_2) = \rho_2$ . Describe in words, the events probabilities are

$$1 - (1 - \rho_1)(1 - \rho_2)$$

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9. Let  $E_1$  and  $E_2$  be two independent events such that  $P(E_1) = \rho_1$  and  $P(E_2) = \rho_2$ . Describe in words, the events probabilities are

$$\rho_1 + \rho_2 - 2\rho_1\rho_2.$$

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10. A bag contains 5 red, 7 green and 4 white balls. Three balls are drawn one after another without replacement. Find the probability that the balls drawn are white, red and green in this very order.

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11. A bag contains 5 red, 7 green and 4 white balls. Three balls are drawn one after another without replacement. Find the probability that the balls drawn are white, red and green in this order.

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12. A bag contains 5 white, 7 red and 8 black balls. If four balls are drawn one by one without replacement, what is the probability that all are white?

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13. If  $A$  and  $B$  are two independent events such that  $P(A \cup B) = 0.6$  and  $P(A) = 0.2$  find  $P(B)$ .

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14. If A and B are two independent events such that  $P(A \cup B) = 0.5$ ,  $P(B) = 0.2$  find  $P(A)$ .



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15. Two dice are thrown together and the total score is noted. The events E, F and G are respectively, a total of 4, a total of 9 or more, and 'a total divisible by 5' calculate  $P(E)$ ,  $P(F)$  and  $P(G)$  and decide which pair of events, if any, are independent.



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16. Three events A, B and C have probabilities  $\frac{2}{5}$ ,  $\frac{1}{3}$  and  $\frac{1}{2}$ , respectively. Given that  $P(A \cap C) = \frac{1}{5}$  and  $P(B \cap C) = \frac{1}{4}$ ,



find the values of  $P(C | B)$  and  $P(A' \cap C')$



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**17.** A coin is tossed successively three times. Determine the probability of getting exactly two heads.



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**18.** Three coins are tossed once. Find the probability of getting at least two heads.



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19. Three coins are tossed. Find the probability of : atmost two heads



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20. A coin and a dice are thrown. What is the probability of getting "a head or an even number"?



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21. Two dice are tossed. Find whether the following two events A and B are independent:

$A = \{(x, y) : x + y = 11\}$ ,  $B = \{(x, y) : x \neq 5\}$ , where  $(x, y)$  denotes a typical sample point.



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**22.** Two dice are thrown together. Let A be the event 'getting 6 on the first dice' and B be the event getting 2 on the second dice. Are the events A and B independent?



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**23.** An urn contains 7 red and 4 blue balls. Two balls are drawn at random with replacement. Find the probability of getting 2 red balls.



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**24.** An urn contains 7 red and 4 blue balls. Two balls are drawn at random with replacement. Find the probability of getting 2 blue balls.



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**25.** An urn contains 7 red and 4 blue balls. Two balls are drawn at random with replacement. Find the probability of getting one red and one blue ball.



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**26.** A husband and his wife appear for an interview for two parts. The probability of husband's selection is  $\frac{1}{7}$  and that of wife's selection is  $\frac{1}{5}$ . What is probability that both of them will be selected?



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27. A husband and his wife appear for an interview for two parts. The probability of husband's selection is  $\frac{1}{7}$  and that of wife's selection is  $\frac{1}{5}$ . What is probability that only one of them is selected?

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28. A husband and his wife appear for an interview for two parts. The probability of husband's selection is  $\frac{1}{7}$  and that of wife's selection is  $\frac{1}{5}$ . What is probability that none of them will be selected?

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**29.** In a family, the husband tells a lie in 30% cases and the wife in 35% cases. Find the probability that both contradict each other on the same fact.



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**30.** A speaks truth in 75% of the cases. While B in 90% of the cases. In what percent of cases are they likely to contradict each other in stating in the same fact? Do you think that statement of B is true?



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**31.** Three cards are drawn with replacement from a well shuffled pack of cards. Find the probability of cards drawn are a king, a

queen and a jack.



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**32.** From a pack of 52 cards, 3 cards are drawn at random. Find the probability of drawing exactly two aces.



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**33.** A problem in statistics is given to three students whose chances of solving it are  $\frac{1}{2}$ ,  $\frac{1}{3}$  or  $\frac{1}{4}$  respectively. What is the probability that only one of them solve it correctly.



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**34.** Two cards are drawn from a well shuffled of 52 cards. One after another without replacement. Find the probability that one of these is a red card and the other a black card.



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**35.** A and B appeared for an interview for two posts. Probability of A selection is  $\frac{3}{5}$  and that of B is selection is  $\frac{3}{7}$ . Find the probability that only one of them is selected.



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**36.** Ramesh appears for an interview for two posts A and B for which selection is independent. The probability of his selection



for post A is  $\frac{1}{6}$  and for post B is  $\frac{1}{7}$ . Find the probability that

Ramesh is selected for at least one of the posts.



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**37.** Tickets are numbered from 1 to 10. two tickets are drawn one after the other at random. Find the probability that the number on one of the tickets is a multiple of 5 and on the other a multiple of 4.



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**38.** A die is thrown twice and the sum of the numbers appearing is observed to be 6. What is the conditional probability that the number 4 has appeared at least once?



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**39.** If a dice is thrown 3 times in succession. What is the probability that all throws are alike?

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**40.** If a dice is thrown 3 times in succession. What is the probability that all throws are alike?

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**41.** What is the chance of throwing an ace in only in first of two successive throws with an ordinary dice?



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**42.** In a thrown of three dice, find the probability that atleast one dice shows up 1.

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**43.** A bag contains 5 white and 3 black balls. Four balls are successively drawn out without replacement . What is the probability that they are alternately of different colours ?

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**44.** A bag contains 8 red, 3 white and 9 blue balls. If three balls are drawn at random, determine the probability that all the three balls are blue.



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**45.** A bag contains 8 red, 3 white and 9 blue balls. If three balls are drawn at random, determine the probability that all the balls are of different colour.



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**46.** A dice is thrown 3 times and the sum of the 3 numbers thrown is 15. The probability that the first thrown was a four, is



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**47.** Two drawings, each of 3 balls, are made from a bag containing 5 white balls and 8 black balls, the balls not being

replaced before the second trial. Find the probability that the first drawing will give three white, and the second three black balls.



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**48.** Two drawings each of 3 balls, are made from a bag containing 5 white and 8 black balls, the balls being replaced before the second trial. Find the chance that the first drawing will give 3 white, and the second 3 black balls.



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**49.** In three throws with a pair of dice, find the chance of throwing doublet at least once.



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50. In four throws with a pair of dice, what is probability of throwing doublet at least twice .



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51. An anti-air craft gun can take maximum four at an enemy plane, moving away from it. The probabilities oh hitting the plane at first, second, third and fourth shot are 0.4, 0.3, 0.2 and 0.1 respectively. What is the probability that the gun hits the plane? Do you agree with us that the success will raise the morale of Indian Army?



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**52.** A card is drawn from a well shuffled deck of 52 cards. The outcome is noted. The card is replaced and the deck reshuffled. Another card is then drawn from the deck. What is the probability that both the cards are of the same suit?



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**53.** A card is drawn from a well shuffled deck of 52 cards. The outcome is noted. The card is replaced and the deck reshuffled. Another card is then drawn from the deck. What is the probability that both the cards are aces?



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**54.** A card is drawn from a well shuffled deck of 52 cards. The outcome is noted. The card is replaced and the deck reshuffled. Another card is then drawn form the deck. What is the probability that the first card is an ace and the second card is a red queen?



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**55.** A card is drawn from a well shuffled deck of 52 cards. The outcome is noted. The card is replaced and the deck reshuffled. Another card is then drawn form the deck. What is the probability that both are face cards?



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**56.** A bag contains 4 white and 7 black and 5 red balls. 4 balls are drawn one by one with replacement. What is the probability that at least two are white?



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**57.** A bag contains 17 balls marked with the numbers 1 to 17. a ball is drawn and replaced. A second drawing is then made. What is the probability that the first ball is drawn is even numbered and the second odd numbered?



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**58.** A bag contains 3 red and 5 black balls and second bag contains 6 red and 4 black balls . A ball is drawn from each bag .

Find the probability that one is red and other is black .



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**59.** A bag contains 4 white balls and 2 black balls. Another bag contains 3 white balls and 5 black balls. If one ball is drawn from each bag, find the probability that both are white.



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**60.** A bag contains 4 white balls and 2 black balls. Another bag contains 3 white balls and 5 black balls. If one ball is drawn from each bag, find the probability that both are black.



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**61.** A bag contains 4 white balls and 2 black balls. Another bag contains 3 white balls and 5 black balls. If one ball is drawn from each bag, find the probability that one is white and one is black.



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**62.** In bag A, there are 5 white and 8 red balls, in bag B, 7 white and 6 red balls and in bag C, 6 white and 5 red balls. One ball is taken out a random from each bag. Find the probability that all the three balls are of the same colour.



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**63.** One bag contains 5 white and 6 black balls. Another bag contains 7 white and 3 black balls. One ball at random is transferred from the first bag to the second bag and then a ball is drawn from the second bag. Find the probability that the ball drawn is white.



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**64.** one bag contains 6 white and 5 black balls. Another bag contains 5 white and 3 black balls. One ball at random is transferred from the first bag to the second bag and then a ball is drawn from the second bag. Find the probability that the ball drawn is white.



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**65.** A bag contains 4 white and 5 black balls. Another bag contains 9 white and 7 black balls. A ball is transferred from the first bag to the second and then a ball is drawn at random from the second bag. Find the probability that the ball drawn is white.



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**66.** A dice is so biased that it is twice as likely to show an even number as an odd number when thrown. It is thrown twice. What is the probability that the sum of the two numbers thrown is even.



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**67.** A and B take turn in throwing two dice. The first to throw 9 being awarded. Show that if A has the first throw, their chances of winning are in the ratio 9:8.



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**68.** A and B throw a pair of dice alternately, till one of them gets a total of 10 and wins the game. Find their respective probabilities of winning if A starts first.



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**69.** In a single throw of three dice, find the probability of getting a total of 5



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**70.** In a single throw of three dice, find the probability of getting a total of 5



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**71.** One card is drawn at random from a well shuffled deck of 52 cards. In which of the following cases are the events E and F independent ? E : 'the card drawn is a king or queen' F : 'the card drawn is a queen or jack'.



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**72.** One card is drawn from a pack of 52 cards to that each card is equally likely to be selected. In which of the following cases are the events  $E_1$  and  $E_2$  independent?

$E_1$ : 'the card drawn is a diamond'

$E_2$ : 'the card drawn is a queen'.



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**73.** One card is drawn from a pack of 52 cards to that each card is equally likely to be selected. In which of the following cases are the events  $E_1$  and  $E_2$  independent?

$E_1$ : 'the card drawn is red'

$E_2$ : 'the card drawn is a jack'.



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**74.** State which of the following events are independent. Give reasons for your answer:

$E_1$ : 'an even number on first throw'



$E_2$ : 'a number multiple of 3 on second throw' in two successive throws of a dice.



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**75.** State which of the following events are independent. Give reasons for your answer:

$E_1$ : '2 tails on first throw'

$E_2$ : '2 heads on second throw' in two successive throws of two coins.



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**76.** State which of the following events are independent. Give reasons for your answer:

$E_1$ : 'a total of 9 on first throw'

$E_2$ : 'a total of 9 on second throw' in two successive throws of a pair of dice.



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77. Two natural numbers  $r, s$  and drawn one at a time, without replacement from the set  $S = \{1, 2, 3, \dots, n\}$ . Find the  $P\left[r \leq \frac{p}{s} \leq p\right]$ , where  $p \in S$ .



