

Probability 201-1-2391 ASSIGNMENT 6
One dimensional distributions and random variables
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Problem 1

A balanced dice is thrown twice. Let X denote the maximal of the two results. Find the distribution function of X .

Problem 2

A balanced dice is thrown 5 times. Let X be the number of times that a number smaller than 3 had shown up.

- a) Find the distribution function of X .
- b) Find the distribution function of $Y = 2X - 1$.

Problem 3

An athlete gets 5 opportunities to jump over the bar. If he succeeds on a certain jump he does not try again. If he fails all the 5 chances then he is out. A certain jumper tries to jump over 2.15 meters and it is known that the probability that he passes the bar is r . Assuming that the jumps are independent, find the distribution of X - the number of jumps that he will do.

Problem 4

A jar contains 15 black balls and 30 white balls. The balls are randomly being pulled out of the jar till the first white ball is pulled out. Let X be the number of the balls pulled out. Compute the distribution of X .

Problem 5

Same as in Problem 4 above, but balls are being pulled out till the second white ball is pulled out.

Problem 6

Let X be a random variable that assumes all the non-negative integral values. We are given that for any positive integer: $k \cdot p(X = k) = 10 \cdot p(X = k - 1)$. Find the distribution of X .

Problem 7

A jar contains a white balls and b black balls. Two opponents pull out (with returning the balls back) balls one by one. The first who pulls out a white ball, wins.

- a) What is the probability that the first player wins?
- b) What is the distribution of the number of pull outs till the determination of the winner (inclusive)?

Problem 8

A robot is located at point 0 on the real axis. Then it forms N steps where in each step (which is independent of the others) it moves rightwards once with probability p , and leftwards once with probability $q = 1 - p$. Let X be the number on the real axis at which the robot arrives after N steps. What is the distribution of X ?

Problem 9

There are 20 notes in a hat that are numbered with the numbers $1, 2, 3, \dots, 20$. One number is written on each note. You pull out the notes one by one till you reach 13. Let X be the number of notes pulled out. What is the distribution of X ?