MATHS

BOOKS - ARIHANT MATHS (HINGLISH)

PROBABILITY

Examples

1. A four digit number is formed using the digits 1, 2, 3, 5 with no repetitions. Write the probability that the number is divisible by 5.

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2. If a leap year is selected at random, what is the chance that it will contain 53 wednesday ?

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3. If $P(A) = \frac{6}{11}, P(B) = \frac{5}{11}$ and $P(A \cup B) = \frac{7}{11}$, find $P(A/B)$.

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4. If $P(A/B) = 0.8, P(B/A) = 0.6$ and $P\left(A^C \cup B^C\right) = 0.7$, then find the value of $P(A \cup B)$.

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5. A black and a red die are rolled together. Find the conditional brobability of obtaining the sum 8, given that the red die resulted a number less than 4.

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6. Ten cards numbered1 through 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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7. 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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8. 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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9. A die marked 1, 2, 3 in red and 4, 5, 6 in green is tossed. Let A be the event, the number is even, and B be the event, the number is red. Are A and B independent?

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10. If $P(A) = \frac{3}{5}$ $P(B) = \frac{5}{7}$, where A and B are independent events, then find $P(A \cup B)$ and $P(A/B)$.

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11. If A and B are independent events such that $P(A) = \frac{3}{10}, P(B) = \frac{2}{5}$, then find :

(i) P(A and B) and (ii) P(A or B).

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12. One card is drawn from a pack of 52 cards so that each card is equally likely to be selected. Prove that the following cases are independent :

(a) A : "The card drawn is a spade"

B : "The card drawn is an ace."

(b) A : "The card drawn is black"

B : "The card drawn is a king."

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13. 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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14. Three coins are tossed simultaneously. Consider the events :

E : 'three heads or three tails'

F : 'at least two heads'

G : 'at most two heads'.

Of the pairs (E, F), (E, G) and (F, G), which are independent, which are dependent ?

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15. A die marked 1, 2, 3 in red and 4, 5, 6 in green is tossed. Let A be the event, the number is even, and B be the event, the number is red. Are A and B independent?

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

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17. In a hockey match, both teams A and B scored same number of goals upto the end of the game, so to decide the winner, the referee asked both the captains to throw a die alternately and decided that the team whose captain gets a six first, will be declared the winner. If the captain of team A was asked to start, then find their respective probabilities of winning the match and state whether the decision of the referee was fair or not.

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18. A speaks truth in 60% of cases, while B in 90% of the cases. In what percent of cases are they likely to contradict each other in stating the same fact?

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19. The probabilities of two students A and B coming to the school in time are $\frac{3}{7}\backslash$ and $\frac{5}{7}$ respectively. Assuming that the events, A coming in time and B coming in time are independent, find the probability of only one of

them coming to the school in time. Write at least one advantage of coming to school in time.

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20. A and B throw a pair of dice alternately. A wins the game if he gets a total of 7 and B wins the game if he gets a total of 10. If A starts the game, then find the probability that B wins.

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21. If A and B are two independent events such that :

$P(\overline{A} \cap B) = \frac{2}{15}$ and $P(A \cap \overline{B}) = \frac{1}{6}$, then find P(A) and P(B).

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22. How many times must a man toss a fair coin, so that the probability of having at least one head is more than 80%?

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23. A and B appeared for an interview. The probability of their selection is $\frac{1}{2}$ and $\frac{1}{3}$ respectively. Find the probability that :

(i) both selected

(ii) at least one of them selected.

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24. The probability of solving a specific problem independently by A and B are $\frac{1}{3}$ and $\frac{1}{5}$ respectively. If both try to solve the problem independently, find the probability that the problem is solved.

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25. A problem in Mathematics is given to three students whose chances of solving it are $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}$.

What is the probability in the following cases ?

(i) that the problem is solved

(ii) only one (exactly one) of them solves it correctly

(iii) at least one of them may solve it.

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

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27. A person has undertaken a construction job. The probabilities are 0.65 that there will be strike. 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 ther

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28. There are two bags I and II. Bag I contains 4 white and 3 red balls while another Bagt 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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29. 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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30. Assume that the chances of a patient having a heart attack is 40%. Assuming that a meditation and yoga course reduces the risk of heart

attack by 30% and prescription of certain drug reduces its chance 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. Interpret the result and state which of the above stated methods is more beneficial for the patient.

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31. An insurance company insured 2000 scooter drivers, 4000 car drivers and 6000 truck drivers. The probability of an accident involving a scooter, a car and a truck 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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32. 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 of the lost card being a spade.

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33. Three persons A, B and C apply for a job of Manager in a Private Company. Chances of their selection (A, B and C) are in the ratio 1 : 2 : 4. The probabilities that A, B and C can introduce changes to improve profits of the company are 0.8, 0.5 and 0.3 respectively. If the change does not take place, find the probability that it is due to the appointment of C.

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34. Often it is taken that a truthful person commands more respect in the society. A man is known to speak the truth 4 out of 5 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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35. In a bolt factory, machines A, B and C manufacture respectively 25%, 35% and 40% of the total bolts. Of their output 5, 4 and 2 percent are respectively defective bolts. A bolt is drawn at random from the product. What is the probability that the bolt drawn is defective?

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36. 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 tune, B is on the job

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37. Suppose a girl throws a die. If she gets 1 or 2 , she tosses a coin three times and notes the number of tails. If she gets 3,4,5 or 6, she tosses the

coin once and notes whether 'head' or 'tail' is obtained. If she obtained exactly one 'tail', what is the probability that she threw 3,4,5,or 6 with the die

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38. Suppose a girl throws a die. If she gets a 5 or 6, she tosses a coin three times and notes the number of heads. If she gets 1, 2, 3 or 4, she tosses a coin once and notes whether a head or tail is obtained. If she obtained exactly one head, what

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39. Bag I contains 3 red and 4 black balls and Bag II contains 4 red and black balls. Two balls are transferred at random 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 balls were both black.

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40. There are three coins. One is a coin having tails on both faces, another is a biased coin that comes up tails on both faces, anoter is a biased coin that comes up tails 70% of the time and the third is an unbiased coin. One of the coins is chosen at random and tossed, it shows tail. Find the probability that it was a coin with tail on both the faces.

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41. Suppose that the reliability of a HIV test is specified as follows: Of people having HIV. 90% of the test detects the disease but 10% go undetected. Of people free of HIV, 99% of the test are judged HTV-ive but 1% are diagnosed as showing H3V+ive

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42. Of the students in a school, it is known that 30% have 100% attendance and 70% students are irregular. Previous year results report

that 70% of all students who have 100% attendance attain A grade and 10% irregular students attain A grade in their annual examination. At the end of the year, one student is chosen at random from the school and he was found to have an A grade. What is the probability that the student has 100% attendance ? Is regularity required only in school ? Justify your answer.

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43. The following is a probability distribution function of a random variable :

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

(i) Find k (ii) Find $P(X > 3)$ (iii) Find $P(-3 < X < 4)$

(iv) Find $P(X < -3)$.

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44. A bag contains 2 white and 1 red balls. One ball is drawn at random and then put back in the box after noting its colour. The process is repeated again. If X denotes the number of red balls recorded in the two draws, describe X.

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45. 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 denotes the amount gained or lost by the person. Show that X is a rando

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

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47. Find the probability distribution of X; the number of heads in two tosses of a coin (or a simultaneous toss of two coins).

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48. Four defective oranges are accidently mixed with sixteen 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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49. The random variable X can the values 0, 1, 2, 3, Give P(X = 0) = P(X = 1)= p and P(X = 2) = P(X = 3) such that $\sum p_i x_i^2 = 2\sum p_i x_i$ then find the value of p

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50. Let a pair of dice be thrown and the random variable X be the sum of the numbers that appear on the two dice. Find the mean or expectation of X.

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51. Find the mean and variance of the numbers obtained on a throw of an unbiased die.

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52. Find the mean and variance of the number of heads in the two tosses of a coin.

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53. Two cards are drawn (without replacement) from a well shuffled deck of 52 cards. Find the probability of both being king of red colour.

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54. Two numbers are selected at random(without replacement) from the first five positive integers. Let X denote the larger of the two numbers obtained. Find the mean and variance of X

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55. Two cards are drawn simultaneously (without replacement) from a well-shuffled pack of 52 cards. Find the mean and variance of the number of red cards.

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56. There are 4 cards numbered 1, 3, 5 and 7, one number on one card. Two cards are drawn at random without replacement. Let 'X' denote the sum of the numbers on the two drawn cards. Find the mean and variance of X.

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57. From a lot of 10 items containing 3 defective items a sample of 4 items is drawn at random. Let the random variable 'X' denote the number of defective items in the sample. If the sample is drawn without replacement, find :

(i) The Probability Distribution of X

(ii) Mean of X (iii) Variance of X.

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58. three numbers are selected at random (without replacement) from first six positive integers. Let X denote the largest of the three numbers

obtained. the probability distribution of X. Also, find the mean

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59. Six balls are drawn successively from an um containing 7 red and 9 black balls. Tell whether or not the trials of drawing balls are Bernoulli trials when after each draw the ball drawn is (i) replaced (ii) not replaced in the urn.

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60. An experiment succeeds thrice as often as it fails. Find the probability that in the next five trials, there will be atleast 3 successes.

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61. An unbiased coin is tossed 6 times .Find using binomial distribution , the probability of getting at least 5 heads .

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62. A pair of dice is thrown 4 times. If getting a doublet is considered as a success,

(i) find the probability of getting a doublet

(ii) hence, find the probability of two succeses.

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63. The probability that a student entering university will graduate is 0.4. Find the probability that out of 3 students of the university: (i) none will graduate, (ii) only one will graduate, (iii) all will graduate.

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64. 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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65. 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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66. 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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67. In a backward state, there are 729 families having six children each. If probability of survival of a girl is $\frac{1}{3}$ and that of a boy is $\frac{2}{3}$, find the number of families having 2 girls and 4 boys.

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

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69. In an examination, 10 questions of true-false type are asked. A student tosses a fair coin to determinehis answer to each question. If the coin falls heads, he answers "true" and if it falls Lails, he answers "false "Show that the probability that he answers at most correctly 7 questions is $\frac{121}{128}$

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70. Find the mean of the Binomial distribution $B\left(4, \frac{1}{3}\right)$.

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71. The sum of mean and variance of a binomial distribution is 15 and the sum of their squares is 117. Determine the distribution.