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78. There are 2 bag, one of which contains 3 black and 4 white balls, while the other contains 4 black and 3 white balls. A die is cast. If the face 1 or 3 turns up a ball is taken out from the first bag and if any other face turns up, a ball is taken from the second bag. The probability of choosing a black ball, is



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**79.** An urn contains 2 white and 2 black balls. A ball is drawn at random. If it is white, it is not replaced into urn, otherwise it is replaced along with another ball of the same colour. The process is repeated, find the probability that the third ball drawn is black.



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**80.** A family has two children. What is the probability that both the children are boys given that at least one of them is a boy ?



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**81.** A couple has two children, find the probability that both children are females, if it is known that the elder child is a female.



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**82.** Consider the experiment of tossing a coin. If the coin shows head, toss it again but if it shows tail, then throw a die. Find the conditional probability of the event that the die shows a number greater than 4, given that there is at least one tail.



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**83.** A purse contains 2 silver and 4 copper coins. A second purse contains 4 silver and 3 copper coins. If a coin is pulled at

random from one of the two purses, what is the probability that it is a silver coin?



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**84.** Bag I contains 3 black and 2 white balls, Bag II contains 2 black and 4 white balls. A bag and then a ball is selected at random. Determine the probability of selecting a black ball.



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**85.** Find the probability of drawing one rupee coin from a purse with two compartments one of which contains 3 fifty paise coins and 2 one rupee coins and the other contains 2 fifty paise coins and 3 one rupee coins.



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**86.** Three bags A, B and C contain 6 red, 4 black and 5 red, 5 black balls and 4 red, 6 black balls respectively. A bag is selected at random (each of the three bags being equally likely to be selected) and from the selected bag, a ball is drawn at random. If this ball is found to be red, find the probability that it is drawn from the bag A.



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**87.** There are three urns containing 2 white and 3 black balls, 3 white and 2 black balls, and 4 white and 1 black balls respectively. There is an equal probability of each urn being chosen. A ball is drawn at random from an urn chosen at random and is found to be white. Find the probability that the ball has been drawn from the second urn.



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**88.** There are two bags I and II. Bag I contains 4 white and 3 red balls while another Bag II contains 3 white and 7 red balls. One ball is drawn at random from one of the bags and it is found to be white. Find the probability that it was drawn from Bag I.



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**89.** A bag X contains 4 white balls and 2 black balls, while another bag Y contains 3 white balls and 3 black balls. Two balls are drawn (without replacement) at random from one of the bags and were found to be one white and one black. Find the probability that the balls were drawn from bag Y.



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**90.** The contents of three bags A, B and C are as follows:

Bag A: 1 white, 2 black and 3 red balls, Bag B: 2 white, 1 black and 1 red balls.

Bag C: 4 white, 5 black and 3 red balls.

A bag is selected at random. Two balls are drawn from the selected bag. if these found to be white and red, find the probability that they have been drawn from bag A.



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**91.** The contents of three bags A, B and C are as follows:

Bag A: 1 white, 2 black and 3 red balls, Bag B: 2 white, 1 black and 1 red balls.

Bag C: 4 white, 5 black and 3 red balls.



A bag is selected at random. Two balls are drawn from the selected bag. if these found to be white and red, find the probability that they have been drawn from bag B.



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**92.** In a bolt factory, machines A, B and C manufacture respectively 25%, 35%, 40% of the total. Of their output 5,4 and 2% are defective. A bolt is drawn at random from the product. What is the probability that the bolt drawn is defective?



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**93.** In a tape recorder factory, three machines A, B and C produced 25%, 35% and 40% respectively. The percentage of

defective output of these machines are 5%, 4% and 2% respectively. A tape recorder is selected at random and is found to defective. Find the probability that tape recorder is produced by machine B .



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**94.** In a bolt factory, machines A, B and C manufacture respectively 25%, 35%, 40% of the total. Of their output 5,4 and 2% are defective. A bolt is drawn at random from the product. What is the probability that the bolt drawn is defective?



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**95.** An item is manufacture by three machines A, B and C. out of the total number of items manufactured during a specified

period, 50% are manufactured on A, 30% on B and 20% on C. 2% of the items produced on A and 2% of items produced on B are defective, and 3% of these produced on C are defective. All the items are stored at one godown. One item is drawn at random and is found to be defective. What is the probability that it is manufactured on machine A?



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**96.** Three machines  $E_1$ ,  $E_2$ ,  $E_3$  in a certain factory produce 50%, 25% and 25% respectively of the total daily output of electric tubes. It is known that 4% of the tubes produced by each of machines  $E_1$  and  $E_2$  are defective, and that 5% of those produced on  $E_3$  are defective. If one tube is picked up at random from a day's production, calculate the probability that it is defective.



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**97.** Three machines  $E_1, E_2, E_3$  in a certain factory produce 50%, 25% and 25% respectively of the total daily output of electric tubes. It is known that 4% of the tubes produced by each of machines  $E_1$  and  $E_2$  are defective, and that 5% of those produced on  $E_3$  are defective. If one tube is picked up at random from a day's production, calculate the probability that it is defective.

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**98.** An insurance company insured 3000 scooters, 4000 cars and 5000 trucks. The probabilities of an accident involving a scooter, a car and a truck are 0.02, 0.03, 0.04 respectively. One of the

insured vehicles meets with an accident. Find the probability that it is a car.



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**99.** An insurance company insured 3000 scooters, 4000 cars and 5000 trucks. The probabilities of an accident involving a scooter, a car and a truck are 0.02, 0.03, 0.04 respectively. One of the insured vehicles meets with an accident. Find the probability that it is a car.



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**100.** An insurance company insured 3000 scooters, 4000 cars and 5000 trucks. The probabilities of an accident involving a scooter, a car and a truck are 0.02, 0.03, 0.04 respectively. One of

the insured vehicles meets with an accident. Find the probability that it is a car.



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101. Three bags contains a balls as shown in the following table:

Bag	Number of		
	White balls	Black balls	Red balls
I	1	2	3
II	2	1	1
III	4	3	2

A bag is selected at random and two balls are drawn. They happen to the white and red. What is the probability that they come from the third bag.



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**102.** Bag I contains 3 red and 4 black balls and Bag II contains 4 red and 5 black balls. One ball is transferred from Bag I to Bag II and then a ball is drawn from Bag II. The ball so drawn is found to be red in colour. Find the probability that the transferred ball is black

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**103.** A car manufacturing factory has two plants X and Y. Plant X manufactures 70% of the cars and plant Y manufactures 30%. 80% of the cars at plant X and 90% of the cars at plant Y are rated of standard quality. A car is chosen at random and is found to be of standard quality what is the probability that it comes from plant X

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**104.** Suppose you have two coins which appear identical in your pocket. You know that one coin is fair and the other is 2 handed. If you take out one coin, toss it and get and a head, what is the probability that it is a fair coin?



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**105.** A bag contains  $(2n + 1)$  coins. It is known that  $n$  of these coins have a head on both side whereas the rest of the coins are fair A coin is plaked up at random from the bag and is tossed. If the probability that the toss results in a head is  $\frac{31}{42}$ , determine the value of  $n$ .



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**106.** A letter is known to have come from TATANAGAR or from CALCUTTA. On the envelope, just two consecutive letter. TA are visible. What is the probability that the letter had come from TATANAGAR?



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**107.** Suppose that 6% of the persons with blood group O are left handed and 10% of those with other blood groups are left handed. It is given that 30% of the persons have blood group O. if a left handed person is selected at random. What is the probability that the person has blood group O.



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**108.** By examining the chest X-ray, the probability that TB is detected when a person is actually suffering is 0.99. the probability of a healthy person diagnosed to have TB is 0.001. In a certain city, 1 in 1000 persons suffer from TB. A person is selected at random and is diagnosed to have TB. what is the probability that the actual suffers from TB?



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**109.** A doctor is to visit a patient. From the past experience, it is known that the probabilities that he will come by train, bus, scooter or by other means of transport are respectively  $\frac{3}{10}$ ,  $\frac{1}{5}$ ,  $\frac{1}{10}$  and  $\frac{2}{5}$ . The probabilities that he will be late are  $\frac{1}{4}$ ,  $\frac{1}{3}$ ,  $\frac{1}{12}$ , if he comes by train, bus and scooter respectively, but if he comes by other means of transport, then he will not be

late. When he arrives, he is late. What is the probability that he comes by train?



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**110.** A shopkeeper sells three types of flower seeds  $A_1$ ,  $A_2$  and  $A_3$ . They are sold as a mixture whereas the proportions are 4:4:2 respectively. The germination rates of the three types of the seeds are 45%, 60%, 35%. Find the probability of a randomly chosen seed to germinate.



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**111.** A shopkeeper sells three types of flower seeds  $A_1$ ,  $A_2$  and  $A_3$ . They are sold as a mixture whereas the proportions are 4:4:2 respectively. The germination rates of the

three types of the seeds are 45%, 60%, 35%. Find the probability that it will be not geminate given that it is of the type  $A_3$ .



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**112.** A shopkeeper sells three types of flower seeds  $A_1$ ,  $A_2$  and  $A_3$ . They are sold as a mixture whereas the proportions are 4:4:2 respectively. The germination rates of the three types of the seeds are 45%, 60%, 35%. Find the probability that it is of type  $A_2$  given that a randomly chosen seed does not germinate.



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**113.** If a machine is correctly set up, it produces 90% acceptable items. If it is incorrectly set up, it produces only 40% acceptable

items. Past experience shows that 80% of the set ups are correctly done. If after a certain set up, the machine produces 2 acceptable items, find the probability that the machine is correctly setup.



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**114.** A girl throws a die. If she gets 5 or 6, tosses a coin three times and notes the number of heads. If she gets 1,2,3 or 4, she tosses a coin two times and notes the number of heads. If she obtained exactly two heads, what is the probability that she throws 1,2,3 or 4 with the die.



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**115.** Find the probability distribution of a random variable  $X$  which denotes the number of tails in two tosses of a coin.



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**116.** Find the mean and variance of the number of heads on the throw of three coins.



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**117.** A dice is rolled thrice. If getting a four is considered a success, find the mean and the variance of the probability distribution of the number of success.



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**118.** Find the probability distribution of the number of successes in two tosses of a die, where a success is defined as : number greater than 4

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**119.** Two dice are thrown simultaneously. If  $X$  denotes the numbers of sixes obtained, find probability distribution of  $X$  and also is mean and variance.

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**120.** Two cards are drawn with replacement from a well shuffled deck of 52 cards. Find  $\mu$  and  $\sigma$  for the numebr of queens drawn.

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**121.** Two cards are drawn one after the other from a well shuffled pack of 52 cards. Find the mean and variance of the number of red cards.



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**122.** An urn contains 4 white and 3 red balls. Find the probability distribution of the number of red balls in three draws, with replacement from an urn.



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**123.** Four balls are to be drawn without replacement from a box containing 8 red and 4 white balls. If  $X$  denotes the number of red balls drawn, find the probability distribution of  $X$ .





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**124.** Four defective oranges are accidentally mixed with 16 good ones and by looking at them it is not possible to differentiate between them. Three oranges are drawn at random from the lot. Find the probability distribution of  $X$ , the number of defective oranges.

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**125.** A bag contains 2 white , 3 red and 4 blue balls. Two balls are drawn at random from the bag . If the random variable  $X$  denotes the number of white balls among the two balls drawn, describe the probability distribution of  $X$  :

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**126.** Calculate the mean variance and standard deviation of a number obtained as a result of throwing an unbiased die.



