MATHS

BOOKS - V PUBLICATION

PROBABILITY

Question Bank

1. if $P(A) = \dfrac{7}{13}$, $P(B) = \dfrac{9}{13}$, $P(A \cap B) = \dfrac{4}{13}$ then $P(A|B)$ is..... a) $\dfrac{9}{4}$ b) $\dfrac{16}{13}$ c) $\dfrac{4}{9}$ d) $\dfrac{11}{13}$

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

3. Ten cards numbered 1 to 10 are placed in a box, mixed up thoroughly and then one card is drawn randomly. if it is known that the

number on the drawn card is more than 3, what is the probability that it is an even number?

4. In a school, there are 1000 students, out of which 430 are giris. 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 claṣs XII given that the chosen student is a girl?

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

6. 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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7. Given that 'E' and 'F' are events such that 'P(E)=0.6, P(F)=0.3'.and 'P(E n F)=0.2', find 'P(E | F)' and 'P(F| E)'

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8. Compute 'P(A | B)', if 'P(B)=0.5' and 'P(A n B)=0.32'

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9. If 'P(A)=0.8, P(B)=0.5' and 'P(B / A)=0.4', find (i) 'P(A n B) ' (ii) 'P(A | B)' (iii) 'P(A u B)'.

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10. Evaluate 'P(A uu B)', If '2 P(A)=P(B)=5/(13)' and 'P(A | B)=2/5'

11. If 'P(A)=6/(11), P(B)=5/(11)' and 'P(A uu B)=7/(11)', find

i)' P(A nn B)' ii) 'P(A | B)'

(iii) 'P(B | A)'

12. A coins is tossed three times,where

E:head on third toss,F: heads on first two

tosses find P(E/F)

13. Two coins are tossed once,where E: tail

appears on one coin, F: one coins shows head .

Find P(E/F)

14. Determine P(E|F). A die thrown three times, E: '4 appears on the third toss`.F:'6 and 5 appears respectively on the two tosses'.

15. Mother,Father and Son line up at random for a family picture.E : son on one end, F:Father in middle. Find P(E/F).

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

17. A fair die is rolled. Consider the events E= {1,3,5}, F = {2,3} and

G={2,3,4,5}. Find P(E/F) and P(F/E)

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

the youngest is a girl

19. An instructor has a question bank consisting of 300 easy True/False question,200 difficult true/false questions, 500 easy

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

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

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

Find the conditional probability of the event "the coins shows a tail" given that "at least one die shows a 2".

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

A)0 B)$\dfrac{1}{2}$ C)not defined D)1

A. 0

B. 1/2'

C. notdefined

D. 1

Answer: C

23. If A and B are event's such that $P(A \mid B) = P(B \mid A)$, then A)$A \subset B$ but $A \ne B$ B)$A = B$ C)$A \cap B = \phi$ D) $P(A) = P(B)$

A. A subset B' but 'A ne B'

B. A=B'

C. A nn B=phi'

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

Answer: D

24. 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?

25. 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?

26. A die 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 ?

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

28. Three coins are tossed simultaneously. Consider the event E three heads or three tails, F at least two heads and G at most two

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

29. If A and B are two independent events, then

Prove that A and B' are independent events.

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

show that the probability of occurrence of at

least one of A and B is

$1 - P(A')P(B')$

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31. Given $P(A) = \dfrac{3}{5}$ and $P(B) = \dfrac{1}{5}$

Find P(A or B), if A and B are mutually exclusive

events.

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

33. A box of oranges is inspected by examining three randomly selected oranges drawn without replacement. If all the three oranges

are good, the box is approved for sale, otherwise it is rejected. Find the probability that a box containing 15 oranges out of which 12 are good and 3 are bad ones will be approved for sale.

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34. 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.

35. 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 are independent?

36. Let E and F be events with

P(E) = 3/5,P(F) = 3/10 and

$P(E \cap F)$=1/5.Are E and F independent?

37. Given that the events 'A' and 'B' are such that 'P(A)=1/2, P(A uu B)=3/5' and 'P(B)=p'. Find 'p' if they are (i) mutually exclusive ii) independent.