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72. The mean and variance of a binomial distribution are 4 and 4/3 respectively, find $P(X \geq 1)$.

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73. 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 probability that B is selected.

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74. The probability of simultaneous occurrence of at least one of two events A and B is p. If the probability that exactly one of A, B occurs is q then prove that $P(A)+P(B)=2-2p+q$.

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75. 10% of the bulbs produced in a factory are red colour and 2% arered and defective. If one bulb is picked at random, determine the probability of its being defective if it red.

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76. Three machinesE1, E2 and E3 in a certain factory producing electric bulbs, produce 50%, 25% and 25% respectively, of the total daily output of electric bulbs. It is known that 4% of the bulbs produced by each of machines E1 and E2 are defective and that 5% of those produced by machine E3are defective. If one bulb is picked up at random from a days production, calculate the probability that it is defective.

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77. Determine variance and standard deviation of the number of heads in three tosses of a coin.

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Exercise 13 A Satq

1. If $P(E) = \frac{6}{11}, P(F) = \frac{5}{11}$ and $P(E \cup F) = \frac{7}{11}$, find $P(F/E)$.

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2. Given that E and F are events such that

$P(E) = 0.6, P(F) = 0.3, P(E \cap F) = 0.2.$

Find P(E/F) and P(F/E).

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3. (a) A coin is tossed three times.

(i) E : heads on third toss , F : heads on first two tosses

(ii) E : at least two heads,

F : at most two heads

(iii) E : at most two tails , F : at least one tail.

Find the probability in all cases.

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4. Mother, father and son line up at random for a family picture :

E : Son on one end , F : father in the middle. Find P(F/E)

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5. A black and a red dice are rolled. (a) Find the conditional probability of obtaining a sum greater than 9. Given that the black die resulted in a 5.

(b) Find the conditional probability of obtaining the sum 8? given that the red die resulted in a

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Exercise 13 A Latq

1. A fair die is rolled. Consider the events :

E = {1, 3, 5}, F = {2, 3} and G = {2, 3, 4, 5}.

Find : (i) P(E/F) and P(F/E)

(ii) P(E/G) and P(G/E)

(iii) $P(E \cup F/G)$ and $P(E \cap F/G)$.

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2. A family has 2 children. Find the probability that both are boys, if it is known that: (i) at least one of the children is a boy, (ii) the elder child is a boy.

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3. 12 cards numbered 1 to 12 (one number on one card), are placed in a box and mixed up throoughly. Then a card is drawn at random from the box. If it is known that the number on the drawn card is greater than 5. Find the probability that the card bears an odd number.

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4. 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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5. 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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6. Given that the two number appearing on throwing two dice are different. Find the probability of the event the sum of numbers on the dice is 4.

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7. 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 (i) the youngest is a girl (ii) at least one is a girl?

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Exercise 13 B Satq

1. If $P(E) = \frac{3}{5}$ and $P(F) = \frac{1}{5}$. Find:

$P(E \cap F)$ if E and F are independent events.

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2. (a) Given two independent events A, B such that $P(A) = 0.3, P(B) = 0.6$. Find :

(i) P (A and B)

(ii) P (A and not B)

(iii) P (A or B)

(iv) P (neither A nor B).

(b) If $P(A) = 0.2, P(A \cup B) = 0.6$, find P (B).

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3. Let A and B be two Independent events such that :

$P(A) = \frac{1}{4}, P(B) = \frac{1}{2}$, find :

(i) P(A or B)

(ii) P (neither A nor B).

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4. 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 ?

(i) A : "the first throw results in head"

B : "the last throw results in tail"

(ii) A : "the number of heads is two"

B : "the last throw results in head".

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5. 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? (i) E : the card drawn is a spade F : the card drawn is an ace (ii) E : the card drawn is black F : the card dr

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

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7. The probability of student A passing an examination is $\frac{3}{7}$ and of student B passing is $\frac{5}{7}$.Assuming the two events "A passes" B passes as independent, find the probability only one of thempassing the examination.

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8. Out of 8 outstanding students of school, in which there are 3 boys and 5 girls, a team of 4 students is to be selected for a quiz competition. Find the probability that 2 boys and 2 girls are selected.

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Exercise 13 B Latq

1. A box of oranges is inspected by examining three randomly selected oranges drawn without replacement. If all the three oranges are good, die box is approved for sale, otherwise, it is rejected. Find the probability that a box containing 15 orange

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2. A die is thrown once. F A is the event the number appearing is a multiple of 3 and B is the event the number appearing is even: Are the events A and B independent?

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3. Two balls are drawn at random with replacement from a box containing 10 black and 8 red balls. Find the probability that (i) both balls are red. (ii) first ball is black and second is red. (iii) one of them is black and other is red.

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4. An urn contains 10 white and 5 black balls. Two balls are drawn from the urn one after the other without replacement. What is the probability that both drawn balls are white?

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5. A bag contains 10 white and 15 black balls. Two balls are drawn succession without replacement. What is the probability that the first ball is white and the second is black ?

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6. One bag contains 3 red and 5 black balls. Another bag contains 6 red and 4 black balls. A ball is transferred from first bag to the second bag and then a ball is drawn from the second bag. Find the probability that the ball drawn is red.

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7. 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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8. A bag 'A' contains 6 white and 7 black balls while the other bag 'B' contains 4 white and 5 black balls. A ball is transferred from the bag A to the bag B. Then a ball is drawn from the bag B. Find the probability that the ball drawn is white.

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9. There are three urns. A, B, and C . Urn A contains 4 red balls and 3 black balls. Urn B contains 5 red balls and 4 black balls urn c contains 4 red and 4 black balls. Ne balls is drawn from each of these urns. What is the probability that 3 balls drawn consist of 2 red balls and a black ball?

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10. (i) P speaks truth in 70% of the cases and Q in 80% of the cases. In what persentage of cases are they likely to agree in stating the same fact ?

(ii) 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 the same fact ?

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11. (i) A and B toss a coin alternately till one of them tosses a head and wins the game. If A starts the game, find their respective probability of winning.

(ii) A and B throw a coin alternately till one of them gets a 'head' and wins the game. If A starts the game, find the probability of his winning at his third throw.

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12. A and B throw a pair of dice alternatively, 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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13. A, B and C in turn throw a die and one who gets a 6 first, wins the game. A takes the first chance followed by B and C, and the process is

repeated till one them who gets a 6, wins the game. Find the probabilities of each for winning the game.

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14. A, B and C play a game and chances of their winning it in an attempt are $\frac{2}{3}, \frac{1}{2}$ and $\frac{1}{4}$ respectively. A has the first chance, followed by B and then by C. The cycle is repeated till one of them wins the game. Find their respective chances of winning the game.

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15. Three ships $A, B, andC$ sail from England to India. If the ratio of their arriving safely are 2:5, 3:7, and 6:11, respectively, then the probability of all the ships for arriving safely is $18/595$ b. $6/17$ c. $3/10$ d. $2/7$

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16. (i) A husband and wife appear in an interview for two vacancies in the same post. The probability of husband's selection is $\frac{1}{7}$ and that of wife's selection is $\frac{1}{5}$. Find the probability that both of them will be selected.

(ii) Amit and Nisha appear for an interview for two vacancies in a company. The probability of Amit's selection is $\frac{1}{5}$ and that of Nisha's selection is $\frac{1}{6}$. What is the probability that both of them are selected ?

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17. The probabilities of A, B, C solving a question are $\frac{1}{3}, \frac{2}{7}$ and $\frac{3}{8}$ respectively. Find the probability that exactly one of them will solve it.

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18. A bag contains 50 tickets numbered 1, 2, 3, .., 50 of which five are drawn at random and arranged in ascending order of magnitude `(x_1

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19. A bag contains 100 bolts and 300 nuts, 50% of each have been rusted. One item is chosen at random. Find the probability that chosen item is rusted or a bolt.

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Exercise 13 C Satq

1. 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 (not A and not B).

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2. Three coins are tossed once. Find the probability of getting at most two heads.

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3. The probability of A hitting a target is $\frac{4}{5}$ and that of B hitting it is $\frac{2}{3}$. They both fire at the target. Find the probability that :

(i) at least one of them will hit the target

(ii) only one of them will hit the target.

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4. A die is tossed thrice. Find the probability of getting an odd number at least once.

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5. (i) A problem in Mathematics is given to three students whose chances of solving it are :

$\frac{1}{2}, \frac{1}{4}$ and $\frac{1}{5}$.

What is the probability that at least one of them may solve it ?

(ii) A problem is given to three students, whose chances of solving it are :

$\frac{1}{3}, \frac{1}{5}$ and $\frac{1}{6}$.

What is the probability that exactly one of them may solve it.

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6. A and B try to solve the problem independently. The probability that A solves the problem is $\frac{1}{2}$ and that B solves the problem is $\frac{1}{3}$. Find the probability that :

(a) Both of them solve the problem

(b) The problem is solved.

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7. A and B appeared for interview. The probability of their selection is :

$\frac{1}{3}$ and $\frac{1}{4}$ respectively.

Find the probability that :

(i) both selected

(ii) at least one of them selected.

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8. A husband and wife appear in an interview for two vacancies for the same post. The probability of husbands selection is 1/7 and that of wifes selection is 1/5. What is the probability that Both of them will be selected? Only one of them will be selected? None of them will selected?

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9. A can solve 90% of the problems given in a book and B can solve 70%. What is the probability that at least one of them will solve the problem, selected at random from the book?

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10. An anti-aircraft gun can take a maximum of four shots at an enemy plane moving away from it. The probabilities of hitting the plane at the

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 ?

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11. In a lot of 12 Microwave ovens, there are 3 defective units. A person has ordered 4 of these units and since each is identically packed, the selection will be random. What is the probability that i. all 4 units are good. ii. Exactly 3 units are good, iii. at least 2 units are good.

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Exercise 13 D Latq

1. (i) 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.

(ii) A card from a pack of 52 cards is lost. Form the remaining cards of the

pack, two cards are drawn at random and are found to be both clubs. Find the probability of the lost card being of clubs.

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2. As man is known to speak 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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3. Three bags contain :

(i) 4 red and 4 black, 2 red and 6 black balls

(ii) 6 red and 3 balck, 5 red and 5 black balls

(iii) 6 red and 4 black, 3 red and 3 black balls.

One ball is drawn at random from one of the bags and found to be red. Find the probability that it was drawn from the second bag.