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**127.** Calculate the mean, variance and standard deviation of number of heads in two tosses of a coin.



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**128.** A die is tossed once. Let a random variable  $X$  be defined as

$$X = \begin{cases} 0 & \text{if the die shows an odd number} \\ 1 & \text{if the die shows an even number} \end{cases}$$

Find the probability distribution of  $X$ . Also find the mean and variance.

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**129.** From a lot of 30 bulbs which include 6 defectives, a sample of 4 bulbs is drawn at random with replacement. Find the probability distribution of the number of defective bulbs.

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**130.** A coin is biased so that the head is 3 times as likely to occur as tail. If the coin is tossed twice, find the probability distribution of number of tails.

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**131.** Two bad eggs are mixed accidentally with 10 good ones. Find the probability distribution of the number of bad eggs in 3 eggs drawn at random in succession, without replacement from a lot. Find the mean number of bad eggs drawn.

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**132.** Find the variance of the distribution:

<b>X</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>P(X)</b>	$\frac{1}{6}$	$\frac{5}{18}$	$\frac{2}{9}$	$\frac{1}{6}$	$\frac{1}{9}$	$\frac{1}{18}$

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**133.** Consider the probability distribution of a random variable

X:

X	0	1	2	3	4
P(X)	0.1	0.25	0.3	0.2	0.15

Compute

variance (X).



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**134.** Consider the probability distribution of a random variable

X:

X	0	1	2	3	4
P(X)	0.1	0.25	0.3	0.2	0.15

Compute

$$V\left(\frac{X}{2}\right)$$

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**135.** Two probability distribution of the discrete random variables  $X$  and  $Y$  are given below:

$X$	0	1	2	3
$P(X)$	$\frac{1}{5}$	$\frac{2}{5}$	$\frac{1}{5}$	$\frac{1}{5}$

$Y$	0	1	2	3
$P(Y)$	$\frac{1}{5}$	$\frac{3}{10}$	$\frac{2}{5}$	$\frac{1}{10}$

Prove that  $E(Y^2) = 2E(X)$ .

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**136.** The probability distribution of a random variable  $X$  is given below:

Y	0	1	2	3
P(X)	k	$\frac{k}{2}$	$\frac{k}{4}$	$\frac{k}{8}$

find the value of k.



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

Y	0	1	2	3
P(X)	k	$\frac{k}{2}$	$\frac{k}{4}$	$\frac{k}{8}$

Compute  $P(X \leq 2)$



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**138.** The probability distribution of a random variable  $X$  is given below:

<b>Y</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>
<b>P(X)</b>	$k$	$\frac{k}{2}$	$\frac{k}{4}$	$\frac{k}{8}$

Determine  $P(X > 2)$ .



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**139.** The probability distribution of a random variable  $X$  is given below:

<b>Y</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>
<b>P(X)</b>	$k$	$\frac{k}{2}$	$\frac{k}{4}$	$\frac{k}{8}$

Calculate  $P(X \leq 2) + P(X > 2)$





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**140.** The random variable  $X$  can take the values 0, 1, 2 only. Give that  $P(X = 0) = P(X = 1) = p$  and that  $E(X^2) = E(X)$ , find the value of  $p$ .



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**141.** Two biased dice are thrown together. For the first dice  $P(6) = \frac{1}{2}$ , the other scores being equally likely while for the second dice,  $P(1) = \frac{2}{5}$  and the other scores are equally likely. Find the probability distribution of the number of ones shows.



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**142.** A pair of dice is rolled twice. Let  $X$  denote the number of times, 'a total of 9 is obtained'. Find the mean and variance of the random variable  $X$ .



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**143.** Let  $X$  be a discrete random variable whose probability distribution is defined as follows:

$$P(X = x) = \begin{cases} k(x + 1) & \text{for } (x = 1, 2, 3, 4) \\ 2kx & \text{for } (x = 5, 6, 7) \\ 0 & \text{otherwise} \end{cases}$$

where  $k$  is constant, Calculate the value of  $k$ .



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**144.** Let  $X$  be a discrete random variable whose probability distribution is defined as follows:

$$P(X = x) = \begin{cases} k(x + 1) & \text{for } (x = 1, 2, 3, 4) \\ 2kx & \text{for } (x = 5, 6, 7) \\ 0 & \text{otherwise} \end{cases}$$

where  $k$  is constant, Calculate  $E(X)$ .



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**145.** Let  $X$  be a discrete random variable whose probability distribution is defined as follows:

$$P(X = x) = \begin{cases} k(x + 1) & \text{for } (x = 1, 2, 3, 4) \\ 2kx & \text{for } (x = 5, 6, 7) \\ 0 & \text{otherwise} \end{cases}$$

where  $k$  is constant, Calculate Standard deviation of  $X$



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**146.** The probability distribution of a random variable  $X$  is given as under:

$$P(X = x) = \begin{cases} kx^2 & \text{for } (x = 1, 2, 3, 4) \\ 2kx & \text{for } (x = 5, 6, 7) \\ 0 & \text{otherwise} \end{cases} \quad \text{where } k \text{ is a}$$

constant. Calculate

$$P(X \geq 4)$$



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**147.** The probability distribution of a random variable  $X$  is given as under:

$$P(X = x) = \begin{cases} kx^2 & \text{for } (x = 1, 2, 3, 4) \\ 2kx & \text{for } (x = 5, 6, 7) \\ 0 & \text{otherwise} \end{cases} \quad \text{where } k \text{ is a constan.}$$

Calculate

$$E(3X^2)$$



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**148.** The probability distribution of a random variable  $X$  is given as under:

$$P(X = x) = \begin{cases} kx^2 & \text{for } (x = 1, 2, 3, 4) \\ 2kx & \text{for } (x = 5, 6, 7) \\ 0 & \text{otherwise} \end{cases} \quad \text{where } k \text{ is a}$$

constant. Calculate

$$P(X \geq 4)$$



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**149.** A discrete random variable  $X$  has the following probability distribution:

$X$	0	1	2	3	4	5	6	7
$P(X)$	0	$k$	$2k$	$2k$	$3k$	$k^2$	$2k^2$	$7k^2 + k$

Determine

value of  $k$ .



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**150.** A discrete random variable  $X$  has the following probability distribution:

$X$	0	1	2	3	4	5	6	7
$P(X)$	0	$k$	$2k$	$2k$	$3k$	$k^2$	$2k^2$	$7k^2 + k$

Determine

Mean  $X$ .



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**151.** A discrete random variable  $X$  has the following probability distribution:

$X$	0	1	2	3	4	5	6	7
$P(X)$	0	$k$	$2k$	$2k$	$3k$	$k^2$	$2k^2$	$7k^2 + k$

Determine

$P(X < 3)$



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152. A discrete random variable  $X$  has the following probability distribution:

$X$	0	1	2	3	4	5	6	7
$P(X)$	0	$k$	$2k$	$2k$	$3k$	$k^2$	$2k^2$	$7k^2 + k$

Determine

$$P(X > 6)$$



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153. A discrete random variable  $X$  has the following probability distribution:

$X$	0	1	2	3	4	5	6	7
$P(X)$	0	$k$	$2k$	$2k$	$3k$	$k^2$	$2k^2$	$7k^2 + k$

Determine

$$P(0 < X < 3)$$



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**154.** Three numbers are selected at random (without replacement) from first 6 positive integers. Let  $X$  denote the largest of the three numbers obtained. Find the probability distribution of  $X$ . Also, find the mean and variance of the distribution.



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**155.** Three numbers are selected at random (without replacement) from first 6 positive integers. Let  $X$  denote the largest of the three numbers obtained. Find the probability



distribution of  $X$ . Also, find the mean and variance of the distribution.



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**156.** A dice is thrown 120 times and getting '1' or '5' is considered a success. Find the mean and the variance of the number of success.



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**157.** Find the mean and the variance of random variable  $X$  which is the number of successes in two tosses of a dice, where a success is defined as a number greater than 4.



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**158.** Find the mean and variance of the number of heads on the throw of three coins.



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**159.** An unbiased coin is tossed 4 times. Find the mean and variance of the number of heads obtained.



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**160.** An unbiased coin is tossed 4 times. Find the mean and variance of the number of heads obtained.



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**161.** Ten coins are thrown simultaneously. Find the probability of getting at least 7 heads.



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**162.** A dice is rolled thrice. If getting a four is considered a success, find the mean and the variance of the probability distribution of the number of success.



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**163.** Two cards are drawn with replacement from a well shuffled deck of 52 cards. Find  $\mu$  and  $\sigma$  for the number of aces.



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**164.** An urn contains 4 white and 3 red balls. Find the probability distribution of the number of red balls in three draws, with replacement from an urn.



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**165.** A coin is tossed 5 times. What is the probability that head appears an even number of times.



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**166.** A coin is tossed 5 times. What is the probability that head appears on odd number of times?



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**167.** Using binomial distribution find the probability of obtaining "less than 3 heads" when an unbiased coin is tossed 6 times.

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**168.** The probability of a man hitting a target is  $\frac{1}{4}$ . If he fires seven times, what is the probability of his hitting the target atleast twice?

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**169.** In a hurdle race, a player has to cross 10 hurdles. The probability that he will clear each hurdle is  $\frac{5}{6}$ . What is the probability that he will knock down fewer than 2 hurdles?

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**170.** A bag contains 10 balls each marked with one of the digit is 0 to 9. If 4 balls are drawn successively with replacement from the bag. What is the probability that none is marked with the digit is 0?



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**171.** Find the probability distribution of the number of doublets in four throws of a pair of dice.



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**172.** Find the probability distribution of number of doublets in three throws of a pair of dice.



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**173.** Three cards are drawn in succession from a well shuffled pack of 52 cards. Determine the probability distribution of the random variable  $X$  which denotes the number of spades in the three cards. Hence find the mean of the distribution.



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**174.** Determine the binomial distribution whose mean is 10 and whose standard deviation is 8.



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**175.** If the sum of mean and variance of a binomial distribution is 4.8 for five trials, find the distribution.



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**176.** If the sum of the mean and variance of a binomial distribution for 18 trials is 10, find the distribution.



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**177.** A lot of 100 watches is known to have 10 defective watches. If 8 watches are selected at random, what is the probability that there will be at least one defective watch?



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**178.** A pair of dice is thrown 7 times if getting a total of 7 is considered a success, what is the probability of at most 6



successes?



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**179.** A bag contains 7 red, 4 white and 5 black balls. If four balls are drawn one by one the replacement, what is the probability that only two are white?



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**180.** If getting '5' or '6' in a throw of an unbiased dice is a success and the random variable 'X' denotes the number of success in six throws of the dice, find  $P(X \geq 4)$ .



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**181.** A bag contains 4 white and 7 black and 5 red balls. 4 balls are drawn one by one with replacelment. What is the probability that at least two are white?



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**182.** The sum of mean and variance of a binomial distribution is 18 and sum of their squares is 164. find the distribution.



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**183.** A box contains 100 tickets each bearing one of the numbers from 1 to 100. if 5 tickets are drawn successively with replacement from the box, find the probability that all the tickets bear numbers divisible by 10.



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**184.** An urn contains 25 balls of which 10 balls bear a mark 'X' and the remaining 15 bear a mark 'Y'. A ball is drawn at random from the urn, its mark is noted down and it is replaced. If 6 balls are drawn in this way, find the probability that all will bear 'X' mark.

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**185.** An urn contains 25 balls of which 10 balls bear a mark 'X' and the remaining 15 bear a mark 'Y'. A ball is drawn at random from the urn, its mark is noted down and it is replaced. If 6 balls are drawn in this way, find the probability that not more than 2 will bear 'Y' mark.

