MATHS

BOOKS - CHHAYA PUBLICATION MATHS (BENGALI ENGLISH)

RANDOM VARIABLE AND ITS DISTRIBUTION

Example

1. Examine which one of the following represent the probability distribution of a random variable x

Watch Video Solution

2. Three cards are drawn at random from a pack of 52 playing cards find the probability distribution of the number of aces

Watch Video Solution

3. Four bad oranges are mixed accidently with 16 good oranges find the probaility distribution of the number of bad oranges in a draw of two oranges

Watch Video Solution

4. A pair of dice is thrown 4 times If getting a double is considered a success find the probability distribution of number of successes

Watch Video Solution

5. A balanced coin is tossed repeatedly until a tail appears if x denotes the number of heads preceding the first tail find the probability distribution of x

Watch Video Solution

6. A lot contains 36 aritticles of which 6 are defective A sample of 5 articles was drawn at random (i) without replacement (ii) with replacement find the probalitiy distribution of x the number of defectives

Watch Video Solution

7. A discrete random variable x has the following probality distribution

(i) find a

(ii) Evaluate : P(X lt 1) , P(X ge 4), PO(0 X lt 3) ,P(01 lexlt2)$(iii)F \in dthe \min i\mu mvalueofasucht\hat{}$ P(X le4) ge0.6`

Watch Video Solution

8. A random variable x has the following probability distribution

Find the probability distribution of a random variable y where y =$2x^2 + 3$

Watch Video Solution

9. If x is a discrete random variable and 'a' is a constant show that

(i) E(a)=a

(ii) E(ax)=aE(x)

(iii) $E\left(x-\overline{X}\right)=0$

Watch Video Solution

10. If a is a constant prove that

(i) var(a)=0

(ii) $var(aX)=a^2var(X)$

(iii) $Var(ax+b)=a^2var(X)$

Watch Video Solution

11. If x and Y are two independent random varibles prove that ,

Var (aX+bY)=a^(2)Var(X)+b^(2)Var(y)` where a and b are constant

Watch Video Solution

12. Two cards are drawn simultaneously (or successively without replacement) from a well shuffled pack of 52 cards find the mean and variance of the number of aces

Watch Video Solution

13. Two cards are drawn successively with replacement from a well-shuffled pack of 52 cards. Find the mean and variance the number of kings.

Watch Video Solution

14. 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

Watch Video Solution

15. A box contains 4 black and 5 white balls let X denote the number of white balls in a random draw of 3 balls find E(X) and standard deviation of X

Watch Video Solution

16. A gambler throws two unbiased dice and stands to loss Rs 5 if he fails to throwl a 5 to win Rs 10 if he throws on e five and to win Rs 25 if he throws fives is the game fair ?

Watch Video Solution

17. (i) find the variance of the number obtained on a throw of an unbaised die

(ii) what is the mathematical expectation of the sum of points on n dice ?

Watch Video Solution

18. A random variable X has the following probability distribution

Find the expection and standard deviation of the random variable X

Watch Video Solution

19. The probability that there is at least one error in an accounts statement prepared by A is 0.2 and for B and C they are 0.25 and 0.4 repectively A,B and C prepared 10,16 and 20 statement respectively find the expected number of correct statement in all

Watch Video Solution

20. Assuming that half of the populatio is vegetarian so that the chance of an individual being a vegetarian is $\frac{1}{2}$ and assuming that 100 investigators can each take a sample of 10 individuals to see whether they are vegetarians how many investigators would you expect to report that 3 people or less were vegetarians ?

Watch Video Solution

21. A number is chosen at random from the set 1,2,3 ...100 and another number is chosen at

random from the set 1,2,3,...50 what is the expected value of the product ?