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4. (i) 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.

(ii) There are two bags I and II. Bag I contains 4 white and 3 red balls and bag II contains 6 white and 5 red balls. One ball is drawn at random from one of the bags and is found to be red. Find the probability that it was drawn from bag II.

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5. 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

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6. (a) (i) Bag I contains 5 red and 3 black balls, Bag II contains 6 red and 5 black balls. One bag is chosen at random and a ball is drawn which is found to be black. Find the probability that it was drawn from Bag I, (II).

(ii) Bag I contains 3 red and 5 white balls and bag II contains 4 red and 6 white balls. One of the bags is selected at random and a ball is drawn from it. The ball is found to be red. Find the probability that ball is drawn from Bag II.

(b) 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 it was drawn from bag II.

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7. Given three identical boxes I, II and III, each containing two coins. In box L both coins are gold coins, in box II, both are silver coins and in the box III, There is one gold and one silver coin. A person chooses a box at random and takes out a

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8. In a tape recorder factory three machines A, B and C produced 50%, 30% and 20% of total production. The percentage of the defective output of these machines are 3%, 4% and 5% respectively. A tape recorder is selected randomly and found to be defective, find the probability that it is produced by machine A.

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9. A company has two plants to manufacture scooters. Plant I manufactures 70% of the scooters and Plant II manufactures 30%. At Plant I, 80% of the scooters are rated as of standard quality and at Plant II, 90% of the scooters are rated as of standard quality. A scooter is chosen at random and is found to be of standard quality. What is the probability that it has come from Plant II?

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10. An insurance company insured 2000 scooter drivers, 4000 car drivers and 6000 truck drivers. The probability of an accident involving a scooter, a car and a truck 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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11. 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 l

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12. (i) A man is known to speak the truth 3 out of 4 times. He throws a die and reports that it is 6. Find the probability that it is actually a 6.

(ii) A man is known to speak the truth 3 out of 5 times. He throws a die

and reports that it is number greater than 4. Find the probability that it is actually a number greater than 4.

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13. A bag contains 4 balls. Two balls are drawn at random, and are found to be white. What is the probability that all balls are white?

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14. 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 grad

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15. 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 proba

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

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17. There are three coins. One is a two headed coin (having head on both faces), another is a biased coin that comes up heads 75% of the time and third is an unbiased coin. One of the three coins is chosen at random and tossed, it shows heads, what i

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18. In a certain college, 4% of boys and 1% of girls are taller than 1.75 metres. Furthermore, 60% of the students in the college are girls. A student is selected at random from the college and is found to be taller than 1.75 metres. Find the probability that the selected student is a girl.

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19. Bag I contains 2 white, 1 black and 3 red balls, Bag II contains 3 white, 2 black and 4 red balls, Bag III contains 4 white, 3 black and 2 red balls. A bag is chosen at random and two balls are drawn from it. They happen to be one black and one red. What is the probability that they come from bag II ?

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20. (i) Coloured balls are distributed in three bags as shown in the following table :

Bag	Colour of the ball		
	Black	White	Red
I	1	2	3
II	2	4	1
III	4	5	3

A bag is selected at random and then two balls are randomly drawn from the selected bag. They happen to be black and red. Find the probability that they come from bag I ?

(ii) Three bags contain balls as shown in the table below :

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

A bag is chosen at random and two balls are drawn from it. They happen to be white and red. What is the from it. They happen to be white and red. What is the probability that they come from the III bag ?

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21. The members of a consulting firm rent cars from three rental agencies :

50% from agency X, 30% from agency Y and 20% from agency Z. From past experience, it is known that 9% of the cars from agency X need a service and tunning before renting, 12% of the cars from agency Y need a service and tunning before renting and 10% of the cars from agency Z need a service and tunning before renting. If the renting car delivered to the firm neeeds service and tunning, find the probability that agency Z is not to be blamed.

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Exercise 13 E Satq

1. An urn contains 5 red and 2 black balls. Two balls are randomly drawn. Let X represent the number of black balls. What are the possible values of X? Is X a random variable?

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2. 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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3. A random variable 'X' has the following probability distribution :

X:	−2	−1	0	1	2	3
P(X):	0·1	K	0·2	2K	0·3	K

Find : (i) the value of K (ii) $P(X \leq 1)$

(iii) $P(X \geq 0)$.

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4. A fair die is tossed once. If the random variable is the number of "getting an even number" (denoted by X), find the probability distribution of 'X'. Sketch the graph.

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5. Find the probability distribution for number of heads obtained in two tosses of a coin.

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6. A coin is tossed 5 times. If X is the number of heads observed, fid the probability distribution of X.

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7. (a) (i) Find the probability distribution of the number of heads when three coins are tossed simultaneously.

(ii) Find the probability distribution of the number of tails in the simultaneous tosses of three coins.

(iii) Find the probability distribution of the number of heads in the simultaneous toss of four coins.

(b) (i) Find the probability distribution of the number of heads in three tosses of a coin.

(ii) Find the probability distribution of the number of sixes in two tosses of a die.

(c) Find the probability distribution of the number of heads (tails) in four tosses of a coin.

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8. Find the probability distribution of the number of successes in two tosses of a die, where a success is defined as (i) number greater than 4 (ii) six appears on at least one die

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9. If pair of dice is thrown 4 times. If getting a doublet is considered a success, find the probability distribution of the number of doublets in three throws of a pair of dice and hence find its mean.

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10. A pair of dice is thrown 4 times. If getting a doublet is considered a success, find the probability distribution of number of successes. Also, find the mean and variance of number of successes.

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Exercise 13 E Latq

1. Let 'X' denote the number of hours you study during a randomly selected school day. The probability that 'X' can take the values of x has

the following form, where k is some unknown constant.

$P(X=x)=\{(0.1,, \text{if}, x=0), (kx,, \text{if}, x=1 \text{ or } 2), (k(5-x),, \text{if}, x=3$

(a) Find the value of 'k'.

(b) What is the probability that you study at least two hours ? Exactly two hours ? At most two hours ?

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2. Two cards are drawn successively with replacement from a well shuffled pack of 52 cards. Find the probability distribution of the number of aces.

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3. If a card is drawn from a well shuffled pack of 52 cards, then the probability that is a queen card is

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4. Two cards are drawn one by without replacement from a well shuffled deck of 52 cards. Find the proability distribution of the number of (I) Aces (II) kings (III) face cards (IV) spades.

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5. Two cards are drawn successively with replacement from a well shuffled pack of 52 cards. Find the probability distribution of the number of aces.

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6. Two cards are drawn without replacement from a well-shuffled deck of 52 cards. Determine the probability distribution of the number of face cards (i.e. Jack, Queen, King and Ace).

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7. 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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8. Three cards are drawn successively with replacement from a well shuffled card of 52 cards. If getting a card of spade is a success, then find the probability distribution of number of successes.

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9. An urn contains 4 white and 3 rd balls. Find the probability distribution of the number of red alls in a random draw of three balls.

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10. 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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11. Find the probability distribution of the number of green balls drawn when 3 balls are drawn , one by one, without replacement from a bag containing 3 green and 5 white balls.

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12. 3 defective bulbs are mixed up with 7 good 3 bulbs are drawn at random. Find the probability distribution of defective bulbs.

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13. We take 8 identical slips of paper, write the number 0 on one of them, the number 1 on three of the slips, the number 2 on three of the slips and the number 3 on one the ships. These slips are folded, put in a box and thoroughly mixed. One slip is drawn at random from the box. If X is the random variable denoting the number written on the drawn slip, find the probability distribution of X.

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14. From a lot of 10 bulbs, which includes 3 defectives, a sample of 2 bulbs is drawn at random. Find the probability distribution of the number of defective bulbs.

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Exercise 13 F Satq

1. The p.d.f. of a continuous r.v. X is $f(x) = \begin{cases} \frac{1}{10}, -5 \leq x \leq 5 \\ 0, \text{otherwise} \end{cases}$, then $P(X < 0)$ =

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

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

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

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

Answer: A

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

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Exercise 13 F Latq I

1. 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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2. Find the mean of the probability distribution of the number of doublets in three throws of a pair of dice.

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3. 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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4. 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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5. A coin is tossed 4 times. Let X denote the number of heads. Find the probability distribution of X. Also, find the mean and variance of X.

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6. Find the mean, variance and standard deviation of the number heads when three coins are tossed.

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7. 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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8. Two bad eggs are accidently mixed up with ten good ones. Three eggs are drawn at random with replacement from this lot. compute the mean for the number of bad eggs drawn.

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9. 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 the mean of X.

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10.

X :	1	2	3	4	5
P(X) :	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{8}$	$\frac{1}{16}$	p

The probability distribution of a random variable 'X', taking values 1, 2, 3, 4, 5 is given :

(a) Find the value of p.

(b) Find the mean of X.

(c) Find the variance of X.

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Exercise 13 F Latq Ii

1. Four bad oranges are mixed accidently with 16 good oranges. Find the probability distribution of the number of bad oranges in a draw of two oranges.

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2. 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 number of defective bulbs. Hence find the mean of the distribution.

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3. Find the probability distribution of the number of white balls drawn in a random of 3 balls without replacement from a bag of 4 white and 6 red balls. Also find the mean and variance of the distribution.

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4. Two numbers are selected at random (without replacement) 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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5. An urn contains 3 white and 6 red balls. Four balls are drawn one by one with replacement from the urn. Find the probability distribution of the number of red balls drawn. Also find mean and variance of the distribution.

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Exercise 13 G Satq

1. (a) Obtain binomial probability distribution, if :

(i) $n = 6, p = \frac{1}{3}$ (ii) $n = 5, p = \frac{1}{6}$.

(b) 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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2. (i) A coin is tossed 7 times. What is the probability that head appears an odd number of times ?

(ii) A coin is tossed 7 times. What is the probability that tail appears an odd number of times ?

(iii) A coin is tossed 5 times. What is the probability that head appears an odd number of times ?

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Exercise 13 G Latq

1. (i) A coin is tossed 5 times. What is the probability of getting :

(a) at least 3 heads (b) at most 2 heads

(c) no head (d) 3 heads ?

(ii) If a fair coin is tossed 10 times, find the probability of :

(a) exactly four heads

(b) exactly six heads

(c) at least six heads

(d) at most six heads.

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2. Find the probability of :

(i) getting 5 exactly twice in 7 throws of a die

(ii) throwing at most 2 sixes in 6 throws of a single die.