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**186.** An urn contains 25 balls of which 10 balls bear a mark 'X' and the remaining 15 bear a mark 'Y'. A ball is drawn at random from the urn, its mark is noted down and it is replaced. If 6 balls are drawn in this way, find the probability that the number of balls with 'X' mark and 'Y' mark will be equal.



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**187.** An urn contains 25 balls of which 10 balls bear a mark 'X' and the remaining 15 bear a mark 'Y'. A ball is drawn at random from the urn, its mark is noted down and it is replaced. If 6 balls are drawn in this way, find the probability that at least one ball will bear 'Y' mark.



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**188.** A factory produces bulbs. The probability that any one bulb is defective is  $\frac{1}{50}$  and they are packed in boxes of 10. From a single box, find the probability that none of bulb is defective.



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**189.** A factory produces bulbs. The probability that any one bulb is defective is  $\frac{1}{50}$  and they are packed in boxes of 10. From a single box, find the probability that exactly two bulbs are defective.



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**190.** A factory produces bulbs. The probability that any one bulb is defective is  $\frac{1}{50}$  and they are packed in boxes of 10. From a

single box, find the probability that

more than 8 bulbs work properly.



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**191.** A factory produces bulbs. The probability that any one bulb is defective is  $\frac{1}{50}$  and they are packed in boxes of 10. From a single box, find the probability that none of bulb is defective.



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**192.** What is the probability of sure event ?



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**193.** The probability of an impossible event is



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**194.** What is the number of sample points in a simple event associated with an experiment?



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**195.** If  $E_1, E_2, E_3$  are mutually exclusive and exhaustive events then what is the value of  $P(E_1) + P(E_2) + P(E_3)$ ?



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**196.** If  $E$  is an event associated with an experiment, find the value of  $P(E) + P(E^c)$ .



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**197.** A two digit number is selected at random. Find the number selected is an odd number.

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**198.** A letter from the English alphabet is selected at random. Find the chance that it is a vowel.

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**199.**  $E_1$  and  $E_2$  are equally likely events associated with an experiment. If  $P(E_1) = p$  what is the probability of  $E_2$ ?

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**200.** If  $E_1$  and  $E_2$  are independent events associated with an experiment and  $P(E_1 \cap E_2) = \lambda P(E_1)P(E_2)$ , then what is down the value of  $\lambda$ .



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**201.** If  $E_1$  and  $E_2$  are mutually exclusive, then write down the value of  $P(E_1 \cap E_2)$ .



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**202.** If  $E_1$  and  $E_2 = \phi$  are any two events associated with an experiment and  $\lambda P(E_1 \cap E_2) = P(E_1 / E_2)$ , then write down the value of  $\lambda$ .



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203. A decimal numeral from (0,1,2,3,4,5,6,7,8,9) is selected at random. Find the chance it is a prime number.



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204. If  $P(E_2) = \frac{1}{9}$ ,  $P(E_2 / E_1) = \frac{3}{5}$ ,  $P(E_1 / E_2) = \frac{3}{4}$  then find  $P(E_1)$ .



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205. If  $E_1$  and  $E_2$  mutually exclusive, then find  $P(E_1 / E_2)$ .



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**206.** If  $E_1$  and  $E_2$  are independent events such that  $P(E_1) = \frac{1}{3}$  and  $P(E_2) = \frac{1}{6}$  find  $P(E_1^c \cap E_2^c)$ .



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**207.** The probability of occurrence of an event A is 0.5 and that of B is 0.3. If A and B are mutually exclusive events, then the probability of neither A nor B is:



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**208.** If X is the number of tails in three tosses of a coin, determine the standard deviation of X.



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**209.** A bag contains 5 red marbles and 3 black marbles. Three marbles are drawn one by one without replacement. What is the probability that at least one of three marbles drawn be black if the first marble is red?



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**210.** Three dice are thrown at the same time. Find the probability of getting three two's, if it is known that the sum of the numbers on the dice was six.



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**211.** Four cards are successively drawn without replacement from a deck of 52 playing cards. What is the probability that all the four cards are kings?



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**212.** A die is thrown 5 times. Find the probability that an odd number will come up exactly three times.



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**213.** Prove that  $P(A) = P(A \cup B) + P(A \cap B)$ , where A and B are any two events associated with an experiment.



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**214.** Prove that  $P(A \cup B) = P(A \cap B) + P(A \cap \bar{B}) + P(\bar{A} \cap B)$ , where A and B are any two events associated with an experiment.

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**215.** A box has 5 blue and 4 red balls. One ball is drawn and not replaced. Its colour is also not noted. Another ball is then drawn at random. What is the probability of second ball being blue.

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**216.** If  $P(A) = \frac{2}{5}$ ,  $P(C) = \frac{1}{2}$  and  $P(A \cap C) = \frac{1}{5}$  then find  $P(A' \cap C')$ .

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**217.** Find  $k$ , if the probability distribution of a random variable  $X$  is as follows:

$X$	0	1	2	3
$P(X)$	$k$	$3k$	$3k$	$k$



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**218.** Find the mean of the following probability distribution of a random variable  $X$

$X$	0	1	2
$P(X)$	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{1}{4}$



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**219.** For a Binomial distribution mean is 5 and the number of trials is 50, find the variance.



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**220.** For a random variable  $X$ ,  $\sum X^2P(X) = 48.25$  and mean  $=6.5$  find the variance of  $X$ .



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**221.** For a random variable  $X$ ,  $\sum XP(X) = 1.5$ , find the mean of probability distribution of  $X$ .



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**222.** A bag contains 3 white and 5 black balls. A ball is drawn at random. Find the chance that it is a black ball.



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**223.** For a random variable  $X$ , the variance of 6.25 and the mean is 6. find the value of  $\sum X^2 P(X)$  for the probability distribution of  $X$ .



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**224.** If  $E_1$  and  $E_2$  are independent events and  $P(E_1) = \rho_1$ ,  $P(E_2) = \rho_2$  then find  $P(E_1 \cup E_2)$ .



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**225.** If  $E_1$  and  $E_2$  are independent events and  $P(E_1) = \rho_1$ ,  $P(E_2) = \rho_2$  then find  $P(E_1^c \cap E_2^c)$ .



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**226.** A coin is tossed twice. Let X denotes of the number of times 'head' turns up. Write down the probability distribution of X.



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**227.** A and B are two candidates seeking admission in a college. The probability that A is selected is 0.7 and the probability that exactly one of them is selected is 0.6. find the chance that B is selected if the admission of one candidate is independent of the other.



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**228.** Two dice are thrown together. Let A be the event 'getting 6 on the first dice' and B be the event getting 2 on the second dice. Are the events A and B independent?



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**229.** Explain why the experiment of tossing a coin three times is said to have binomial distribution.



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**230.** In a dice game, a player pays a stake of Rs.1 for each throw of the dice. He receives Rs.5 if the dice shows up 3, Rs.2 if the

dice shows 1 or 6, and noticing otherwise. What is the player's expected profit per throw over a long series of throws?



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**231.** A die is thrown thrice. Let  $X$  be 'the number of two's seen'. Find expectation of  $X$ .



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**232.** A die is tossed twice. A 'success' is getting an even number on a toss. Find the variance of number of successes.



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233. Find the standard deviation of the following probability distribution

X	2	3	4
P(X)	0.2	0.5	0.3

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234. Given that E and F are events such that  $P(E) = 0.6$ ,  $P(F) = 0.3$  and  $P(E \cap F) = 0.2$  find  $P(E | F)$  and  $P(F | E)$

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**235.** Compute  $P(A/B)$  if  $P(B)=0.4$  and  $P(A \cap B) = 0.32$ .



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**236.** If  $P(A)=0.8$ ,  $P(B)=0.5$  and  $P(B/A)=0.4$  find  $P(A \cap B)$



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**237.** If  $P(A)=0.8$ ,  $P(B)=0.5$  and  $P(B/A)=0.4$  find  $P(A / B)$



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**238.** If  $P(A)=0.8$ ,  $P(B)=0.5$  and  $P(B/A)=0.4$  find  $P(A \cup B)$ .



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**239.** Evaluate  $P(A \cup B)$ , if  $2P(A) = P(B) = \frac{5}{13}$  and  $P(A/B) = \frac{2}{5}$ .

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**240.** If  $P(A) = \frac{6}{13}$  and  $P(B) = \frac{7}{13}$  and  $P(A \cup B) = \frac{9}{13}$  find  $P(A \cap B)$

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**241.** If  $P(A) = \frac{6}{13}$  and  $P(B) = \frac{7}{13}$  and  $P(A \cup B) = \frac{9}{13}$  find  $P(A/B)$

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**242.** If  $P(A) = \frac{6}{13}$  and  $P(B) = \frac{7}{13}$  and  $P(A \cup B) = \frac{9}{13}$  find  $P(B/A)$



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**243.** Determine  $P(E/F)$

A coin is tossed three times

E: head on third toss

F: heads on first two tosses.



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**244.** Determine  $P(E/F)$

A coin is tossed three times



E: atleast two heads

F: atmost two heads.

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**245.** Determine  $P(E/F)$

A coin is tossed three times

E: atmost two tails

F: atleast one tail.

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**246.** Determine  $P(E/F)$

Two coins are tossed once

E: tail appears on one coin

F: one cooin shows head.

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**247.** Determine  $P(E | F)$  if two coins are tossed once, where : E : no tail appears, F : no head appears

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**248.** Determine  $P(E | F)$  if A die is thrown three times, where : E : 4 appears on the third toss, F : 6 and 5 appears respectively on first two tosses

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**249.** Determine  $P(E | F)$  Mother, father and son line up at random for a family picture :E : son on one end, F : father in

middle



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**250.** A black and a red dice are rolled :Find the conditional probability of obtaining a sum greater than 9, given that the black die resulted in a 5.



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**251.** A black and a red dice are rolled: Find the conditional probability of obtaining the sum 8, given that the red die resulted in a number less than 4.



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**252.** A fair die is rolled. Consider events  $E=\{1,3,4,5\}$ ,  $F=\{2,3,6\}$  and  $G=\{2,3,4,5\}$ . Find  $P(E/F)$  and  $P(F/E)$ .



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**253.** A fair die is rolled. Consider events  $E=\{1,3,5\}$ ,  $F=\{2,3\}$  and  $G=\{2,3,4,5\}$ . Find  $P(E/G)$  and  $P(G/E)$



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**254.** A fair die is rolled. Consider events  $E = \{1, 3, 5\}$ ,  $F = \{2, 3\}$ , and  $G = \{2, 3, 4, 5\}$  find :  $P(E \cup F | G)$  and  $P(E \cap F | G)$





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**255.** Assume that each born child is equally likely to be a boy or a girl. If a family has two children, what is the conditional probability that both are girls given that the youngest is a girl.



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**256.** Assume that each born child is equally likely to be a boy or a girl. If a family has two children, what is the conditional probability that both are girls given that at least one is a girl?



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**257.** An instructor has a question bank consisting of 300 easy True / False questions, 200 difficult True / False questions, 500

easy multiple choice questions and 400 difficult multiple choice questions. If a question is selected at random from the question bank, what is the probability that it will be an easy question given that it is a multiple choice question?



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**258.** Given that the two numbers appearing on throwing two dice are different. Find the probability of the event the sum of numbers on the dice is 8.



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**259.** Consider the experiment of throwing a die, if a multiple of 3 comes up, throw the die again and if any other number comes,

toss a coin. Find the conditional probability of the event 'the coin shows a tail', given that 'at least one die shows a 3'.