38. Let ' A'. and 'B' be independent events with 'P(A)=0 .3' and 'P(B)=0.4'. Find

i) 'P(A nn B)'

ii) 'P(A uu B)'

iii) 'P(A | B)'

iv) 'P(B | A)'

39. If E and F are two events such that $P(E) = \frac{1}{4}, P(F) = \frac{1}{2}, P(E \text{ and } F) = \frac{1}{8}$

,find P(not E and not F)

40. Event A and B are such that $P(A) = \dfrac{1}{2}$ $P(B) = \dfrac{7}{12}$ and P(not A or not B)= $\dfrac{1}{4}$. State whether A and B are independent.

41. 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)

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

43. Two balls are drawn at random with replacement from a box containing 10 black

and 8 red balls. Find the probability that both balls are red

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

45. One card is drawn at random from a well shuffled pack of 52 cards. In which of the cases are the events E and F independent ? a) E: 'the card drawn is a spades.' F: 'the card drawn is an ace.'

46. In a ladies hostel,60% of the students read Hindi newspaper,40% read English newspaper and

20%read both Hindi and English newspapers.A

student is selected at random.

Find the probability that she reads neither Hindi

nor English newspapers.

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47. Choose the correct answer:

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

a) 0

b)1/3

c)1/12

d)1/36

A. 0

B. 1/3'

C. 1/(12)'

D. 1/(36)'

Answer: D

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48. Two events A and B wll 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

    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

49. 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 there is a strike. Determine the probability that the construction job will be completed on time.

50. 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 bag it is found to be red. Find the probability that it was drawn from bag II.

51. Given three identical boxes I, II and III, each containing two coins. In box 1 , 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 coin. If the coin is of gold, what is the probability that the other coin in the box is also of gold?

52. Suppose that the reliability of a HIV test is specifled as follows:

Of people having HIV '90 %' of the test detect the disease but '10 %' go undetected. Of

people free of HIV, '99 %' of the test are judged HIV-ive but '1 %' are diagnosed as showing HIV+ive. From a large population of which only '0.1 %' have HIV, one person is selected at random, given the HIV, test, and the pathologist reports him/her as HIV+ive. What is the probatility that the person actually has HIV?

53. In a factory which manufactures bolts, machines A,B and C manufacture respectively 25%, 35% and 40% of the bolts. Of their outputs 5%, 4% and 2% are defective bolts. A bolt is drawn at random from the product and is found to be defective. What is probability that it is manufactured by the machine B ?

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

55. A 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.

56. An urn contains 5 red and 5 black balls. A ball is drawn at random, its colour is noted and is returned to the urn. Moreover, 2 additional balls of the colour drawn are put in the urn and then a ball is drawn at random.

What is the probability that the second ball is red?

57. A bag contains 4 red and 4 black balls . Another bag contains 2red and 5 black balls. One of the two bags is selected at random and a ball is drawn from the bag and which is found to be red . Find the probability that the ball is drawn from first bag.

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

59. In answering a question on a multiple choice test,a student either knows the answer or guesses. Let 3/4 be the probability that he knows the answer and 1/4 be the probability that he guesses. Assuming that a student who guesses at the answer will be correct with probability 1/4. What is the probability that the studdent knows the answer given that he answered it correctly?

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

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61. 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 is the probability that it was the two headed coin?

62. An Insurance company insured 2000 scooter drivers, 4000 car drivers and 6000

truck drivers. The probabilities of an accident are 0.01, 0.03 and 0.15 respectively. One of the insured persons meets with an accident. What is the probability that he is a scooter driver ?

63. A factory has two machines A and B. past record shows that machine A produced 60% of the items of output and the machine B produced 40% of the items. Future 2% of the items produced by machine A and 1%

produced by machine B were defective. All the items are put into one stockpile and then one item is choosen at random from this and is found to be defective. what is the probability that it was produced by machine B ?

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64. Vineetha and Reshma are competing for the post of school leader. The probability Vineetha to be elected is 0.6 and that of Reshma is 0.4 Futher if Vineetha is elected the

probability of introducing a new pattern of election is 0.7 and the corresponding probability is 0.3 , if reshma is elected. Find the probability that the new pattern of election is introduced by Reshma ?

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65. 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 is the probability that she threw 1,2,3 or 4 with the die ?

66. A manufacturer has three machine operators A,B and C. The first operator A produces 1% defective items,whereas the other two operator B and C produce 5% and 7% defective items respectively. A is on the job for 50% of the time,B is on the job 30 %

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

67. 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 diamond.