22. Obtain the expection of the number of tails preceding the first head in the indefinite series of tosses of the same coin

23. Three persons A,B and C are taking part in a shooting competition where the person hitting the target first will win Rs 94 probability of hitting by them are $\frac{3}{5}, \frac{2}{5}$ and $\frac{3}{4}$ respwectively if the cometition is fair and A,B and C shoots in order then calculate the prize money each will win it is given that the total prize money of the competition is Rs 94

Watch Video Solution

Multiple Choice Type Questions

1. The probability function of a rondom variable is always

A. ≥ 1

B. $0 > 1$

C. positive

D. non negative

Answer: D

Watch Video Solution

2. The value of E(10x) is

A. 10+E(x)

B. 10 E(x)

C. E(x)

D. E(x)-10

Answer: B

 Watch Video Solution

3. The value of Var (4x) is

A. 16 Var (x)

B. 4 Var (x)

C. 2 Var (x)

D. Var (x)+4

Answer: A

 Watch Video Solution

4. The value of Var (x) is

A. $E\left(x^2\right) - E(x)$

B. $E\left(x^2\right) - \left\{E(x)^2\right\}$

C. $E\left(x^2\right) + E(x)$

D. $\{E(x)\}^2 - E\left(x^2\right)$

Answer: B

Watch Video Solution

5. If F(x) is the probability function of a random varible X and X can assume only two values x_1, x_2 then the value of $F(x_1) + f(x_2)$ is

A. ≥ 1

B. ≤ 1

C. ≥ 0

D. 1

Answer: D

Watch Video Solution

6. Var (ax+b) is equal to

A. a Var(x)+b

B. $a^2 Var(x) + b$

C. $a^2Var(x)$

D. none of these

Answer: C

Watch Video Solution

Very Short Answer Type Questions

1. Probability Distribution of Random variable

Watch Video Solution

2. Mean or mathematical expectation of random variable

Watch Video Solution

3. Variance of random variable

Watch Video Solution

4. E(K) =K where K is a constant .TRUE or FALSE

Watch Video Solution

5. prove that E(ax+b)=aE(x)+b where a and b are constants

Watch Video Solution

6. Prove that $E(x-\bar{x})$=0 where $\bar{x}$ = mean of a random variable x

Watch Video Solution

7. Var (K) =0 where k is a constant

Watch Video Solution

Watch Video Solution

8. Prove that Var (a+bx)=b^2 Var(x)

Watch Video Solution

9. Define a random variable and explain what is meant by its mean (or mathematical expectation)

Watch Video Solution

10. Define a discrete random variable X and its mean E(x) and variance Var(x)

Watch Video Solution

11. What is meant by discrete probability distribution ?

Watch Video Solution

12. Define the probability function of a discrete random variable x .state the conditions satisfied

by it

Watch Video Solution

13. The variance of a random varibale x is defined by the expected value of $(x - \bar{x})^2$ where $\bar{x}$ is the mean of x prove that variance (x) = $E(x^2) - \{E(x)\}^2$

Watch Video Solution

14. If X and Y are indiependent random variable show that $Var(ax + by) = a^2\omega_1^2 + b^2\omega_2^2$ where ω_1 and ω_2 are standard deviation of x and y respectively and a,b are constant

Watch Video Solution

Short Answer Type Questions

1. Define a random varible on the sample space of the random experiment of tossing two unbiased coins

Watch Video Solution

2. Define two random variable X and Y on the sample space of the random experiment of rolling a balanced die

Watch Video Solution

3. Examine which one of the following represent the probability distribution of a random variable x

Watch Video Solution

4. A random experiment consists of three independent tosses of a fair coin write down the sample space let x be the number of heads obtained obtain the probability distribution of x and calcualte its expectation and variance

Watch Video Solution

5. Four unbiased coins are tossed simultaneously let x be the random variabvel

denoting the number of heads obtained obtain the probability distribution of x find E(x) and var(x) [symvbols have their usual meaning]

Watch Video Solution

6. Let x denote the sum of digits in the random experiement of throwing two balacned dice find the probability distribution of the random variable x

Watch Video Solution

7. Let x denote the number of tails preceding the first head when an unbiased coin is tossed repeatedly find the probability distribution of x

Watch Video Solution

8. In a box there are 5 watches of which 2 are known to be defective two watches are taken out at random let x denote the number of defective watches selected obtain the probability distribution of x also calcuated mean of x

Watch Video Solution

9. Five defective bulbs are accidentally mixed with 20 good ones it is not possible to just look at a bulbs and tell whether or not it is defective find the probability distribution of the number of defective bulbs in a draw of 4 bulbs