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260. If  $P(A) = \frac{1}{2}$ ,  $P(B) = 0$  then  $P(A | B)$  is :

A. 0

B.  $\frac{1}{2}$

C. not defined

D. 1

**Answer:**



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261. If  $A$  and  $B$  are two events such that  $A \cap B \neq \phi$ ,  $P\left(\frac{A}{B}\right) = P\left(\frac{B}{A}\right)$ . Then.

A.  $A \subset B$  but  $A \neq B$

B.  $A=B$

C.  $A \cap B = \phi$

D.  $P(A)=P(B)$

**Answer:**

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262. If  $P(A) = \frac{3}{4}$  and  $P(B) = \frac{1}{4}$ , find  $P(A \cap B)$  if  $A$  and  $B$  are independent events.

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**263.** Two cards are drawn at random and without replacement from a pack of 52 playing cards. Find the probability that both the cards are red.



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**264.** A box of oranges is inspected by examining three randomly selected oranges drawn without replacement. If all the three oranges are good, the box is approved for sale, otherwise, it is rejected. Find the probability that a box containing 15 oranges out of which 12 are good and 3 are bad ones will be approved for sale.



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**265.** A fair coin and an unbiased die are tossed. Let  $A$  be the event 'head appears on the coin' and  $B$  be the event '3 on the die'. Check whether  $A$  and  $B$  are independent events or not.

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**266.** Let  $E$  and  $F$  be events with  $P(E) = \frac{4}{5}$ ,  $P(F) = \frac{4}{10}$  and  $P(E \cap F) = \frac{1}{5}$ . Are  $E$  and  $F$  independent?

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**267.** Given that the events  $A$  and  $B$  are such that  $P(A) = \frac{1}{2}$ ,  $P(A \cup B) = \frac{3}{5}$  and  $P(B) = p$ . find  $p$  if they are mutually exclusive.

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**268.** Given that the events A and B are such that  $P(A) = \frac{1}{2}$ ,  $P(A \cup B) = \frac{3}{4}$  and  $P(B)=p$ . find p if they are independent.



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**269.** Let A and B are be independent events with  $P(A)=0.2$  and  $P(B)=0.3$  find

$$P(A \cap B)$$



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**270.** Let A and B are be independent events with  $P(A)=0.2$  and  $P(B)=0.3$  find

$$P(A \cup B)$$



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**271.** Let A and B are be independent events with  $P(A)=0.2$  and  $P(B)=0.3$  find

$$P(A / B)$$



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**272.** Let A and B are be independent events with  $P(A)=0.2$  and  $P(B)=0.3$  find

$$P(B/A)$$



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**273.** If  $A$  and  $B$  are two events such that  $P(A) = \frac{1}{4}$ ,  $P(B) = \frac{1}{2}$  and  $P(A \cap B) = \frac{1}{8}$  find  $P(\neg A \text{ and } \neg B)$

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**274.** Events  $A$  and  $B$  are such that  $P(A) = \frac{1}{2}$ ,  $P(B) = \frac{7}{12}$  and  $P(\text{not } A \text{ or not } B) = \frac{1}{4}$ . State whether  $A$  and  $B$  are independent.

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**275.** Give two independent events  $A$  and  $B$  such that  $P(A)=0.3$ ,  $P(B)=0.4$ . Find  $P(A \text{ and } B)$

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**276.** Give two independent events A and B such that  $P(A)=0.3$ ,

$P(B)=0.4$ . Find

$P(A \text{ and not } B)$



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**277.** Give two independent events A and B such that  $P(A)=0.3$ ,

$P(B)=0.4$ . Find

$P(A \text{ or } B)$



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**278.** Give two independent events A and B such that  $P(A)=0.3$ ,

$P(B)=0.4$ . Find

$P(\text{neither } A \text{ nor } B)$



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**279.** A die is tossed thrice. Find the probability of getting an odd number atleast once.



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**280.** Two balls are drawn at random with replacement from a box containing 10 black and 8 red balls. Find the probability that both balls are red.



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**281.** Two balls are drawn at random with replacement from a box containing 10 black and 8 red balls. Find the probability that

first ball is black and second is red.



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**282.** 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 other is red.



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**283.** Probability of solving specific problem independently by A and B are  $\frac{1}{2}$  and  $\frac{1}{3}$  respectively. If both try to solve the problem independently, find the probability that the problem is solved.



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**284.** Probability of solving specific problem independently by A and B are  $\frac{1}{2}$  and  $\frac{1}{3}$  respectively. If both try to solve the problem independently find the probability that exactly one of them solve the problem.



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**285.** One card is drawn at random from a pack of well shuffled deck of 52 cards. IN which of the following cards are the events E and F independent? : E: the card drawn is spade F: the card drawn is an ace



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**286.** One card is drawn at random from a well shuffled deck of 52 cards. In which of the following cases are the events E and F independent ? E : 'the card drawn is black' F : 'the card drawn is a king'



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**287.** One card is drawn at random from a well shuffled deck of 52 cards. In which of the following cases are the events E and F independent ? E : 'the card drawn is a king or queen' F : 'the card drawn is a queen or jack'.



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**288.** In a hostel, 60% of the students read Hindi news paper, 40% read English news paper and 20% read both Hindi and English news papers. A student is selected at random. Find the probability that she reads neither Hindi nor English news papers.



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**289.** In a hostel, 60% of the students read Hindi newspaper, 40% read English newspaper and 20% read both Hindi and English news paper. A student is selected at random. If she reads Hindi newspaper, find the probability that she reads English newspaper.



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**290.** In a hostel, 60% of the students read Hindi newspaper, 40% read English newspaper and 20% read both Hindi and English news paper. A student is selected at random. If she reads English newspaper, find the probability that she reads Hindi newspaper.



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**291.** The probability of obtaining an even prime number on each die, when a pair of dice is rolled is :

A. 0

B.  $\frac{1}{3}$

C.  $\frac{1}{12}$

D.  $\frac{1}{36}$

**Answer:**



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**292.** Two events A and B are said to be independent if

A. A and B are mutually exclusive

B.  $P(A'B') = [1 - P(A)][1 - P(B)]$

C.  $P(A)=P(B)$

D.  $P(A)+P(B)=0$

**Answer:**



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**293.** An urn contains 5 red and 5 black balls. A ball is drawn at random, its colour is noted and is returned to the urn. Moreover, 2 additional balls of the colour drawn are put in the urn and then a ball is drawn at random. What is the probability that the second ball is red?



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**294.** A bag contains 4 red and 4 black balls, another bag contains 2 red and 6 black balls. One of the two bags is selected at random and a ball is drawn from the bag which is found to be red. Find the probability that the ball is drawn from the first bag.



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**295.** Of the students in a college, it is known that 60% reside in hostel and 40% are day scholars (not residing in hostel). Previous year results report that 30% of all students who reside in hostel attain A grade and 20% of day scholars attain A grade in their annual examination. At the end of the year, one student is chosen at random from the college and he has an A grade, what is the probability that the student is a hostlier?



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**296.** In answering a question in a multiple choice test a student either knows the answer or guesses. Let  $\frac{3}{4}$  be the probability that he knows the answer and  $\frac{1}{4}$  be the probability that he guesses. Assuming that a student who guesses at the answer will be correct with probability  $\frac{1}{4}$ . What is the probability that

a student knows the answer, given that he answered it correctly

?



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**297.** A laboratory blood test is 99% effective in detecting a certain disease when it is in fact, present. However, the test also yields a false positive result for 0.5% of the healthy person tested (i.e. if a healthy person is tested, then, with probability 0.005, the test will imply he has the disease). If 0.1 percent of the population actually has the disease, what is the probability that a person has the disease given that his test result is positive ?



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**298.** 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 the probability that it was the two-headed coin?



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**299.** An insurance company insured 2000 scooter drivers, 4000 car drivers and 6000 truck drivers. The probabilities of an accident are 0.01, 0.03 and 0.15 respectively. One of the insured persons meets with an accident. What is the probability that he is a scooter driver?



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**300.** A factory has two machines A and B. Past record shows that machine A produced 60% of the items of output and machine B produced 40% of the items. Further, 2% of the items produced by machine A and 1% produced by machine B were defective. All the items are put into one stockpile and then one item is chosen at random from this and is found to be defective. What is the probability that it was produced by machine B?



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**301.** Two groups are competing for the position on the Board of directors of a corporation. The probabilities that the first and the second groups will win are 0.6 and 0.4 respectively. Further, if the first group wins, the probability of introducing a new product is 0.7 and the corresponding probability is 0.3 if the

second group wins. Find the probability that the new product introduced was by the second group.



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**302.** Suppose a girl throws a die. If she gets a 5 or 6, she tosses a coin three times and notes the numbers of heads. If she gets 1,2,3, or 4, she tosses a coin once and notes whether a head or a tail is obtained. If she attained exactly one head what is the probability that she threw 1,2,3, or 4 with the die?



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**303.** A manufacturer has three machine operators A, B and C. The first operator A produces 1% defective items, where as the other two operators B and C produce 5% and 7% defective

items respectively. A is on the job for 50% of the time, B is on the job for 30% of the time and C is on the job for 20% of the time. A defective item is produced, what is the probability that it was produced by A?



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**304.** A card from a pack of 52 cards is lost. From the remaining cards of the pack, two cards are drawn and are found to be both diamonds. Find the probability of the lost card being a diamond.



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**305.** Probability that A speaks truth is  $\frac{4}{5}$ . A coin is tossed. A reports that a head appears. The probability that actually there

was head is

A.  $\frac{4}{5}$

B.  $\frac{1}{2}$

C.  $\frac{1}{5}$

D.  $\frac{2}{5}$

**Answer:**



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**306.** If  $A$  and  $B$  are two events such that  $A \subset B$  and  $P(B) \neq 0$ , then which of the following is correct?

A.  $P(A/B) = \frac{P(B)}{P(A)}$

B.  $P(A/B) < P(A)$

C.  $P(A/B) \geq P(A)$

D. none of these

**Answer:**

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**307.** State which of the following are not the probability distribution of a random variable. Give reasons for your answer.

<b>X</b>	<b>0</b>	<b>1</b>	<b>2</b>
<b>P(X)</b>	<b>0.4</b>	<b>0.4</b>	<b>0.2</b>

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**308.** State which of the following are not the probability distribution of a random variable. Give reasons for your answer.

$X$	0	1	2	3	4
$P(X)$	0.1	0.5	0.2	-0.1	0.3

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**309.** State which of the following are not the probability distribution of a random variable. Give reasons for your answer.

$Y$	-1	0	1
$P(Y)$	0.6	0.1	0.2

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**310.** State which of the following are not the probability distribution of a random variable. Give reasons for your answer.

<b>Z</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>	<b>-1</b>
<b>P(Z)</b>	<b>0.3</b>	<b>0.2</b>	<b>0.4</b>	<b>0.1</b>	<b>0.05</b>

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**311.** An urn contains 5 red and 5 black balls. Two balls are randomly selected. Let  $X$  represent the number of black balls. What are the possible values of  $X$ . is  $X$  a random variable?

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**312.** Let  $X$  represent the difference between the number of heads and the number of tails obtained when a coin is tossed 6 times. What are possible values of  $X$ ?



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**313.** Find the probability distribution of number of heads in two tosses of a coin



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**314.** Find the probability distribution of number of tails in the simultaneous tosses of three coins.



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**315.** Find the probability distribution of number of tails in four tosses of a coin.



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**316.** Find the probability distribution of the number of successes in two tosses of a die, where a success is defined as : number greater than 4



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**317.** Find the probability distribution of the number of successes in two tosses of a die, where a success is defined as : six appears on at least one die.