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3. (i) A die is thrown 5 times. If getting an 'odd number' is success, find the probability of getting at least 4 successes.

(ii) A die is thrown 6 times. If getting an 'odd (even) number' is a success, what is the probability of :

(I) 5 successes (II) at least 5 successes (III) at most 5 successes (IV) no success ?

(iii) A die is thrown 10 times. If getting an even number is considered a success, find the probability of at least 9 successes.

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4. A pair of dice is thrown 7 times. If getting a total of 7 is considered a success, what is the probability of (i) no success? (ii) 6 success? (iii) at least 6 success? (iv) at most 6 successes?

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

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7. Probability of a shooter of hitting the target is $\frac{3}{4}$. If he shoots 10 times, find the probability of hitting 8 targets successfully.

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8. Suppose that 90% of people are right-handed. What is the probability that at most 6 of a random sample of 10 people are right-handed?

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9. Four dice are thrown simultaneously. If the occurrence of 2, 4 or 6 in single die is considered a success, find the probability of at least three successes.

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10. 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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11. An urn contains 25 balls of which 10 balls bear a mark "X" and the remaining 15 bear a mark T. 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 (i) all

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12. 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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13. Oil 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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14. In a box containing 100 bulbs, 10 are defective. What is the probability that out of a sample of 5 bulbs, (i) none is defective and (ii) exactly 2 are defective ?

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15. The probability that a bulb produced by a factory will fuse after 160 days of use is 0.06. Find the probability that out of 5 such bulbs at the most one bulb will fuse after 160 days of use.

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16. 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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17. Assume that on an average one telephone number out of 15 called between 2 P.M. and 3 P.M. on week days is busy. What is the probability that if six randomly selected telephone numbers are called, at least three of them will be busy ?

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18. If getting a '5' or a '6' in the throw of an unbiased die is a 'success' and the random variable 'X' denotes the number of succeses in six throws of the die, find $P_X[X = 4, 5, 6]$.

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19. On a multiple choice examination with three possible answers (out of which only one is correct) 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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20. Calculate P (r) for r = 1, 2, 3, 4 and 5 by using the recurrence formula of the binomial distribution for the following Hence, draw the histogram for the distribution :

(i) $p = \frac{1}{3}, n = 5$ (ii) $p = \frac{1}{6}, n = 5.$

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21. Six dice are thrown 729 time. How many times do you expect at least three dice to show a five or six.

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Exercise 13 H Latq

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

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2. If the mean and variance of a binomial distribution are 18 respctively , then n = ...

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3. If the sum of the mean and variance of a binomial distribution of 18 trials is 10, determine the distribution.

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4. If the sum of the mean and variance of a binomial distribution for 5 trials is $\frac{75}{16}$, find the binomial distribution.

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5. The mean and variance of a Binomial variable X are respectively 4 and $\frac{4}{5}$. Find $P(X \geq 3)$.

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6. If the sum of the mean and variance of a binomial distribution for 5 trials is 1.8; find the distribution.

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7. Obtain the binomial distribution whose mean is 10 and standard deviation is $2\sqrt{2}$

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8. Find the binomial distribution whose :

(i) mean is 4 and variance is 3

(ii) mean is 9 and variance is 6.

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9. If tow dice are rolled 12 times, obtain the mean and the variance of the distribution of success, if getting a total greater than 4 is considered a success.

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10. A die is thrown 20 times. Getting a number greater than 4 is considered a success. Find the mean and variance of the number of successes.

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11. 10 coins are tossed at random. Obtain the mean and variance of the number of heads obtained.

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12. The sum and product of the mean and variance of a binomial distribution are 3.5 and 3 respectively. Find the binomial distribution.

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13. A die is thrown 6 times. Find the mean and variance of the number of aces.

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14. Eight dice are rolled at random. Find the mean and variance of number of successes if :

(i) Getting an odd number is success

(ii) Getting a number less than 3 is success.

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15. Two dice are rolled at random 5 times. Obtain the mean and variance of the distribution of doublets obtained.

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16. The mean and variance of a binomial distribution are 4 and 4/3 respectively, find $P(X \geq 1)$.

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17. If the sum of mean and variance of a binomial distribution is 4.8 for 5 trials. Find the distribution.

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18. A discrete random variable 'X' has mean equal to 3 and variance equal to 2. Assuming that the underlying distribution of 'X' is binomial, find the distribution and hence obtain :

(i) $P(X = 0)$

(ii) Draw a histogram for the distribution.

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19. (a) Determine the binomial distribution whose mean is 10 and variance is 8.

(b) Write its probability function.

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20. The screws produced by a certain machine were checked by examining samples of 7. The following table shows the distribution of 128 samples according to the number of defective items they contained.

No. of defectives in a sample of 7 is :

	:	0	1	2	3	4	5	6	7
No of samples:	:	7	6	19	35	30	23	7	1

N = 128.

Fit a binomial distributtion and find the expected frequencies if the chance of screw being defective is $\frac{1}{2}$. Also find the mean and variance of the fitted distribution.

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Objective Type Question A Multiple Choice Questions

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

A. 0

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

C. not defined

D. 1

Answer: C

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

Then,

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

B. A = B

C. $A \cap B = \phi$

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

Answer: D

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3. 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: D

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4. 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. $P(A) + P(B) = 1$

Answer: B

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5. Probability that A speaks truth is $\frac{4}{5}$. A coin is tossed. A reports that a 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: A

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6. If A and B are two events such that $A \subset B$ and $P(B) \neq 0,$ them 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: C

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7. If A and B are two events such that

$P(A) \neq 0$ and $P(B/A) = 1$, then :

A. $A \subset B$

B. $B \subset A$

C. $B = \phi$

D. $A = \phi$

Answer: A

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8. If P(A]B) > P(A), then which of the following is correct:

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

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

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

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

Answer: C

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9. 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: B

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10. 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: B

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11. 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: D

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12. In a box containing 100 bulbs, 10 are defective. The probability that out of a sample of 5 bulbs, none is defective is

A. 10^{-1}

B. $\left(\frac{1}{2}\right)^5$

C. $\left(\frac{9}{10}\right)^5$

D. $\frac{9}{10}$

Answer: C

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13. The probability that a student is not a swimmer is $\frac{1}{5}$. Then the probability that out of five students, four are swimmers is

A. ${}^5C_4\left(\frac{4}{5}\right)^4\frac{1}{5}$

B. $\left(\frac{4}{5}\right)^4\frac{1}{5}$

C. ${}^5C_2\frac{1}{5}\left(\frac{4}{5}\right)^4$

D. None of these

Answer: A

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14. A die is thrown once, then the probability of getting a number greater than 3 is :

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

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

C. 6

D. 0

Answer: A

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15. Let A and B be two events. If P(A) = 0.2, P(B)=0.4, $P(A \cup B) = 0.6$, then $P(A/B)$ is equal to :

A. 0.8

B. 0.5

C. 0.3

D. 0

Answer: D

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16. Let A and B be two events such that $P(A) = 0.6, P(B) = 0.2$ and $P(A/B) = 0.5$. Then $P(A'/B')$ equals :

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

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

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

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

Answer: C

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17. If E and F are independent events such that $0 < P(E) < 1$ and $0 < P(F) < 1$, then

A. E and F are mutually exclusive

B. A and B' are independent

C. A' and B are independent

D. A' and B' are independent

Answer: A

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18. Let 'X' be a discrete random variable. The probability distribution of X is given below :

X :	30	10	−10
P(X) :	$\frac{1}{5}$	$\frac{3}{10}$	$\frac{1}{2}$

Then E(X) is equal to :

A. 6

B. 4

C. 3

D. -5

Answer: B

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19. If X be a random variable taking values $x_1, x_2, x_3, \ldots, x_n$ with probabilities $P_1, P_2, P_3, \ldots P_n$, respectively. Then, Var (x) is equal to ..... .

A. $E\left(X^2\right)$

B. $E\left(X^2\right) + E(X)$

C. $E\left(X^2\right) - [E(X)]^2$

D. $\sqrt{E\left(X^2\right) - [E(X)]^2}$

Answer: C

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20. If A and B two events such that P(A)=0.2, P(B)=0.4 and $P(A \cup B) = 0.5$, then value of $P(A/B)$ is ?

A. 0.1

B. 0.25

C. 0.5

D. 0.08

Answer: B

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21. An urn contains 6 balls of which two are red and four are black. Two balls are drawn at random. Probability that they are of the different colours is

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

B. $\frac{1}{15}$

C. $\frac{8}{15}$

D. $\frac{4}{15}$

Answer: C

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22. If E and F are independent events, $P(E) = \frac{1}{2}$ and $P(F) = \frac{1}{3}$, then $P(E \cap F)$ is :

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

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

C. 0

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

Answer: D

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23. 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: D

Watch Video Solution

24. If $P(A) = 0.8, P(B) = 0.5$ and $P\left(\frac{B}{A}\right) = 0.4,$ then find P(A/B)

A. 0.15

B. 0.23

C. 0.64

D. 0.51

Answer: C

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25. If $P(A)\frac{7}{13}, P(B) = \frac{9}{13}$ and $P(A \cap B) = \frac{4}{13}$, find $P\left(\frac{A}{B}\right)$.

A. $\frac{4}{9}$

B. $\frac{7}{13}$

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

D. $\frac{9}{4}$

Answer: A

Watch Video Solution

26. if A and B be two events such that $P(A) = \frac{1}{4}, P(B) = \frac{1}{3}$ and $P(A \cup B) = \frac{1}{2}$, show that A and B are independent events.

