

DATA 1010
IN-CLASS EXERCISES
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Problem 1

Write a program to play the five-dice game many times, and determine the proportion of two-pair rolls you get.

Problem 2

Suppose that X is a random variable with CDF F_X and that $Y = X^2$. Express $\mathbb{P}(Y > 9)$ in terms of the function F_X . For simplicity, assume that $\mathbb{P}(X = -3) = 0$.

- (a) $1 - F_X(3) + F_X(3)$
- (b) $F_X(-3)$
- (c) $F_X(3)$
- (d) $F_X(3) + F_X(-3)$

Problem 3

Random variables with the same cumulative distribution function are not necessarily equal as random variables, because the probability mass sitting at each point on the real line can come from different ω 's.

For example, consider the two-fair-coin-flip experiment and let X be the number of heads. Find another random variable Y which is not equal to X but which has the same distribution as X .

Problem 4

Consider a computer program which rolls two virtual dice and returns roll results with probabilities shown in the table.

What is the probability that Die 1 shows 4?

		Die 1					
		1	2	3	4	5	6
Die 2	1	$\frac{1}{36}$	$\frac{2}{36}$	$\frac{1}{36}$	$\frac{1}{36}$	$\frac{3}{36}$	$\frac{1}{36}$
	2	$\frac{1}{72}$	$\frac{1}{36}$	$\frac{1}{72}$	$\frac{1}{36}$	$\frac{1}{36}$	$\frac{1}{36}$
	3	$\frac{1}{36}$	$\frac{1}{72}$	$\frac{1}{72}$	$\frac{1}{72}$	$\frac{1}{36}$	$\frac{2}{36}$
	4	$\frac{1}{72}$	$\frac{1}{72}$	$\frac{1}{72}$	$\frac{1}{36}$	$\frac{1}{36}$	$\frac{1}{36}$
	5	$\frac{2}{36}$	$\frac{1}{36}$	$\frac{1}{36}$	$\frac{1}{36}$	$\frac{1}{36}$	$\frac{1}{36}$
	6	$\frac{1}{36}$	$\frac{1}{36}$	$\frac{1}{72}$	$\frac{1}{36}$	$\frac{1}{36}$	$\frac{1}{72}$

Problem 5

Determine which of the following joint distributions on (X, Y) has the property that each random variable X and Y has the same marginal distribution. (Note: each disk indicates a probability mass at a point, with the size of the disk proportional to the mass at that point)