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**318.** From a lot of 30 bulbs which include 6 defectives, a sample of 4 bulbs is drawn at random with replacement. Find the probability distribution of the number of defective bulbs.



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**319.** A coin is biased so that the head is 3 times as likely to occur as tail. If the coin is tossed twice, find the probability distribution of number of tails.



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**320.** A random variable  $X$  has the following probability distribution

X	0	1	2	3	4	5	6	7
P(X)	0	k	2k	2k	3k	k <sup>2</sup>	2k <sup>2</sup>	7k <sup>2</sup> + k

Determine

k?



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**321.** A random variable X has the following probability distribution

X	0	1	2	3	4	5	6	7
P(X)	0	k	2k	2k	3k	k <sup>2</sup>	2k <sup>2</sup>	7k <sup>2</sup> + k

Determine

$P(X < 3)$ ?



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**322.** A random variable  $X$  has the following probability distribution

$X$	0	1	2	3	4	5	6	7
$P(X)$	0	$k$	$2k$	$2k$	$3k$	$k^2$	$2k^2$	$7k^2 + k$

Determine

$P(X > 6)$ ?



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**323.** A random variable  $X$  has the following probability distribution

$X$	0	1	2	3	4	5	6	7
$P(X)$	0	$k$	$2k$	$2k$	$3k$	$k^2$	$2k^2$	$7k^2 + k$

Determine

$P(0 < X < 3)$ ?



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**324.** The random variable  $X$  has a probability distribution  $P(X)$  of the following form, where  $k$  is some number :  $P(x) = \{(k, \text{ if, } x = 0), (2k, \text{ if, } x = 1), (3k, \text{ if, } x = 2), (0, \text{ , , , } ) : \}$

Determine the value of  $k$ .



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**325.** The random variable  $X$  has a probability distribution  $P(X)$  of the following form, where  $k$  is some number :

$$P(X) = \begin{cases} k, & \text{If } x = 0 \\ 2k, & \text{if } x = 1 \\ 3k, & \text{if } x = 2 \\ 0, & \text{otherwise} \end{cases}$$

Find  $P(X < 2)$ ,  $P(X \leq 2)$ ,  $P(X \geq 2)$



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**326.** Find the mean number of heads in three tosses of a fair coin.



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**327.** Two dice are thrown simultaneously. If  $X$  denotes the number of sixes, find the expectation of  $X$ .



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**328.** Two numbers are selected at random (without replacement) from the first six positive integers. Let  $X$  denote the larger of the two numbers obtained. Find  $E(X)$ .



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**329.** Let  $X$  denote the sum of the numbers obtained when two fair dice are rolled. Find the variance and standard deviation of  $X$ .



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**330.** 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 in such a manner that each has the same chance of being chosen and the age  $X$  of the selected student is recorded. What is the probability distribution of the random variable  $X$ ? Find mean, variance and standard deviation of  $X$ .



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**331.** In a meeting, 70% of the members favour and 30% oppose a certain proposal. A member is selected at random and we take  $X = 0$  if he opposed, and  $X = 1$  if he is in favour. Find  $E(X)$  and  $Var(X)$ .



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**332.** The mean of the numbers obtained on throwing a die having written 1 on three faces, 2 on two faces and 5 on one face is:

A. 1

B. 2

C. 5

D.  $\frac{8}{3}$

**Answer:**



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**333.** Suppose that two cards are drawn at random from a deck of cards. Let  $X$  be the number of aces obtained. Then the value of  $E(X)$  is:

A.  $\frac{37}{221}$

B.  $\frac{5}{13}$

C.  $\frac{1}{13}$

D.  $\frac{2}{13}$

**Answer:**



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**334.** A die is thrown 6 times. If 'getting an odd number' is a success, what is the probability of 5 successes?



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**335.** A die is thrown 6 times. If getting an odd number is a success, what is the probability of at least 5 successes?



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**336.** A die is thrown 6 times. If getting an odd number is a success, what is the probability of at most 5 successes?



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**337.** A pair of dice is thrown 4 times. If getting a doublet is considered a success, find the probability of two successes.



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**338.** There are 5% defective items in a large bulk of items. What is the probability that a sample of 10 items will include not more than one defective item?



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**339.** Five cards are drawn successively with replacement from a well shuffled deck of 52 cards. What is the probability that all the five cards are diamonds?



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**340.** Four cards are drawn successively with replacement from a well shuffled deck of 52 cards. What is the probability that only 3 cards are spades?

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**341.** Five cards are drawn successively with replacement from a well shuffled deck of 52 cards. What is the probability that none is a spade?

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**342.** The probability that a bulb produced by a factory will fuse after 150 days of use is 0.05. Find the probability that out of 5

such bulbs none will fuse after 150 days of use.



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**343.** The probability that a bulb produced by a factory will fuse after 150 days of use is 0.05. Find the probability that out of 5 such bulbs not more than one will fuse after 150 days of use.



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**344.** The probability that a bulb produced by a factory will fuse after 150 days of use is 0.05. Find the probability that out of 5 such bulbs more than one will fuse after 150 days of use.



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**345.** The probability that a bulb produced by a factory will fuse after 150 days of use is 0.05. Find the probability that out of 5 such bulbs at least one bulb will fuse after 150 days of use.



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**346.** A bag consists of 10 balls each marked with one of the digits 0 to 9. If four balls are drawn successively with replacement from the bag, what is the probability that none is marked with the digit 0?



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**347.** In an examination, 20 questions of true-false type are asked. Suppose a student tosses a fair coin to determine his

answer to each question. If the coin falls heads, he answers 'true', if it falls tails, he answers 'false'. Find the probability that he answers at least 12 questions correctly.

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**348.** Suppose  $X$  has a binomial distribution  $B\left(6, \frac{1}{2}\right)$ . Show that  $X = 3$  is the most likely outcome .

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**349.** On a multiple choice examination with three possible answers for each of the five questions, what is the probability that a candidate would get four or more correct answers just by guessing ?

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**350.** A person buys a lottery ticket in 50 lotteries, in each of which his chance of winning a prize is  $\frac{1}{100}$ . What is the probability that he will win a prize at least once.



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**351.** A person buys a lottery ticket in 50 lotteries, in each of which his chance of winning a prize is  $\frac{1}{100}$ . What is the probability that he will win a prize exactly once.



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**352.** A person buys a lottery ticket in 50 lotteries, in each of which his chance of winning a prize is  $\frac{1}{100}$ . What is the

probability that he will win a prize at least twice?



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**353.** Find the probability of getting 5 exactly twice in 7 throws of a die.



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**354.** Find the probability of throwing at most 2 sixes in 6 throws of a single die.



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**355.** If it is known that 10% of certain articles manufactured are defective. What is the probability that in a random sample of 12

such articles ,9 are defective?



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**356.** Binomial distribution is given this name because

- A. This distribution was evolved by James Binomial.
- B. Each trial has only two outcomes, namely success and failure.
- C. Its probability function is obtained by general term of binomial expansion.
- D. It is obtained by combining two distribution.

**Answer:**



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**357.** Which of the following is not a case of Bernoulli's trials:

A. (a) tosses of a coin

B. (b) drawing balls (with replacement) from bag containing 5 white balls only

C. (c) throws of a pair of dice

D. (d) attempting 10 true false type question on the basis of the outcomes of tosses of a coin.

**Answer:**



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**358.** A and B are two events such that  $P(A) \neq 0$ . Find

$P(B | A)$ , if : A is a subset of B



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**359.** A and B are two events such that  $P(A) \neq 0$ . Find  $P(B | A)$ , if  $A \cap B = \phi$



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**360.** A couple has two children  
find the probability that both children are males if it is known  
that at least one of the children is male.



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**361.** A couple has two children, find the probability that both  
children are females, if it is known that the elder child is a

female.



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**362.** Suppose that 5% of men and 0.25% of women have grey hair. A grey haired person is selected at random. What is the probability of this person being male? Assume that there are equal number of males and females.



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**363.** An urn contains 25 balls of which 10 balls bear a mark 'X' and the remaining 15 bear a mark 'Y'. A ball is drawn at random from the urn, its mark is noted down and it is replaced. If 6 balls are drawn in this way, find the probability that all will bear 'X' mark.



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**364.** An urn contains 25 balls of which 10 balls bear a mark 'X' and the remaining 15 bear a mark 'Y'. A ball is drawn at random from the urn, its mark is noted down and it is replaced. If 6 balls are drawn in this way, find the probability that not more than 2 will bear 'Y' mark.



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**365.** An urn contains 25 balls of which 10 balls bear a mark 'X' and the remaining 15 bear a mark 'Y'. A ball is drawn at random from the urn, its mark is noted down and it is replaced. If 6 balls are drawn in this way, find the probability that at least one ball will bear 'Y' mark.



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**366.** An urn contains 25 balls of which 10 balls bear a mark 'X' and the remaining 15 bear a mark 'Y'. A ball is drawn at random from the urn, its mark is noted down and it is replaced. If 6 balls are drawn in this way, find the probability that the number of balls with 'X' mark and 'Y' mark will be equal.



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**367.** In a hurdle race, a player has to cross 10 hurdles. The probability that he will clear each hurdle is  $\frac{5}{6}$ . What is the probability that he will knock down fewer than 2 hurdles?



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**368.** A die is thrown again and again until three sixes are obtained. Find the probability of obtaining the third six in the sixth throw of the die.



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**369.** If a leap year is selected at random, what is the chance that it will contain 53 tuesdays?



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**370.** An experiment succeeds twice as often as it fails. Find the probability that in the next six trials, there will be at least 4 successes.



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**371.** How many times must a man toss a fair coin so that the probability of getting at least one head is more than 90%?



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**372.** In a game, a man wins a rupee for a six and loses a rupee for any other number when a fair die is thrown. The man decided to throw a die thrice but to quit as and when he gets a six. Find the expected value of the amount he wins / loses.



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**373.** Suppose we have four boxes A,B,C and D containing coloured marbles as given below:

Box	Marble colour		
	Red	White	Black
A	1	6	3
B	6	2	2
C	8	1	1
D	0	6	4

One of the boxes has been selected at random and a single marble is drawn from it. If the marble is red, what is the probability that it was drawn from box A? box B? box C?



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**374.** Assume that the chances of a patient having a heart attack is 40%. It is also assumed that a meditation and yoga course reduce the risk of heart attack by 30% and prescription of certain drug reduces its chances by 25%. At a time a patient can choose any one of the two options with equal probabilities. It is given that after going through one of the two options the patient selected at random suffers a heart attack. Find the

probability that the patient followed a course of meditation and yoga?