A. independent

B. dependent

C. mutually exclusive

D. None of these

Answer: A

Watch Video Solution

27. 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: C

Watch Video Solution

28. 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: D

Watch Video Solution

29. If P (E) denotes probability of occurrence of event E, then :

A. $P(E) \in [-1, 1]$

B. $P(E) \in (1, \infty)$

C. $P(E) \in (0, 1)$

D. $P(E) \in [0, 1]$

Answer: D

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30. If A and B are independent events, then :

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

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

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

D. $P(A \cup B) = P(A) + P(B)$

Answer: A

Watch Video Solution

31. 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) $\frac{1}{36}$

A. 0

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

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

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

Answer: D

Watch Video Solution

32. If $AandB$ are two events such that $P(A) = 0.5, P(B) = 0.6 and P(A \cup B) = 0.8$, find $P(A/B) and P(B/A)$.

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

B. $\frac{3}{5}$

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

D. None of these

Answer: B

Watch Video Solution

33. If A and B are two independent events such that $P(A \cup B) = 0.60 \, and \, P(A) = 0.2$, find $P(B)$.

A. 0.5

B. 0.6

C. 0.7

D. None of these

Answer: A

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34. Two cards are drawn from a well shuffled deck of \$2 cards with replacement The probability that both cards are queens, is

A. $\frac{1}{17}$

B. $\frac{1}{221}$

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

D. None of these

Answer: B

Watch Video Solution

35. Events A and B are 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. $P(A) = P(B) = 1$

Answer: B

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36. A pair of dice is thrown once, the probability of doublet is :

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

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

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

D. None of these

Answer: A

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37. If $P(A) = \frac{1}{2}$ and $P(B) = 0$, then $P(A/B)$ is equal to :

A. 0

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

C. not defined

D. 1

Answer: C

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38. If A and B are events such that $P(A/B) = P(B/A)$, then :

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

B. A = B

C. $A \cap B = \phi$

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

Answer: D

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39. A die is rolled. If the outcome is an odd number, what is the probability that it is prime?

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

B. $\frac{3}{4}$

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

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

Answer: A

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40. If $P(A) = \frac{3}{5}$ and $P(B) = \frac{1}{5}$, then the value of $P(A \cap B)$ when A and B are independent events is :

A. $\frac{3}{25}$

B. $\frac{3}{28}$

C. $\frac{2}{7}$

D. $\frac{2}{11}$

Answer: A

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41. If A and B are two independent events and $P(A) = \frac{1}{4}, P(B) = \frac{1}{3}$, then :

A. $P(A \cup B) = \frac{1}{5}$

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

C. $P(A \cup B) = \frac{1}{2}$

D. $P(A \cup B) = \frac{1}{3}$

Answer: C

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42. If $P(A) = \frac{1}{2}, P(B) = \frac{3}{8}$ and $P(A \cap B) = \frac{1}{5}$, then $P(A/B)$ is equal to :

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

B. $\frac{8}{15}$

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

D. $\frac{5}{8}$

Answer: B

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43. If P(A]B) > P(A), then which of the following is correct: (A) $P(B \mid A) < P(B)$ (B) `P(AnnB)" "P(B)(D)P(B" "|" "A)" "=" "P(B)`

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

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

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

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

Answer: C

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44. 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: B

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45. 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) $\frac{1}{36}$

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

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

C. 0

D. $\frac{11}{12}$

Answer: B

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46. Let E and F be two events associated with the same random experiment. Then E and F are said to be independent if $P(E \cap F)$ is equal to :

A. $\frac{P(E)}{P(F)}$

B. $P(E) + P(F)$

C. $P(E) - P(F)$

D. $P(E).\ P(F)$

Answer: D

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47. The probability that a student is not a swimmer is $\frac{1}{5}$. Then the probability that out of five students, four are swimmers is (A) $\hat{}\ 5C_4 \frac{\left(\frac{4}{5}\right)^{41}}{5}$ (B) $\frac{\left(\frac{4}{5}\right)^{41}}{5}$ (C) $\hat{}\ 5C_1 \frac{1}{5}\left(\frac{4}{5}\right)^4$ (D) None of these

A. ${}^5C_4\left(\frac{4}{5}\right)^4 \frac{1}{5}$

B. $\left(\frac{4}{5}\right)^4\left(\frac{1}{5}\right)$

C. ${}^5C_4 \frac{1}{5}\left(\frac{4}{5}\right)^4$

D. None of these.

Answer: C

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48. A card is drawn from a well shuffled deck of 52 cards. The probability of red queen is :

A. $\frac{4}{52}$

B. $\frac{2}{52}$

C. $\frac{13}{52}$

D. None of these.

Answer: B

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49. If A and B are events such that $P(A/B) = P(B/A)$, then :

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

B. A = B

C. $A \cap B = \phi$

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

Answer: D

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50. 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) $\frac{1}{36}$

A. 0

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

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

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

Answer: D

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Objective Type Question B Fill In The Blanks

1. If $P(A) = \frac{1}{5}$ and $P(A - B) = \frac{1}{6}$, then $P(A \cap B)$=_____.

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2. The probability of 'Ace of spade' is _____.

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3. 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 the value of P (not A and not B).

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4. If $P(A) = \frac{6}{11}, P(B) = \frac{5}{11}$ and $P(A \cup B) = \frac{7}{11}$, then

(i) $P(A \cap B)$=_____ (ii) $P(B/A)$=_____

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5. If $P(A) = 0.6$, $P(B) = 0.7$ and $P(A \cup B) = 0.9$, then

(i) $P(A/B)$=_____ (ii) $P(B/A)$ =_____

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6. If A and B are independent events such that $P(A) = \frac{3}{10}$, $P(B) = \frac{2}{5}$, then P(A and B) is _____.

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7. If A and B are independent events, then $P(A \cap B)$ =_____.

Watch Video Solution

8. Let A and B be independent events with $P(A) = 0.3$ and $P(B) = 0.4$, then :

(i) $P(A \cap B)$=_____ (ii) $P(A \cup B)$=_____

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9. If A and B are two independent events such that :

$P(A \cup B) = 0.60$ and $P(A) = 0.2$, then P(B) = _____.

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10. If $P(\overline{A}) = 0.4, P(A \cup B) = 0.7$ and A and B are given to be independent events, then P(B) = _____.

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11. If A and B are two independent events such that $P(A) = \frac{1}{2}, P(A \cup B) = \frac{3}{5}$ and $P(B) = p$, then p = _____.

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12. A pair of coins is tossed once. Then the probability of showing at lest one head is _____.

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13. If A and B are two independent events, then the probability of occurrence of at least one of A and B is given by 1 P (A) P (B)

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14. A random variable 'X' has a probability distribution P(X) of the following form (k is constant):

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

then k = _____ .

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15. Find the mean and variance of the number of heads in the two tosses of a coin.

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Objective Type Question C True False Questions

1. If (A) = 0.8, P(B) = 0.5 and $P(B/A) = 0.4$, then $P(A/B) = 0.64$.

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2. Given that E and F are events such that

$P(E) = 0.6$, $P(F) = 0.3$ and $P(E \cap F) = 0.2$.

then (i) $P(E/F) = \frac{2}{3}$ (ii) $P(F/E) = \frac{2}{3}$.

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3. Two events E and F are such that :

$P(E) = 0.6, P(F) = 0.2$ and $P(E \cup F) = 0.68.$

Then E and F are independent events.

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4. Given two independent events A and B such that

$P(A) = 0.3, P(B) = 0.6,$

then P(A and not B) = 0.18.

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5. 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 the value of P (not A and not B).

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Objective Type Question D Very Short Answer Tyep Questions

1. If $P(E) = 0.6$, $P(F) = 0.3$ and $P(E \cap F) = 0.2$, then find $P(E/F)$.

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2. If $P(A) = 0.3$, $P(B) = 0.6$ and A and B are independent events, then find the value of P(A and B).

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3. There are 4 white and 6 black balls in a bag. Two balls are drawn at random. Find the probability that both balls drawn are black.

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4. Find the probability of drawing a king from a well shuffled pack of 52 cards.

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5. If $P(A) = 0.6, P(B) = 0.5$ and $P(A/B) = 0.3$, then find $P(A \cup B)$.

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6. If A and B are two events such that $P(A) = 0.4, P(B) = 0.8$ and $P(B/a) = 0.6$, then find:

(i) $P(A \cap B)$ (ii) $P(A \cup B)$ (iii) $P(A/B)$

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7. If A and B are two events such that $P(A) = 0.3, P(B) = 0.6$ and $P(B/A) = 0.5$, find $P(A/B)$.

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8. If two events A and B are such that P(A) =0.3, P(B)=0.4 and $P(A' \cap B') = 0.5$. then find the value of $P(B/(A \cup B'))$.

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9. If $P(A) = 0.3, P(B) = 0.6, P(B/A) = 0.5$, find $P(A \cup B)$.

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10. If A, B, C are mutually exclusive and exhaustive events associated to a random experiment, then write the value of $P(A) + P(B) = P(C)$.

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11. If A and B are two independent events such that $P(A) = 0.3$ and $P(A \cup \overline{B}) = 0.8$, find P(B).

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12. If $P(A) = 0.35, P(A \cup B) = 0.60$, find P(B), where A and B are independent events.

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13. Let A and B be two independent events such that $P(A) = \frac{1}{4}$ and $P(B) = \frac{1}{2}$, find P(not A and not B).

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14. 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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15. One card is drawn at random from a pack of well-shuffled deck of 52 cards. Check whether the following events are independent :

E: 'the card drawn is black'

F: 'the card drawn is a king'.

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16. If A and B are independent events such that $P(A) = p,\ P(B) = 2p\ and\ P$ (Exactly one of A and B occurs) $= \frac{5}{9}$, find the value of p.

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17. Write the probability that a number selected at random from the set of first 100 natural numbers is a cube.

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18. Three numbers are chosen from 1 to 20. Find the probability that they are consecutive.

A. $\frac{18}{{}^{20}C_3}$

B. $\frac{17}{{}^{20}C_3}$

C. $\frac{18}{{}^{18}C_3}$

D. $\frac{18}{{}^{18}C_4}$

Answer: A

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19. The odds in favour of an event are 3 : 4. Find the probability of :

(i) Occurrence (ii) Non-occurrence of the event.

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20. Three coins are tossed once. Find the probability of getting at least two tails.

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21. Find the probability distribution of the number of successes in two tosses of a die, where a success is defined as (i) number greater than 4 (ii) six appears on at least one die

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22. A random variable has the following distribution :

X:	-1	0	1	2
P(X):	$\frac{1}{3}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{3}$

Does it represent a probability function ?

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23. Find mean μ for the following probability distribution :

X:	0	1	2	3
P(X):	$\frac{1}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{1}{8}$

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24. Find the values of 'a' so that the following distribution is a probability distribution :

X:	-2	-1	0	1
P(X):	$\frac{1-a}{4}$	$\frac{1+2a}{4}$	$\frac{1-2a}{4}$	$\frac{1+a}{4}$

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25. Find E(X) from the adjoining probability distribution :

X:	−4	−3	−2	−1	0
P(X):	0.1	0.2	0.3	0.2	0.2

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Ncert File Exercise 13 1

1. 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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2. Compute $P\left(\frac{A}{B}\right)$, if $P(B) = 05$ and $P(A \cap B) = 0.32$

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3. If $P(A) = 0.8, P(B) = 0.5$ and $P(B/A) = 0.4$, find (i) $P(A \cap B)$ (ii) $P(A/B)$ (iii) $P(A \cup B)$.