68. Probability that A speaks truth is $\dfrac{4}{5}$. A coin tossed. A reports that a head appears. The probability that actually there was head is a)$\dfrac{4}{5}$ b)$\dfrac{1}{2}$ c)$\dfrac{1}{5}$ d)$\dfrac{2}{5}$

A. 4/5'

B. 1/2'

C. 1/5'

D. 2/5'

Answer: A

69. 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)$P(A \mid B) = \dfrac{P(B)}{P(A)}$ b) $P(A \mid B) < P(A)$ c)$P(A \mid B) \geq P(A)$ d)None of these

A. P(A | B)=(P(B))/(P(A))'

B. P(A | B)ltP(A)'

C. P(A | B) ge P(A)'

D. None of these

Answer: C

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70. A person plays a game of tossing a coin thrice. For each head, he is, given Rs 2 by the organiser of the game and for each tail, he has to give Rs. '1.50' to the organiser. Let 'X' - denote the amount gained or lost by the person. Show that 'X' is a random variable and

exhibit it as a function on the sample space of the experiment.

71. A bag contain 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'.

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

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73. Find the probability distribution of number of doublets in three throws of a pair of dice ?

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74. Let a pair of dice be thrown and the random variable X be the sum of the numbers that appear on the two dice.
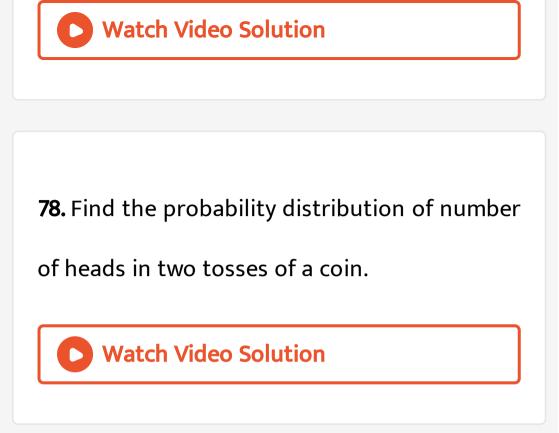
Find variance of X.

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75. Find the mean and variance of the number obtained on a throw of an unbiased die.

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

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

78. Find the probability distribution of number

of heads in two tosses of a coin.

79. Find the probability distribution of the

number of sucesses in two tosses of a die

where success is defined as

number greater than 4

80. 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

81. A coin is tossed 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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82. Find the mean number of heads in three tosses of a fair coin.

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83. Two dice are thrown simultaneously. If X denotes the number of sixes, Find expectation

of X. Also find the variance.

84. Two numbers are selected at random (without replacement) from the first six positivè integers. Let 'X' denote the larger of the two numbers obtained. Find E(X).

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

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

age X of the selected student is recorded.

Find Var(X).

87. 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 $Var(X)$.

88. Choose the corréct answer in each of the following 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. 8/3'

Answer: B

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89. 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. (37)/(221)'
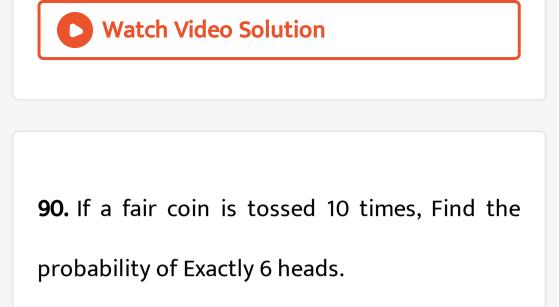
   B. 5/(13)'

   C. 1/(13)'

   D. 2/(13)'

Answer: D

90. If a fair coin is tossed 10 times, Find the probability of Exactly 6 heads.

91. 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.

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

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

94. 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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95. Five cards are drawn successively with a replacement from a pack of 52 cards. What is

the probability that All the 5 cards are spades

?

96. 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.

97. 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?

98. In an examination 20 question of true false type are asked suppose a student tosses a fair coin to determine his answer to each question

if the coins falls heads he answers true if it falls tail he answers false find the probability thet he answers at least 12 question correctly.