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**375.** If each element of a second order determinant is either zero or one, what is the probability that the value of the determinant is positive? (Assume that the individual entries of the determinant are chosen independently, each value being assumed with probability  $\frac{1}{2}$ )



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**376.** An electronic assembly consists of two subsystems, say, A and B. From previous testing procedures, the following probabilities are assumed to be known :  $P(A \text{ fails}) = 0.2$ ,  $P(B$

fails alone ) = 0.15,  $P(A \text{ and } B \text{ fail}) = 0.15$  Evaluate the following probabilities:  $P(A \text{ fails} \mid B \text{ has failed})$



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**377.** An electronic assembly consists of two subsystems, say, A and B. From previous testing procedures, the following probabilities are assumed to be known :  $P(A \text{ fails}) = 0.2$ ,  $P(B \text{ fails alone}) = 0.15$ ,  $P(A \text{ and } B \text{ fail}) = 0.15$  Evaluate the following probabilities:  $P(A \text{ fails alone})$



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**378.** Bag I contains 3 red and 4 black balls and Bag II contains 4 red and 5 black balls. One ball is transferred from Bag I to Bag II and then a ball is drawn from Bag II. The ball so drawn is found

to be red in colour. Find the probability that the transferred ball is black



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**379.** If  $A$  and  $B$  are two events such that  $P(A) \neq 0$  and  $P\left(\frac{B}{A}\right) = 1$ , then

A.  $A \subset B$

B.  $B \subset A$

C.  $B = \phi$

D.  $A = \phi$

**Answer:**



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380. If  $P\left(\frac{A}{B}\right) > P(A)$ , then which of the following is correct :

:

A.  $P\left(\frac{B}{A}\right) < P(B)$

B.  $P(A \cap B) < P(A)P(B)$

C.  $P\left(\frac{B}{A}\right) > P(B)$

D.  $P\left(\frac{B}{A}\right) = P(B)$

**Answer:**



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381. If A and b are any two events such that  $P(A) + P(B) - P(A \text{ and } B) = P(A)$ , then

A.  $P(B/A)=1$

B.  $P(A/B)=1$

C.  $P(B/A)=0$

D.  $P(A/B)=0$

**Answer:**



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**382.** Fill ups

The set  $\{ \}$  as a subset space  $S$ , associated with an experiment, is called an.....event.



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**383.** Fill ups

The set  $S$  as a subset of itself, where  $S$  is the sample space of an



experiment, is called a .....event.



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**384.** Two events A and B associated with an experiment are said to be exclusive iff  $A \cap B = \dots\dots\dots$



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**385.** Fill ups

Two events  $E_1$  and  $E_2$  associated with an experiment are independent iff  $P(E_1 \cap E_2) = \dots\dots\dots$



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**386.** If A and B are such that  $P(A' \cup B') = \frac{2}{3}$  and  $P(A \cup B) = \frac{5}{9}$ , then  $P(A') + P(B') = \dots\dots\dots$

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**387.** Fill ups

If A and B are two events such that  $P(A/B) = p$ ,  $P(A)=p$ ,  $P(B) = \frac{1}{3}$  and  $P(A \cup B) = \frac{5}{9}$  then  $p = \dots\dots\dots$ .

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**388.** If E is an event associated with an experiment, find the value of  $P(E) + P(E^c)$ .

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**389.** If A and B are independent events then  $P(A \cup B) = 1$  .....



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**390.** If A and B are independent events such that  $P(A) = p$ ,  $P(B) = 2p$  and  $P(\text{Exactly one of A, B}) = \frac{5}{9}$  then find p



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**391.** If E and F are independent events associated with an experiment then  $P\left(\frac{E}{F}\right) = \text{_____}$ .



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**392. Fill ups**

If the random variable  $X$  follows Binomial distribution with parameters  $n = 5, p$  and  $P(X = 2) = 9P(X = 3)$ , then  $p = \dots\dots\dots$

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**393. Fill ups**

If  $E_1$  and  $E_2$  are independent events associated with an experiment then  $P(E_2^c / E_1^c) = 1 - \dots\dots\dots$

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**394. Fill ups**

If  $A$  and  $B$  are two events such that  $P(A/B) = P(A)$ , then  $A$  is .....of

B.

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395. Fill ups

For the following distribution, the mean is equal to.....

X	0	1	2
P(X)	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{1}{4}$

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396. Fill ups

If a random variable X follows Binomial distribution such that

$P(X = 20) = P(X = 21)$  and number of trials is 40, then

$p = \dots\dots\dots$  .

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**397.** Let 'X' be a discrete random variable assuming values

$x_1, x_2, \dots\dots\dots x_n$  with probabilities  $p_1, p_2, \dots\dots\dots, p_n$

respectively. Then variance of 'X' is given by :

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**398.** Fill ups

Mean of probability distribution of a random variable is also known as.....value of the distribution.

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**399. Fill ups**

If  $E$  is any event associated with an experiment, then  $P(\text{either } E \text{ or } E^c \text{ occurs}) = \dots\dots\dots$  .

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**400. Fill ups**

If  $A$  is any event associated with an experiment then  $P(\text{both } A \text{ and } B' \text{ occur}) = \dots\dots\dots$  .

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**401. Fill ups**

If  $A, B, C$  are three independent events such that  $P(A) = P(B) = P(C) = p$ , then  $p(\text{exactly one of } A, B, C \text{ occurs}) = \dots\dots\dots$  .

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**402.** True or false

If  $E$  be an event associated with an experiment then  $P(E')=1-P(E)$ .

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**403.** True or false

If  $A$  and  $B$  are independent events associated with an experiment, then  $P(A \cap B) = P(A) + P(B)$ .

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**404.** True or false

If  $A$  and  $B$  are two events associated with an experiment such



that  $P(A) > 0$  and also  $P(B) > 0$ , then A and B can be both mutually exclusive and independent.



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**405.** If  $E_1$  and  $E_2$  are two independent events associated with an experiment, then show that

$E_1^c$  and  $E_2^c$  are also independent.



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**406.** If A, B, C are mutually exclusive and exhaustive events associated with an experiment, then  $P(A) + P(B) + P(C) = 1$ .



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**407.** Two independent events are always mutually exclusive.



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**408.** True or false

Two events  $E_1$  and  $E_2$  are said to be mutually exclusive iff

$$E_1 \cap E_2 = \phi$$



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**409.** True or false

Two mutually exclusive events are always independent.



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**410.** True or false

If A and B are two independent events then  $P(A \text{ and } B) = P(A)P(B)$ .



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**411.** True or false

If A and B are independent events then  $A'$  and  $B'$  are also independent.



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**412.** For any two events  $E_1$  and  $E_2$  associated with an experiment  $P(E_1 \cup E_2) = P(E_1) + P(E_2) + P(E_1 \cap E_2)$ .



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**413.** True or false

For any two events  $E_1$  and  $E_2$  associated with an experiment.

$$P(E_1 \cup E_2) = P(E_1 \cap E'_2) + P(E_1 \cap E_2) + P(E'_1 \cap E_2).$$



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**414.** True or false

Another name for the mean of a probability distribution is expected value.



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**415.** True or false

If  $A$  and  $B$  are independent events, then

$$P(A' \cup B) = 1 - P(A)P(B').$$



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**416.** True or false

If  $E_1, E_2, E_3$  events associated with an experiment, then

$$P(E_3) = P\left(\frac{E_3}{E_1}\right)P(E_1)P\left(\frac{E_3}{E_2}\right)P(E_2).$$

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**417.** True or false

If A and B are two events such that  $P(A) > 0$  and  $P(A) + P(B) > 1$ , then

$$P\left(\frac{B}{A}\right) \geq 1 - \frac{P(B')}{P(A)}.$$

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**418.** True or false

Three events A, B, C are independent if

$$P(A \cap B \cap C) = P(A)P(B)P(C).$$



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**419.** True or false

If  $E_1, E_2, \dots, E_n$  are mutually exclusive events associated with an experiment and  $E$  is any event associated

with the same experiment, then  $P(E) = \sum_{i=1}^n P\left(\frac{E}{E_i}\right)P(E_i)$ .



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**420.** True or false

If  $A$  and  $B$  are independent then  $P(\text{exactly one of } A \text{ and } B \text{ occurs}) = P(A)P(B') + P(A')P(B)$ .



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**421.** One of the condition of Bernoulli trials is that the trails are independent of each other.



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**422.** True or false

When a fair dice is rolled once, then the mean of the random variable  $X$ , which denotes the number appearing the upper most face of the dice is 7.



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**423.** Find the mean number of heads in three tosses of a fair coin.



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**424.** True or false

If A, B and C are three independent events such that  $P(A)=P(B)=P(C)=p$ , then  $P(\text{atleast two of A, B and C occur})=3p^2 - 2p^3$



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**425.** True or false

If a coin is tossed 5 times and X denote the number of heads shows then  $P(X=2)=P(X=3)$ .



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**426.** True or false

Mean and variance of a binomial distribution are respectively  $np$  and  $npq$



and  $\sqrt{npq}$ .



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427. Match the statement in column I with those given in column II.

COLUMN I	COLUMN II										
1. The probability of getting atleast 8 heads, when 10 coins are tossed, is	(p) $\frac{1}{6}$										
2. If A and B are two events such that $P(A) = 0.4$ , $P(B) = 0.2$ and $P(A \cup B) = 0.6$ , then $P(A \cap B) =$	(q) $\frac{5}{4}$										
3. Probability of throwing a total of 7 in a single throw of a pair of dice is	(r) $\frac{3}{4}$										
4. If A and B are two events such that $P(A) = 0.6$ , $P(B) = 0.2$ and $P(A/B) = 0.5$ , then $P(A'/B')$ is equal to	(s) $\frac{1}{3}$										
5. Variance of the random variable X, which denotes the number of tails in three tosses of a coin, is equal to	(t) $\frac{7}{128}$										
6. Value of k if the probability distribution of a random variable X is	(u) $\frac{3}{8}$										
<table border="1" data-bbox="188 975 420 1046"><tr><td>X</td><td>0.5</td><td>1</td><td>1.5</td><td>2</td></tr><tr><td>P(X)</td><td>k</td><td><math>k^2</math></td><td><math>2k^2</math></td><td>k</td></tr></table>	X	0.5	1	1.5	2	P(X)	k	$k^2$	$2k^2$	k	(v) 0
X	0.5	1	1.5	2							
P(X)	k	$k^2$	$2k^2$	k							
7. If A and B be two events such that $P(A) = \frac{1}{2}$ , $P(B) = \frac{1}{3}$ and $P(A \cap B) = \frac{1}{4}$ , then $P(A/B) + P(B/A)$ is equal to											



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**428.** Events A and B associated with an experiment are said to be independent iff

A.  $P(A \cap B) = P(A) + P(B)$

B.  $P(A \cap B) = P(A)P(B)$

C.  $P(A \cap B) = \phi$

D. none of these

**Answer:**



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**429.** Events A and B are said to be mutually exclusive iff

A.  $P(A \cap B) = P(A) + P(B)$

B.  $P(A \cap B) = P(A) + P(B)$

C.  $P(A \cap B) = \phi$

D. none of these

**Answer:**



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**430.** If A and B are independent events then which of the following is not true.

A.  $P(A/B)=P(A)$

B.  $P(B/A)=P(B)$

C.  $P(A/B)=P(B/A)$

D. none of these

**Answer:**

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431. Let  $A$  and  $B$  be two events. If  $P(A) = 0.6$ ,  $P(B) = 0.2$ ,  $P\left(\frac{A}{B}\right) = 0.5$ , then  $P(A \cap B)$  is equal to :

A.  $\frac{1}{10}$

B.  $\frac{3}{10}$

C.  $\frac{3}{8}$

D.  $\frac{6}{7}$

**Answer:**

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432. If  $P(A) = \frac{3}{10}$ ,  $P(B) = \frac{2}{5}$  then  $P(A \cup B) = \frac{3}{5}$ , then

$P(B/A) + P(A/B)$  equals

A.  $\frac{1}{4}$

B.  $\frac{1}{3}$

C.  $\frac{5}{12}$

D.  $\frac{7}{12}$

**Answer:**



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433. The event A and B are independent if

A.  $P(A \cap B) = P\left(\frac{A}{B}\right)P(B)$

B.  $P(A \cap B) = P\left(\frac{B}{A}\right)P(A)$

$$C. P(A \cap B) = P(A) + P(B)$$

$$D. P(A \cap B) = P(A)P(B)$$

**Answer:**



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**434.** For a biased dice, the probabilities of the different faces to turn up are

Face	1	2	3	4	5	6
P	0.10	0.32	0.21	0.15	0.05	0.17

the dice is tossed and it is told that either the face 1 or face 2 has shows up, then the probability that it is face 1 is

A.  $\frac{16}{21}$

B.  $\frac{1}{10}$

C.  $\frac{5}{16}$

D.  $\frac{5}{21}$

**Answer:**



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435. If  $P(A) = \frac{2}{5}$ ,  $P(B) = \frac{3}{10}$  and  $P(A \cap B) = \frac{1}{5}$ , then

$P(A/B') + P(B'/A')$  is equal to

A.  $\frac{5}{6}$

B.  $\frac{5}{7}$

C.  $\frac{65}{42}$

D. 1

**Answer:**



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436. If  $P(A) = 0.4$ ,  $P(B) = 0.8$  and  $P(B/A) = 0.6$  then  $P(A \cup B) =$ .