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

Watch Video Solution

5. If $P(A) = \frac{6}{11}, P(B) = \frac{5}{11}$ and $P(A \cup B) = \frac{7}{11}$, find :

(i) $P(A \cap B)$ (ii) $P(A/B)$ (iii) $P(B/A)$.

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6. A coin is tossed three times, where

(i) A : head on third toss,B: heads on first two tosses

(ii) A: at least two heads, B : at most two heads

(iii) A : at most two tails,B at least one tail

In each case find P(A/B).

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7. Determine $P(E \mid F)$in :Two coins are tossed once, where(i) E: tail appears on one coin, F : one coin shows head(ii) E : no tail appears, F : no head appears

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

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9. Determine P (E|F) in : 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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10. A black and a red dice are rolled. (a) Find the conditional probability of obtaining a sum greater than 9. Given that the black die resulted in a 5. (b) Find the conditional probability of obtaining the sum 8? given that the red die resulted in a

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11. A fair die is rolled. Consider events $E = \{1, 3, 5\}$, $F = \{2, 3\}$and $G = \{2, 3, 4, 5\}$Find(i) $P(E \mid F)$and $P(F \mid E)$ (ii) $P(E \mid G)$and $P(G \mid E)$ (iii) $P((E \cup F) \mid G)$and $P((E \cap F) \mid G)$

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12. 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 (i) the youngest is a girl (ii) at least one is a girl?

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13. 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

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14. Given that the two number appearing on throwing two dice are different. Find the probability of the event the sum of numbers on the dice is 4.

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15. Consider the experiment of throwing a die. if a multiple of 3 comes tip. 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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16. In each of the Exercises choose the correct answer:If $P(A) = \frac{1}{2}$, $P(B) = 0$, then $P(A \mid B)$is(a) 0 (b) $\frac{1}{2}$ (c) not defined (d) 1

A. 0

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

C. not defined

D. 1

Answer: C

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

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

B. $A = B$

C. $A \cap B = \phi$

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

Answer: D

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Ncert File Exercise 13 2

1. If $P(A) = \frac{3}{5}$ and $P(B) = \frac{1}{5}$, find $P(A \cap B)$ if A and B are independent events.

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

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3. A box of oranges is inspected by examining three randomly selected oranges drawn without replacement. If all the three oranges are good, die box is approved for sale, otherwise, it is rejected. Find the probability that a box containing 15 orange

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4. 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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5. A die marked 1, 2, 3 in red and 4, 5, 6 in green is tossed. Let A be the event, the number is even, and B be the event, the number is red. Are A and B independent?

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6. Let E and F be events with $P(E) = \frac{3}{5}$, $P(F) = \frac{3}{10}$ and $P(E \cap F) = \frac{1}{5}$. Are E and F independent?

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7. Given that the events A and B are such that $P(A) = \frac{1}{2}$, $P(A \cap B) = \frac{3}{5}$ and $P(B) = p$. Find p if they are (i) mutually exclusive (ii) independent.

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8. Let A and B be independent events with $P(A) = 0.3$ and $P(B) = 0.4$ Find(i) $P(A \cap B)$ (ii) $P(A \cup B)$(iii) $P(A \mid B)$ (iv) $P(B \mid A)$

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9. 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 (not A and not B).

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10. If A and B are two events such that $P(A) = \frac{1}{2}, P(B) = \frac{7}{12}$ and P(not A or not B) = $\frac{1}{4}$. State whether A and B are independent?

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11. Given two independent events A and B such that $P(A) = 0.3$, $P(B) = 0.6$. Find(i) P(A and B) (ii) P(A and not B)(iii) P(A or B) (iv) P(neither A nor B)

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12. A die is tossed thrice. Find the probability of getting an odd number at least once.

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13. Two balls are drawn at random with replacement from a box containing 10 black and 8 red balls. Find the probability that (i) both balls are red. (ii) first ball is black and second is red. (iii) one of them is black and other is red.

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14. 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 (i) the problem is solved (ii) exactly one of them solves the problem.

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15. 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? (i) E :

the card drawn is a spade F : the card drawn is an ace (ii) E : the card drawn is black F : the card dr

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16. 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. (a) Find the probability that she reads neither Hindi nor English news papers. (b

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17. 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) $\frac{1}{36}$

A. 0

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

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

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

Answer: D

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18. Two events A and B will 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. $P(A) + P(B) = 1$

Answer: C

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Ncert File Exercise 13 3

1. An urn contains 5 red and 6 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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2. 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

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3. 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 grad

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4. In answering a question on 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 the student knows the answer given that he answered it correctly ?

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5. 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 proba

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6. There are three coins. One is a two headed coin (having head on both faces), another is a biased coin that comes up heads 75% of the time and third is an unbiased coin. One of the three coins is chosen at random and tossed, it shows heads, what i

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7. An insurance company insured 2000 scooter drivers, 4000 car drivers and 6000 truck drivers. The probability of an accidents are 0.01, 0.03 and 0.15 respectively. One of the insured persons meets with an accident. What is the probability that he i

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8. 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

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9. 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

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10. Suppose a girl throws a die. If she gets a 5 or 6, she tosses a coin three times and notes the number of heads. If she gets 1, 2, 3 or 4, she tosses a coin once and notes whether a head or tail is obtained. If she obtained exactly one head, what

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11. 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 tune, B is on the job

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12. 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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13. Probability that A speaks truth is $\frac{4}{5}$. A coin is tossed. A reports that a appears. The probability that actually there was head is (A) $\frac{4}{5}$ (B) $\frac{1}{2}$ (C) $\frac{1}{5}$ (D) $\frac{2}{5}$

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

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

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

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

Answer: A

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14. If A and B are two events such that $A \subset B$ and $P(B) \neq 0$, them which of the following is correct? (A) $P \quad (A \quad | \quad B) \quad = \frac{P(B)}{P(A)}$ (B) `P(A|B)

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: C

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Ncert File Exercise 13 4

1. State which of the following are not the probability distributions of a random variable. Given reasons for your answer.

(*i*)

X	0	1	2
P(X)	0.4	0.4	0.2

(*ii*)

X	0	1	2	3	4
P(X)	0.1	0.5	0.2	−0.1	0.3

(*iii*)

Y	−1	0	1
P(Y)	0.6	0.1	0.2

(*iv*)

Z	3	2	1	0	−1
P(Z)	0.3	0.2	0.4	0.1	0.05

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2. An urn contains 5 red and 2 black balls. Two balls are randomly drawn. Let X represent the number of black balls. What are the possible values of

X? Is X a random variable?

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3. 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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4. Find the probability distribution of (i) number of heads in two tosses of a coin. (ii) number of tails in the simultaneous tosses of three corns. (iii) number of heads in four tosses of a com.

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5. Find the probability distribution of the number of successes in two tosses of a die, where a success is defined as (i) number greater than 4 (ii)

six appears on at least one die

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6. 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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7. 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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8. 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

(i) k (ii) $P(X<3)$

(iii) $P(X>6)$ (iv) $P(0<X<3)$.

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9. The random variable X has a probability distribution P(X) of the following form, where k is some number : P(X) = $\{k, \text{ if } x=02k, \text{ if } x=13k, \text{ if } x=20, otherwise$ (a) Determine the value of k. (b) Find

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

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

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12. 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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13. 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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14. 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.

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15. 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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16. 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) $\frac{8}{3}$

A. 1

B. 2

C. 5

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

Answer: B

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17. 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) $\frac{2}{13}$

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

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

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

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

Answer: D

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Ncert File Exercise 13 5

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

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2. 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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3. 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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4. Five cards are drawn successively with replacement from a well-shuffled deck of 52 cards. What is the probability that (i) all the five cards are spades? (ii) only 3 cards are spades? (iii) none is a spade?

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5. 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 :

(i) none

(ii) none more than one

(iii) more than one

(iv) at least one

will fuse after 150 days of use.

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6. 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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7. 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 com falls heads, he answers "true1; if it falls tails, he answers "false1. Find the probability th

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8. Suppose X has a binomial distribution $B\left(6, \frac{1}{2}\right)$. Show that $X = 3$is the most likely outcome.(Hint: $P(x = 3)$is the maximum among all $P(x_i), x_i = 0, 1, 2, 3, 4, 5, 6)$

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9. Oil 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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10. 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(a) at least once (b) exactly once (c) at least twice?

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

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

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13. 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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14. In a box containing 100 bulbs, 10 are defective. The probability that out of a sample of 5 bulbs, none is defective is(A) 10-1 (B) $\left(\frac{1}{2}\right)^5$ (C) $\left(\frac{9}{10}\right)^5$ (D) $\frac{9}{10}$

A. 10^{-1}

B. $\left(\frac{1}{2}\right)^5$

C. $\left(\frac{9}{10}\right)^5$

D. $\frac{9}{10}$

Answer: C

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15. The probability that a student is not a swimmer is $\frac{1}{5}$. Then the probability that out of five students, four are swimmers is (A) $\hat{}\ 5C_4\frac{\left(\frac{4}{5}\right)^{41}}{5}$ (B) $\frac{\left(\frac{4}{5}\right)^{41}}{5}$(C) $\hat{}\ 5C_1\frac{1}{5}\left(\frac{4}{5}\right)^4$ (D) None of these

A. ${}^5C_4\left(\frac{4}{5}\right)^4\frac{1}{5}$

B. $\left(\frac{4}{5}\right)^4\frac{1}{5}$

C. ${}^5C_1\frac{1}{5}\left(\frac{4}{5}\right)^4$

D. None of these.

Answer: A

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Miscellaneous Exercise On Chapter 13

1. A and B are two events such that $P(A) \neq 0$. Find $P(B \mid A)$, if (i) A is a subset of B (ii) $A \cap B = \varphi$

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2. A couple has two children, (i) Find the probability that both children are males, if it is known that at least one of the children is male. (ii) Find the probability that both children are females, if it is known that the elder child is a female.

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3. 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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4. Suppose that 90% of people are right-handed. What is the probability that at most 6 of a random sample of 10 people are right-handed?