Watch Video Solution

10. From a lot of 25 aritcles containing 5 defective a sample of 4 aritcles was drawn at random (a) without replacement (b) with

replacement find the probability distribution of x the number of defectives

Watch Video Solution

11. Two cards are drawn simultaneously (or successively without replacement) from a well shuffled packl of 52 cards find the mean, variance and standard deviation of the number of kings

Watch Video Solution

12. A discrete random variable x has the following probability distrubution

(a) Determine the value of a

(b) Find $P(x < 3), P(x \geq 4), P(0 < x < 5)$

(c) Find the minimum value of m for which $P(x \leq m) \geq 0.6$

Watch Video Solution

13. A random variable x has the following probability function

(a) Calculate k

(b) find $(Px < 2), P(x \geq 2), P(-2 < x \leq 2)$

(c) calcualte the minimum value of k such that

$P(x \leq 1) \geq 0.36$

Watch Video Solution

14. For what value of k will the function f(x) =kx x=1,2,3 ...., n be a probability distribution of a random variable ?

Watch Video Solution

15. The probability distribution of a random variable x is as follows

Find the probability distrubution of the variable y where $y = x^2 + 5$

Watch Video Solution

16. Let x denote the number of heads when 10 unbiased coins are tossed find the probability distribution of x

Watch Video Solution

17. In a given business venture a man can make a profit of Rs 300 with probabiltiy 0.6 incur a loss of Rs 100 with probability 0.4 calcualte his expectation

Watch Video Solution

Long Answer Type Questions

1. Find the mean of the sum of points on 2 unbiased dice

Watch Video Solution

2. A box contains 4 white and 6 red balls if 2 balls are drawn at random find the expectation of the number of red balls

Watch Video Solution

3. A bag contains 5 white and 7 black balls find the expectation of a man who is alloweed to draw two balls form the bag and who is to

receive one rupee for each black bal and two rupee for each white ball drawn

 Watch Video Solution

4. An urn contains 7 white and 3 red balls two balls are drawn together at random from this urn compute the probability that neither of them is white find also the probability of getting one white and one red ball hecne compute the expecteed numbr of white balls

 Watch Video Solution

5. What is the expectation from a throw with a single die when a score of n is rewarded with a prize of n^2 rupees

Watch Video Solution

6. If a person gains or loses an amount equal to the number appearing when a balanced die is rolled once according to whether the number is even or odd how much money can he expect per game in the long run ?

Watch Video Solution

7. A gambler rolls two unbiased dice and stands to loss Rs 2 if he fails to throw a six to win Rs 4 if he throws one six and to win Rs 10 if he throws two sixes is the game fair ?

8. A and B play a game in which they take truns to throw 4 coins simultaneously when A throws he receives Rs h where h is the number of heads shown . Find the expectation of A . when B

throws 4 heads or 4 tails he receives Rs k, otherwise he receives nothing find the value of k for the game to be fair

9. A and B play for a prize of Rs 99 the prize is to be won by a player who first throes a '3' with one die A first throes and if he fails B throws and if he fails A again throws and so on find their respective expectations

10. The probability distribution f(x) of a discrete random variable x is given by

Find mean and variance of x

Watch Video Solution

Multiple Correct Answer Type

1. The probability distribution of a discrete random variable x is as follows

find the expectation and S.D of X

Watch Video Solution

2. Find the mean variance and standard deviation of the following probability distribution

Watch Video Solution

3. The probability distribution of a random variable x is as follows

if y =2x+3 find the expectation variance and standard deviation of the random variable y

A. $\frac{1}{n+1}$

B. $\frac{n!}{n+1!}$

C. $\frac{n}{n+1}$

D. $\frac{2n}{n+1}$

Answer: A::C::D

Watch Video Solution

4. Let x and y be two independent random variables having variance k and 2 respectively if the variance of z=3y -x be 25 find k

A. $\frac{1}{52_{c_4}}$

B. $\frac{4_{c_1}}{52_{c_4}}$

C. $\frac{1}{13c_4}\Big)^4$

D. $4\frac{)}{270725}$

Answer:

Watch Video Solution

Watch Video Solution

5. For a random varibale x it is given $E(x) = 10$ and $Var(x) = 25$ find the positive values of a and b such that $y = aX - b$ have expectation 0 and variance 1

Watch Video Solution

Integer Answer Type

1. A number is chosen at random from the set 1,2,3 ...150 and another number is chosen at random from the set 1,2,3....75 find the expected value of the product of the chosen number

Watch Video Solution

2. If $E_1, E_2, E_3 \ldots E_n$ be n independent events such that $P(Ei) = \frac{1}{1+i}$ for $1 \leq I \leq n$ then the chance that none of $E_1, E_2, E_3 \ldots E_n$ occur is

A. $\frac{1}{n+1}$

B. $\frac{n!}{(n+1)!}$

C. $\frac{n}{n+1}$

D. $\frac{2n}{n+1}$

Answer: A::B

Watch Video Solution

3. If shuffling a pack of 52 cards four cards are accidentally dropped the prbability that the dropped cards are from the same suit is

Watch Video Solution

4. An unbiased die thrown twice find the probability distribution of the number of sixes

Watch Video Solution

5. The probability distrubution of the number of successes in two tosses of a die where a success is defined as getting a number greater than 4 then the probability distribution of number of successes in two tosses of are die are

Watch Video Solution

Matrix Match Type

1. A random varibale x takes values 0,1,2,3.... With probability proportional to $(x+1)\left(\frac{1}{5}\right)^x$ then

View Text Solution

2. If standard deviation of a ravdom variable x is 2 then $var(5x)$ is

A. 25

B. 100

C. 50

D. 26

Answer:

Watch Video Solution

Comprehension Type

1. The probability distribution function of a random variable x is given by

value of c is $\frac{1}{k}$ find k

Watch Video Solution

2. In a single throw of a die if x denotes the number on its upper face lthe mean of x is $\frac{k}{2}$ what will be the value of k?

Watch Video Solution

3. If a pair of dice is thrown and x denotes the sum of the numbers on them the expectation of x is k find the value of k

Watch Video Solution

4. The standard deviation of the data $6, 8, 10, 12, 14$ is

A. 0

B. 1

C. 2.14

D. 2.83

Answer: D

Watch Video Solution

5. Two numbers p and q are chosen randomly from the set {1,2,3,4,5,6,7,8,9,10} with replacement match column I contain the nature of the roots of $x^2 + px + q = 0$ with column II contains their probability

A. 0.65

B. 0.55

C. 0.3

D. 0.75

Answer: A::B::C::D

Watch Video Solution

6. A student has to match three historical event s dandi march quit india movement and mahatma gandjhi 's assassinnation with the

years 1948 ,1930 and 1942 the student has no knowledge of the corect answeres and decides to match the events and years randomly here x denotes the number of correct answer obtained by the student

A. 0.2

B. 0.1

C. 0.3

D. 0.4

Answer: A::B::C::D

Watch Video Solution

Assertion Reason Type

1. The standard deviation of the data $7, 9, 11, 13, 15$ is

Watch Video Solution

2. The mean deviation of the following data $2, 5, 6, 7, 9, 10, 11, 14$ is

Watch Video Solution

3. The median of $0, 2, -3, 2, 2, 5, -1, 5, 5, -3, 6, 5, 6, 6$ is .

Watch Video Solution

4. A random variable X has the following probability distribution

The value of k is

A. Statement I is true Statement II is true ,Statement II is a correct explanation for Statement I

B. Statement I is true Statement II is true is true , Statement II is not a correct explanation for Statement I

C. Statement I is true , Statement II is false

D. Statement I is false Statement II is true

Answer: B

Watch Video Solution

5. A random variable X has the following probability distribution

The mean of X is

Watch Video Solution

6. A random variable X has the following probability distribution

The variance of X is

Watch Video Solution

7. The following is the data of wages per day : $5, 4, 7, 8, 8, 7, 5, 7, 9, 5, 7, 9, 10, 8.$ Find the mode

Watch Video Solution

8. The following marks are obtained by students in a test : $82, 72, 91, 90, 86, 85, 92, 70, 71, 83, 89, 94, 85, 79, 62$ .Find the range of the marks

Watch Video Solution