EC 1302: Assignment #1

Due on Monday, September 14, 2015

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Problem 1

Given $\Omega = \{2, 4, 6, 8, 10, 2\}$ $A = \{2, 4, 10\}$ $B = \{4, 6, 8, 10\}$ Determine
(a) $\bar{A}$
b) $A - B$
c) $A \cup B$
d) $A \cap B$
e) $\bar{A} \cap B$

Problem 2

A bag contains 10 white balls are 6 black balls. Two balls are drawn at random one after the other. Find the probability that both are black

Problem 3

Consider the following experiment. A fair coin is thrown. IF head shows up a six faced die is thrown and the number is recorded. If the coin shows a tail, a pair of dice are thrown. and the sum of the numbers shown is recorded. What is the probability that the recorded number is 2? What is the probability that the recorded number is less than 5?

Problem 4

Consider two boxes, A and B . A contains 1000 transistors of which 15% is defective. B contains 2000 transistors of which 10% is faulty. Two transistors are selected with out replacement. from a randomly chosen box. What is the probability that both transistors are defective. Assuming both defective what is the probability that they came from box A.

Problem 5

A bag contains 10 items out of which 3 are defective. We select 5 items at random. We define a random variable X as the number of defective items in the selected sample. Find the probability distribution of X. Draw the CDF. From the CDF find out $P(X \leq 2)$

Problem 6

Your are given a function $f(x) = \frac{x^3}{3}$ for $x - 1 < x < 2$, The function takes a value of zero elsewhere. Can this function be a PDF?

Problem 7

It seen that the PDF of a random variable is $f)x) = \frac{k}{1+x^2}$ The random variable is defined through out the real line. Find

1. k
2. cumulative distribution function of X
3. $P(X \leq 0)$

Problem 8

A random variable X has the following density. $f(x) = 1$ for $0 < x < 1$. It takes a value of 0 elsewhere on the real line. Find an expression for the CDF of X.

Problem 9

You are tossing a fair coin 10 times. Find the probability that you will get

1. 7 heads and 3 tails
2. 7 heads
3. At least 1 head
4. not more than 1 tail

Problem 10

A soldier fires a cannon. The probability of hitting the target is 0.35. If he fires 10 times what is the probability of hitting the target atleast twice.

Problem 11

It is known from past experience that in a certain industry there are 4 accidents on the average . What is the probability that in a given year there will be less than 4 accidents.

Problem 12

In a certain college the mean weight of the students is 50kg and the standard deviation is 5 kg. Assuming the weights are normally distributed, how many students weigh more than 54 kg.

Problem 13

If two random variable X and Y have the joint pdf

$$\begin{aligned} f_{X,Y}(x,y) = x + y \quad for \quad & 0 < x < 1, 0 < y < 1 \\ = 0 \quad otherwise & \end{aligned}$$

Check whether X and Y and independent.

Problem 14

If two random variable X and Y have the joint pdf

$$\begin{aligned} f_{X,Y}(x,y) = \frac{8}{9}xy \quad for \quad & 1 < x < y < 2 \\ = 0 \quad otherwise & \end{aligned}$$

Find the marginal density function of X and Y

Problem 15

Let X be a random variable with the PDF

$$\begin{aligned} f(x) &= 0.3e^{-0.3} \quad for \quad x > 0 \\ &= 0 \qquad otherwise \end{aligned}$$

Find

1. Moment generating function of X
2. $E(X)$ and $Var(X)$