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5. An urn contains 25 balls of which 10 balls bear a mark "X" and the remaining 15 bear a mark T. 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 (i) all

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6. 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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7. 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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8. If a leap year is selected at random, what is the chance that it will contain 52 Tuesdays ?

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9. An experiment succeeds twice as often as it fails. Find the probability that in the next six trials, there will be atleast 4 successes.

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10. How many times must a man toss a fair com so that the probability of having at least one head is more than 90%?

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11. 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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12. Suppose we have four boxes A,B,C and D containing coloured marbles as given below : 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? bo

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13. 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 ch

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14. 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

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15. 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 fails) = 0.2 P(B fails alone) = 0.15 P(A and B fail) = 0.15 Evaluate the following probabilit

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16. 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 t

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17. If A and B are two events such that $P(A) \neq 0$ and $P(B/A) = 1$, then :

A. $A \subset B$

B. $B \subset A$

C. $B = \phi$

D. $A = \phi$

Answer: A

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18. If $P(A/B) > P(A)$, then which of the following is correct :

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

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

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

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

Answer: C

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19. 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: B

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Exercise

1. A committee of 4 students is selected at random from a grourp consisting of 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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2. A bag contains 5 red marbles and 3 black marbles. Three marbles are drawn one by one without replacement. What is the probability that atleast one of the three marbles drawn be black, if the first marble is red?

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3. A and B throw a pair of dice alternately. A wins the game, if he gets a total of 6 anfd B wins, if she gets a total of 7. If a starts the game, then find the probabbility of winning the game by A in third throw of the pair of dice.

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4. 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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5. Find the probability that in 10 throws of a fair die a score which is a multiple of 3 will be obtained in at least 8 of the throws.

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Revision Exercise

1. E and F are two events such that $P(E) \neq 0$. Find $P(F/E)$, if :

(i) E is a subset of F (ii) $E \cap F = \phi$.

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

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3. Suppose we have four boxes A,B,C and D containing coloured marbles as given below : 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? bo

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4. 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 t

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5. 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 these person being male? Assume that there are equal number of males and females.

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6. 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 ch

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7. 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

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8. 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 fails) = 0.2 P(B fails alone) = 0.15 P(A and B fail) = 0.15 Evaluate the following probabilit

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9. A box contains 16 bulbs out of which 4 bulbs are defective. 3 bulbs are drawn one by one from the box without replacement. Find the probability that all three are defective bulbs

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10. A box contains 13 bulbs out of which 5 bulbs are defective. 3 bulbs are drawn one by one from the box without replacement. Find the probability that exactly 2 bulbs are defective.

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11. 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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12. (i) A die is thrown 7 times. If getting an "even number" is "success", find the probability of getting at least 6 successes.

(ii) A die is thrown 8 times. If getting an "even number" is a "success", find the probability of getting at least 7 successes.

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13. A die is thrown 3 times. Getting a multiple of 3 is considered a success. Find the probability of at least 2 successes.

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14. Six coins are tossed simultaneously. Find the probability of getting (i) 3 head (ii) no head (iii) at least one head.

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15. 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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16. An experiment succeeds twice as often as it fails. Find the probability that in the next six trails there will be at least 4 successes.

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17. How many times must a man toss a fair com so that the probability of having at least one head is more than 90%?

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18. From the frequency distribution table from the following data

Marks (Out of 90)	**Number of candidates**
More than or equal to 80	4
More than or equal to 70	6
More than or equal to 60	11
More than or equal to 50	17
More than or equal to 40	23
More than or equal to 30	27
More than or equal to 20	30
More than or equal to 10	32
More than or equal to 0	34

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19. A man takes a step forward with probability 0.4 and backward with probability 0.6. Find the probability that at the end of 5 steps, he is one step away from the starting point.

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20. Out of (2n+1) tickets consecutively numbered, three are drawn at random. Find the chance that the numbers on them are in AP.

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Check Your Understanding

1. If E and F are mutually exclusive, then $P(E \cap F)$ is equal to _____(Fill in the Blank)

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2. Let E and F be events with :

$P(E) = \frac{4}{5}, P(F) = \frac{3}{10}$ and $P(E \cap F) = \frac{1}{5}$. Are E and F independent ?

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3. If A and B are two independent events such that

$P(A) = \frac{5}{13}, P(B) = \frac{2}{13}$, then $P(A \cap B)$ is equal to _____.

A. $\frac{10}{169}$

B. $\frac{5}{169}$

C. $\frac{2}{169}$

D. $\frac{11}{169}$

Answer: A

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4. A pair of dice is tossed once and X denotes the sum of numbers that appear on the two dice, then $P(X \leq 4)$ =_____.

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5. A dice is tossed twice. Find the probability of getting an odd number at least once.

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6. Bayes' Theorem

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7. The mean of the number of heads in two tosses of a coin is _____.

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8. Obtain the Binomial Probability Distribution, if $n = 6, p = \frac{1}{5}$.

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9. Suppose X has a binomial distribution $B\left(6, \frac{1}{2}\right)$. Show that $X = 3$is the most likely outcome.(Hint: $P(x = 3)$is the maximum among all $P(x_i), x_i = 0, 1, 2, 3, 4, 5, 6)$

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10. If the Mean and Variance of a Binomial Distribution are 12 and 8 respectively, find the number of trials.

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Competition File

1. it is given that the events A and B are such that $P(A) = \frac{1}{4}, P\left(\frac{A}{B}\right) = \frac{1}{2}$ and $P\left(\frac{B}{A}\right) = \frac{2}{3}$ then $P(B) =$

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

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

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

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

Answer: C

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2. A die is thrown. Let A be the event that the number obtained is greater than 3. Let B be the event that the number obtained is less than 5. Then $P(A \cup B)$ is

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

B. $\frac{3}{5}$

C. 0

D. 1

Answer: D

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3. One ticket is selected at random from 50 tickets numbered 00, 01, 02, ... , 49. Then the probability that the sum of the digits on the selected ticket is 8, given that the product of these digits is zero, equals

A. $\frac{1}{7}$

B. $\frac{5}{14}$

C. $\frac{1}{50}$

D. $\frac{1}{14}$

Answer: D

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4. An urn contains nine balls of which three are red, four are blue and two are green. Three balls are drawn at random without replacement from the urn. The probability that the three balls have different colour, is

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

B. $\frac{2}{7}$

C. $\frac{1}{21}$

D. $\frac{2}{23}$

Answer: B

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5. If C and D are two events such that $C \subset D$and P(D) is not equal to 0,` then the correct statement among the following is

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

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

C. $P(C/D) < P(C)$

D. $P(C/D) - \frac{P(D)}{P(C)}$

Answer: B

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6. Consider 5 independent Bernoulli's trials each with probability of success p. If the probability of at least one failure is greater than or equal to $\frac{31}{32}$, then p lies in the interval :

A. $\left(\frac{1}{2}, \frac{3}{4}\right]$

B. $\left(\frac{3}{4}, \frac{11}{12}\right]$

C. $\left[0, \frac{1}{2}\right]$

D. $\left(\frac{11}{12}, 1\right]$

Answer: C

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7. Let A, B, C be pariwise independent events with $P(C) > 0$ and $P(A \cap B \cap C) = 0$. Then $P\left(\frac{A^c \cap B^c}{C}\right)$.

A. $P(A) - P(B^c)$

B. $P(A^c) + P(B^c)$

C. $P(A^c) - P(B^c)$

D. $P(A^c) - P(B)$

Answer: D

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8. Three numbers are chosen at random without replacement from {1, 2, 3, ... 8}. The probability that their minimum is 3, given that their maximum is 6, is

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

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

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

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

Answer: B

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9. Let A and B be two events such that $P(\overline{A \cup B}) = \frac{1}{6}, P(A \cap B) = \frac{1}{4}$ and $P(\overline{A}) = \frac{1}{4}, where \overline{A}$ stands for the complement of the event A. Then the events A and B are

A. equally likely but not independent

B. independent but not equally likely

C. independent and equally likely

D. mutually exclusive and independent

Answer: B

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10. If 12 identical balls are to be placed in 3 identical boxes,then the probability that one of the boxes contains exactly 3 balls is-

A. $\frac{55}{3}\left(\frac{2}{3}\right)^{11}$

B. $\frac{55}{3}\left(\frac{2}{3}\right)^{10}$

C. $220\left(\frac{1}{3}\right)^{12}$

D. $22\left(\frac{11}{3}\right)^{11}$

Answer: A

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11. Let two fair six-faced dice A and B be thrown simultaneously. If E_1 is the event that die A shows up four, E_2 is the event that die B shows up

two and E_3 is the event that the sum of numbers on both dice is odd, then which of the following statement is NOT True ?

A. E_1 and E_2 are not independent

B. E_1 and E_3 are independent

C. E_1, E_2 and E_3 are independent

D. E_1 and E_2 are independent

Answer: C

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12. A box contains 15 green and 10 yellow balls. If 10 balls are randomly drawn, one-by-one, with replacement, then the variance of number of yellow balls drawn is :

A. 4

B. $\frac{6}{25}$

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

D. 6

Answer: C

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13. If two different numbers are taken from the set $(0, 1, 2, 3. 10)$: then the probability that their sum as well as absolute difference are both multiple of 4 are

A. $\frac{14}{45}$

B. $\frac{7}{55}$

C. $\frac{6}{55}$

D. $\frac{12}{55}$

Answer: C

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14. For three events A, B and C, P (Exactly one of A or B occurs) $= P$ (Exactly one of B or C occurs) $= P$ (Exactly one of C or A occurs) $= \frac{1}{4}$ and P (All the three events occur simultaneously) $= \frac{1}{6}$. Then the probability that at least one of the events occurs, is :

A. $\frac{3}{16}$

B. $\frac{7}{32}$

C. $\frac{7}{16}$

D. $\frac{7}{64}$

Answer: C

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15. A bag contains 4 red and 6 black balls. A ball is drawn at random from the bag, its colour is observed and this ball along with two additional balls of the same colour are returned to the bag. If now a ball is drawn at random from the bag, then the probability that this drawn ball is red, is

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

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

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

D. $\frac{3}{4}$

Answer: B

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16. In a random experiment, a fair die is rolled until two fours are obtained in succession. The probability that the experiment will end in the fifth throw of the die is equal to

A. $\frac{150}{6^5}$

B. $\frac{225}{6^5}$

C. $\frac{175}{6^5}$

D. $\frac{200}{6^5}$

Answer: C

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17. Probability of hitting a targen independently of 4 persons are $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{8}$. Then the probability that target is hit is-

A. $\frac{1}{192}$

B. $\frac{5}{192}$

C. $\frac{25}{32}$

D. $\frac{7}{32}$

Answer: C

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Chapter Test

1. 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: B

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2. If $P(A)\frac{7}{13}, P(B) = \frac{9}{13}$ and $P(A \cap B) = \frac{4}{13}$, find $P\left(\frac{A}{B}\right)$.