99. Suppose X has a binomial distribution B(6,1/2) show that X=3 is the most likely outcome.
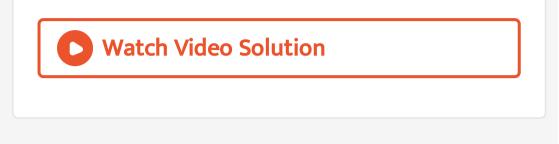
100. On a multiple choice examination with three possible answers for each of the five questions what is the probability that a candidate would get four or more correct answers just by guessing?

101. A person buys a lottery ticket in 50 lotteries , in each of which his chance of

winning prize is 1/100 .What is the probability that he will win a prize at least once.

102. Find the probability of getting 5 exactly twice in 7 throw of a die.

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

104. 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?

105. 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. (12)^5'

C. (9/(10))^5'

D. '9/(10)'

Answer: C

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106. The probability that a student is not a swimmer is 1/5 then the probability that out of five student , four are swimmer is

A. ^5 C_4 (45)^4 (1/5)'

B. (4/5)^4 (1/5)'

C. ^5 C_1 (1/5)(4/5)^4'

D. None of these

Answer: A

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

108. A and B throw a die alternatively: till one of them gets a 6 and wins the game. Find their respective probabilities of winning, If A starts first:

109. A and B are two events such that $P(A) \neq 0$. Find $P(B \mid A)$, if

i) $A \subset B$

ii) $A \cap B = \phi$

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

111. Suppose 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 there are equal number of males and females.

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112. In a hurdle race, a player has to cross 10 hurdles. The probability

that he will clear hurdle is $\dfrac{5}{6}$. What is the

probability that he will

knock down fewer than 2 hurdles?

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113. If a leap year is selected at random, what is

the chance that it will cointain 53 tuesday?

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114. If each element of a second order determinant is either zero or one, what is the probability that the value of the determinant is positive? (Assume that the individual entries of the determinant are chosen independently, each value being assumed with probability 1/2.)

115. 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(Aand B fail) =0.15

Evaluate the following probabilities

i) $P(A$ fails I B has failed)

ii) $P(A$ fails alone)

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

117. If A and B are two events such that $P(A) \neq 0$ and $P(B \mid A) = 1$, then a)$A \subset B$

b)$B \subset A$ c)$B = \phi$ d)$A = \phi$

A. A subset B'

B. B subset A'

C. B=phi'

D. A=phi'

Answer: A

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118. If $P(A \mid B) > P(A)$, then which of the following is correct: a) $P(B \mid A) < P(B)$ b) $P(A \cap B) < P(A) . P(B)$ c) $P(B \mid A) > P(B)$ d)$P(B \mid A) = P(B)$

A. 'P(B | A)ltP(B)'

B. P(A nn B)ltP(A), P(B)'

C. P(B | A)gtP(B)'

D. PB | A]=P(B)'

Answer: C

119. If 'A' and 'B' are any two events such that

'P(A)+P(B)-P(A' 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

120. Consider the random experiment of throwing a die. Let' E be the event "the number appearing is a multiple of '3' and 'F' be the event "the number appearing is even." Show that E and F are independent events.

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121. If 'P(E)=0.40, P(F)=0.35' and 'P(E, uu F)=0.55', find 'P(E / F)' and. 'P(F / E)'

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122. A' and 'B' are two events such that 'P(A)=1/4, P(A / B)=(1/3)' and 'P(B / A)=1/2', find 'P(B)' and 'P(A / barB)'

123. A die is thrown twice and the sum of the numbers appearing is observed to be 7.What is the conditional probability that the number 2 has appeared at least once.

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

125. If A and B are independent events, Prove that $\overline{A}$ and $\overline{B}$ are independent

126. A problem is given to three students whose chances of solving it are $\dfrac{1}{2}, \dfrac{1}{3}$ and $\dfrac{1}{4}$ respectively. Find the probability that:

i) the problem will be solved

ii) exactly two of them solves the problem.

127. A can hit a target 3 times in 6 shots, B 2 times in 6 shots and C 4 times in 4 shots .What is the probability that at least two shots hit the target.

128. Obtain the probability distribution of the total number of heads occurring in a toss of three unbiased coins.

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

130. 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?

131. Three cards are drawn successively without replacement from a well-shuffled pack of 52 cards. A random variable 'X' denotes the number of spades in the three cards. Determine the probability distribution of X.

132. Two cards drawn successively with replacement from a well shuffled pack 52 cards. Find the probability distribution of the number of kings.