A. 0.24

B. 0.3

C. 0.48

D. 0.96

Answer:



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437. A and B are events such that  $P(A) = 0.4$ ,  $P(B) = 0.3$  and  $P(A \cup B) = 0.5$ . Then  $P(B \cap A)$  equals



A.  $\frac{2}{3}$

B.  $\frac{1}{2}$

C.  $\frac{3}{10}$

D.  $\frac{1}{5}$

**Answer:**



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**438.** If  $P(A \cap B) = 0.15$ ,  $P(B) = 0.10$  then  $P(A/B) =$

A.  $\frac{1}{3}$

B.  $\frac{1}{4}$

C. none

D.  $\frac{1}{5}$

**Answer:**



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**439.** In Q.10  $P(A) = 0.4$ ,  $P(B) = 0.3$   $P(A \cap B) = 0.2$ ,  $P(B/A')$  is equal to

A.  $\frac{1}{4}$

B.  $\frac{3}{10}$

C.  $\frac{5}{6}$

D.  $\frac{1}{6}$

**Answer:**



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440. If  $P(B) = \frac{3}{5}$ ,  $P(A/B) = \frac{1}{2}$  and  $P(A \cup B) = \frac{4}{5}$  then

$$P(A \cup B') + P(A' \cup B) =$$

A.  $\frac{1}{5}$

B.  $\frac{4}{5}$

C.  $\frac{1}{2}$

D. 1

**Answer:**



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441. Let  $P(A) = \frac{5}{13}$ ,  $P(B) = \frac{9}{13}$  and  $P(A \cap B) = \frac{5}{13}$ , then

$P(A/B)$  is equal to

A.  $\frac{6}{13}$

B.  $\frac{4}{13}$

C.  $\frac{5}{9}$

D.  $\frac{5}{9}$

**Answer:**



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**442.** If A and B are two independent events with  $P(A) = \frac{3}{5}$  and  $P(B) = \frac{4}{9}$ , then  $P(A' \cap B')$  equals

A.  $\frac{4}{15}$

B.  $\frac{8}{45}$

C.  $\frac{2}{9}$

D.  $\frac{1}{3}$

**Answer:**



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**443.** If two events are independent then

- A. they must be mutually exclusive
- B. the sum of their probabilities must be equal to .
- C. both(a) and (b) are correct
- D. none of the above is correct.

**Answer:**



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**444.** If  $A$  and  $B$  are independent events such that  $0 < P(A) < 1$  and  $0 < P(B) < 1$  then which of the following is not correct ?

- A.  $A$  and  $B$  mutually exclusive.
- B.  $A$  and  $B'$  are independent
- C.  $A'$  and  $B$  are independent
- D.  $A'$  and  $B'$  are independent.

**Answer:**



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**445.** Let  $A$  and  $B$  be two events such that  $P(A) = \frac{3}{8}$ ,  $P(B) = \frac{5}{8}$  and  $P(A \cup B) = \frac{3}{4}$   $P(A/B) P(A'/B)$  is equal to

A.  $\frac{2}{5}$

B.  $\frac{3}{8}$

C.  $\frac{3}{20}$

D.  $\frac{6}{25}$

**Answer:**



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**446.** Two events E and F are independent . If  $P ( E ) = 0.3$  ,  $P ( E \cup F ) = 0.5$  then  $P ( E | F ) - P ( F | E )$  equals

A.  $\frac{2}{7}$

B.  $\frac{3}{35}$

C.  $\frac{1}{70}$

D.  $\frac{1}{7}$

**Answer:**



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**447.** A bag contains 5 red and 3 blue balls. If 3 balls are drawn at random without replacement, the probability of getting exactly one red balls

A. A)  $\frac{45}{196}$

B. B)  $\frac{135}{392}$

C. C)  $\frac{15}{56}$

D. D)  $\frac{15}{29}$

**Answer:**





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**448.** In reference Q.20 above, the probability that exactly two of the three balls are red, the first balls being red is

A.  $\frac{1}{3}$

B.  $\frac{4}{7}$

C.  $\frac{15}{28}$

D.  $\frac{5}{28}$

**Answer:**

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**449.** Three persons A, B and C fire at a target in turn, starting with A. their probabilities of hitting the target are 0.4, 0.3 and

0.2 respectively. The probability of two hits is

A. 0.024

B. 0.188

C. 0.336

D. 0.452

**Answer:**



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**450.** Three distinguishable balls are distributed in three cells. The probability that all three occupy the same cell, given that at least two of them are in the same cell, is

A.  $\frac{1}{7}$

B.  $\frac{1}{9}$

C.  $\frac{1}{6}$

D. none of these

**Answer:**



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**451.** Suppose  $X$  is a binomial variate  $B(5,p)$  and  $P(X=2)=P(X=3)$ , then  $p$  is equal to

A.  $\frac{1}{5}$

B.  $\frac{1}{4}$

C.  $\frac{1}{3}$

D.  $\frac{1}{2}$

**Answer:**

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**452.** A die is thrown and a card is selected at random from a deck of 52 playing cards. The probability of getting an even number on the die and a spade card is

A.  $\frac{1}{8}$

B.  $\frac{1}{4}$

C.  $\frac{1}{2}$

D.  $\frac{3}{4}$

**Answer:**

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**453.** A box contains 3 orange balls, 3 green and 2 blue balls. Three balls are drawn at random from the box without replacement. The probability of drawing 2 green balls and one blue ball is

A.  $\frac{2}{21}$

B.  $\frac{3}{28}$

C.  $\frac{1}{28}$

D.  $\frac{167}{168}$

**Answer:**



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**454.** A flashlight has 8 batteries out of which 3 are dead. If two batteries are selected without replacement and tested, the

probability that both are dead is

A.  $\frac{33}{56}$

B.  $\frac{9}{24}$

C.  $\frac{1}{14}$

D.  $\frac{3}{28}$

**Answer:**



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**455.** Two dice are thrown. If it is known that the sum of the number on the dice is less than 6, the probability of a getting a sum is 3

A.  $\frac{1}{18}$

B.  $\frac{2}{5}$

C.  $\frac{1}{5}$

D.  $\frac{5}{18}$

**Answer:**



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**456.** Two cards are drawn from a well shuffled deck of 52 playing cards with replacement. The probability that both cards are queen, is :

A.  $\frac{1}{13} \times \frac{1}{13}$

B.  $\frac{1}{13} + \frac{1}{13}$

C.  $\frac{1}{13} \times \frac{1}{17}$

D.  $\frac{1}{13} \times \frac{4}{51}$

**Answer:**



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**457.** The mean and variance of a random variable  $X$  having a binomial distribution are 4 and 2 respectively, then  $P(X=1)$  is

A.  $\frac{1}{4}$

B.  $\frac{1}{32}$

C.  $\frac{1}{16}$

D.  $\frac{1}{8}$

**Answer:**



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**458.** Two numbers are selected randomly from the set  $S = \{1, 2, 3, 4, 5, 6\}$  without replacement one by one. The probability that minimum of the two numbers is less than 4 is a.  
1/15 b. 14/15 c. 1/5 d. 4/5

A.  $\frac{4}{5}$

B.  $\frac{1}{15}$

C.  $\frac{1}{5}$

D.  $\frac{14}{15}$

**Answer:**



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**459.** Which one is not a requirement of a binomial distribution?

- A. There are 2 outcomes for each trials
- B. There is a fixed number of trails.
- C. The outcomes must be dependent on each other.
- D. The probability of success must be same for each trial.

**Answer:**

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**460.** The probability distribution of a discrete random variable  $X$  is given below:

<b><math>X</math></b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b><math>P(X)</math></b>	<b><math>\frac{5}{k}</math></b>	<b><math>\frac{7}{k}</math></b>	<b><math>\frac{9}{k}</math></b>	<b><math>\frac{11}{k}</math></b>

The value of  $k$  is

A. 8

B. 32

C. 16

D. 48

**Answer:**



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**461.** Let  $X$  be a random variable. The probability distribution of  $X$  is given below:

<b><math>X</math></b>	<b>30</b>	<b>10</b>	<b>-10</b>
<b><math>P(X)</math></b>	<b><math>\frac{1}{5}</math></b>	<b><math>\frac{3}{10}</math></b>	<b><math>\frac{1}{2}</math></b>

The  $E(X)$  is equal to

A. 6

B. 4

C. 3

D. -5

**Answer:**



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**462.** Let 'X' be a discrete random variable assuming values  $x_1, x_2, \dots, x_n$  with probabilities  $p_1, p_2, \dots, p_n$  respectively. Then variance of 'X' is given by :

A.  $E(X^2)$

B.  $E(X^2) + E(X)$

C.  $E(X^2) - [E(X)]^2$

$$D. \sqrt{E(X^2) - \{E(X)\}^2}$$

**Answer:**



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**463.** For the following probability distribution

<b>X</b>	<b>-4</b>	<b>-3</b>	<b>-2</b>	<b>-1</b>	<b>0</b>
<b>P(X)</b>	<b>0.1</b>	<b>0.2</b>	<b>0.3</b>	<b>0.2</b>	<b>0.2</b>

E(X) is equal to

A. 0

B. -1

C. -2

D. -1.8

**Answer:**



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**464.** For the following probability distribution

<b>X</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
<b>P(X)</b>	$\frac{1}{10}$	$\frac{1}{5}$	$\frac{3}{10}$	$\frac{2}{5}$

$E(X^2)$  is equal to

A. 3

B. 5

C. 7

D. 10

**Answer:**



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**465.** Suppose that a random variabe  $X$  follows Binomial distribution with parameters  $n$  and  $p$ ,

where  $0 < p < 1$ . If  $\frac{P(X = r)}{P(X = n - r)}$  is independent of  $n$  and  $r$ , then

$p$  is equal to

A.  $\frac{1}{2}$

B.  $\frac{1}{3}$

C.  $\frac{1}{5}$

D.  $\frac{1}{7}$

**Answer:**



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**466.** In a college 30% students fail in physics 25% fail in mathematics and 10% fail in both one student is chosen at random, the probability that the student fails in Physics if he she has failed in mathematics is

A.  $\frac{1}{10}$

B.  $\frac{2}{5}$

C.  $\frac{9}{20}$

D.  $\frac{1}{3}$

**Answer:**



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467. A and B are two students. Their chances of solving a problem correctly are  $\frac{1}{3}$  and  $\frac{1}{4}$  respectively if the probability of their making a common error is  $\frac{1}{20}$  and they obtain the same answer then the probability of their answer to be correct is

A.  $\frac{1}{12}$

B.  $\frac{1}{40}$

C.  $\frac{13}{40}$

D.  $\frac{10}{13}$

**Answer:**



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