A. $\frac{4}{9}$

B. $\frac{7}{13}$

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

D. $\frac{9}{4}$

Answer: A

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3. If $P(E) = \frac{7}{13}, P(F) = \frac{9}{13}$ and $P(E \cap F) = \frac{4}{13}$, then $P(E/F)$ _____.

A. $\frac{4}{7}$

B. $\frac{2}{9}$

C. $\frac{4}{9}$

D. $\frac{2}{7}$

Answer: C

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4. Let A and B be events with :

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

Are A and B independent ?

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5. A coin is tossed 7 times. What is the probability that head appears an odd number of times ?

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6. 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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7. 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 :

(i) the problem is solved

(ii) exactly one of them solves the problem.

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8. 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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9. Find the probability of the number of doublets in three throws of a pair of dice.

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10. 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.

A. $1-\frac{9^9}{10^{10}}$

B. $1-\frac{9^{10}}{10^9}$

C. $1-\frac{9^{10}}{10^{10}}$

D. $1-\frac{9^9}{10^9}$

Answer: C

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11. Assume that the chances of a patient having a heart attack is 40%. Assuming that a meditation and yoga course reduces the risk of heart attack by 30% and prescription of certain drug reduces its chance 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. Interpret the result and state which of the above stated methods is more beneficial for the patient.

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

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

(a) Determine the value of k.

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

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Mock Test Select The Correct Option

1. If A is a 3×3 non-singular matrix such that $AA' = A'A$ and $B = A^{-1}A'$, then BB' equals:

A. I

B. B^{-1}

C. $(B^{-1})'$

D. $I + B$

Answer: A

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2. If area of triangle is 35 sq units with vertices $(2, -6), (5, 4)$ and $(k, 4)$. Then k is

A. 12

B. -2

C. $-12, -2$

D. $12, \ -2$

Answer: D

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3. If θ is the angle between two vectors $\vec{a}$ and $\vec{b}$, then $\vec{a} \cdot \vec{b} \geq 0$ only when `0

A. $0 < \theta < \frac{\pi}{2}$

B. $0 \leq \theta \leq \frac{\pi}{2}$

C. $0 < \theta < \pi$

D. $0 \leq \theta \leq \pi$

Answer: B

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

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

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

D. None of these

Answer: C

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5. Maximise $Z = 2x + 3y$ subject to $x + 2y \leq 6, x \geq 4, y \geq 0$ is :

A. 6 at (6, 0)

B. 6 at (0, 6)

C. 12 at (6,0)

D. 12 at (0, 6)

Answer: C

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6. The value of $\cot\left(\sin^{-1} x\right)$ is :

A. $\frac{\sqrt{1+x^2}}{x}$

B. $\frac{x}{\sqrt{1+x^2}}$

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

D. $\frac{\sqrt{1-x^2}}{x}$

Answer: D

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7. Let 'X' be a discrete random variable. The probability distribution of X is given below :

X	30	10	−10
P(X)	$\frac{1}{5}$	$\frac{3}{16}$	$\frac{1}{2}$

Then E(X) is equal to:

A. 6

B. 4

C. 3

D. -5

Answer: B

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8. $\int \frac{dx}{x^2+2x+2}$ equals

A. $x\tan^{-1}(x+1)+c$

B. $\tan^{-1}(x+1)+c$

C. $(x+1)\tan^{-1}x+c$

D. $\tan^{-1} x + c$

Answer: B

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9. The line passing through the points $(5, 1, a)$ and $(3, b, 1)$ crosses the YZ-plane at the point $\left(0, \frac{17}{2}, -\frac{13}{2}\right)$. Then,

A. a = 8, b = 2

B. a = 2, b = 8

C. a = 4, b = 6

D. a = 6, b = 4

Answer: D

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10. What is the angle between the vector $\vec{r} = \left(4\hat{i} + 8\hat{j} + \hat{k}\right)$ and the x-axis ?

A. $\cos^{-1}\left(\frac{13}{9}\right)$

B. $\cos^{-1}\left(\frac{13}{3}\right)$

C. $\cos^{-1}\left(\frac{\sqrt{13}}{9}\right)$

D. $\cos^{-1}\left(\frac{4}{9}\right)$

Answer: D

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Mock Test Fill In The Blanks

1. If $f(x) = \frac{x-1}{x+1}, x \neq 1$, then $f(f(x))$=_____.

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2. $\frac{d}{dx}\left[\tan^{-1}\left(\sqrt{x}\right)\right]=$

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3. If $\begin{bmatrix}5 & x & 1\end{bmatrix}\begin{bmatrix}4\\2\\7\end{bmatrix}=[35]$, then x = _____.

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4. The function $x^3-3x^2+3x-100$ is _____ on R.

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5. Find the value of c in Rolle's theorem for the function f(x) = x^3– 3x in [– sqrt3, 0].

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6. If the projection of $\vec{i} + 3\vec{j} + 7\vec{k}$ on $2\vec{i} - 3\vec{j} + 6\vec{k}$ is _____.

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7. The direction-cosines of the line: $\frac{x-1}{2} = -y = \frac{z+1}{2}$ are _____.

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Mock Test Answer The Following Questions

1. Find the area of the triangle with vertices $(3, 8)$, $(-4, 2)$ and $(5, 1)$.

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2. Evaluate $\int -11\sin^5 x \cos^4 x dx$

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3. Find $\int x \cos x dx$

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4. Find: $\int \frac{x^3}{\sqrt{1-x^8}} dx.$

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5. $\int \frac{1}{\sqrt{5-4x-2x^2}} dx$

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6. Find the integrating factor of $x \log x \frac{dy}{dx} + y = 2 - \log x.$

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7. If $\tan^{-1}\left(\frac{x-2}{x-4}\right)+\tan^{-1}\left(\frac{x+2}{x+4}\right)=\frac{\pi}{4}$, find the value of 'x'.

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8. Let T be the set of all triangles in a plane with R a relation in T given by $R=\{(T_1,T_2):T_1 \text{ is congruent to } T_2\}$. Show that R is an equivalence relation.

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9. Find $\frac{dy}{dx}$, when:

$(\cos x)^y=(\cos y)^x$

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10. Find the equation of the tangent to the curve $x^2+3y=3$, which is parallel to the line $y-4x+5=0$

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11. Prove that: $\left[\vec{a} \quad \vec{b} \quad \vec{c}+\vec{d}\right]=\left[\vec{a} \quad \vec{b} \quad \vec{c}\right]+\left[\vec{a} \quad \vec{b} \quad \vec{d}\right]$.

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12. Find the values of lamda and mu for which $\left(2\hat{i}+6\hat{j}+27\hat{k}\right)\times\left(\hat{i}+\lambda\hat{j}+\mu\hat{k}\right)=\vec{0}$

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13. Find the points on the line $\frac{x+2}{3}=\frac{y+1}{2}=\frac{z-3}{2}$ at a distance of 5 units from the point $P(1,3,3,)$.

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14. If A and B are two independent events, then the probability of occurrence of at least one of A and B is given by 1 P (A) P (B)

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15. Let f: $W \to W$ be defined by: $f(n) = \begin{cases} n-1, & \text{if n is odd} \\ n+1, & \text{if n is even} \end{cases}$. Show that 'f' is invertible. Find the inverse of 'f'. (Here 'W' is the set of whole numbers.)

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16. Differentiate $\sin^{-1}\left(\frac{2^{x+1}}{1+4^x}\right)$ w.r.t. x.

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17. If $y = \left\{\log\left(x+\sqrt{x^2+1}\right)\right\}^2$, show that $(1+x^2)\frac{d^2y}{dx^2} + x\frac{dy}{dx} = 2$.

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18. Find the general solution of the differential equation: $\cos^2 x \frac{dy}{dx} + y = \tan x$. Find the particular solution which satisfies $y = 0$ at $x = 0$.

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19. Evaluate the definite integrals $\int 0 \frac{\pi}{2} \frac{\cos^2 x dx}{\cos^2 x + 4 \sin^2 x}$

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20. 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 t

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21. three numbers are selected at random (without replacement) from first six positive integers. Let X denote the largest of the three numbers obtained. the probability distribution of X. Also, find the mean

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22. A factory manufactures two types of screws, A and B. Each type of screw requires the use of two machines, an automatic and a hand operated. It takes 4 minutes on the automatic and 6 minutes on hand operated machines to manufacture a package of screws A, while it takes 6 minutes on automatic and 3 minutes on the hand operated machines to manufacture a package of screws B. Each machine is available for at the most 4 hours on any day. The manufacturer can sell a package of screws A at a profit of 70 paise and screws B at a profit of Rs 1. Assuming that he can sell all the screws he manufactures, how many packages of each type should the factory owner produce in a day in order to maximise his

profit? Formulate the above LPP and solve it graphically and determine the maximum profit.

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Mock Test Section D

1. If $A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$ and $A^3 - 6A^2 + 7A + kI_3 = O$, find k.

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2. Q. $\begin{vmatrix} x+y & x & x \\ 15x+4y & 4x & 2x \\ 10x+8y & 8x & 3x \end{vmatrix} = x^3$

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3. Draw a rough sketch of the curves $y^2 = x + 1$ and $y^2 = -x + 1$ and find the area enclosed between them,

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4. A water tank has the shape of an inverted right-circular cone with its axis vertical and vertex lower most. Its semi-vertical angle is $\tan^{-1}\left(\frac{1}{2}\right)$. Water is poured into it at a constant rate of 5 cubic meter per minute. Find the rate at which the level of the water is rising at the instant when the depth of water in the tank is 10 m.

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5. A square piece of tin of side 24 cm is to be made into a box without top by cutting a square from each and folding up the flaps to form a box. What should be the side of the square to be cut off so that the volume of the box is maximum ? Also, find the maximum volume.

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6. Find the distance of the point (2,3,4) from the plane $3x + 2y + 2z + 5 = 0$ measured parallel to the line $\frac{x+3}{3} = \frac{y-2}{6} = \frac{z}{2}$.

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