MA 519: Homework 5

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Problem 5.1 (Handout 7, # 6(d, f))

Find the variance of the following random variables

(d) $X = \#$ of tosses of a fair coin necessary to obtain a head for the first time.
(f) $X = \#$ matches observed in random sitting of 4 husbands and their wives in opposite sides of a linear table.
This is an example of the *matching problem.*

Solution. ■

Problem 5.2 (Handout 7, # 8 (Nonexistence of variance))

(a) Show that for a suitable positive constant c, the function $p(x) = c/x^3$, $x = 1, \ldots$, is a valid probability mass function (PMF).
(b) Show that in this case, the expectation of the underlying random variable exists, but the variance does not!

Solution. ■

Problem 5.3 (Handout 7, # 9)

In a box, there are 2 black and 4 white balls. These are drawn out one by one at random (without replacement).

(a) Let X be the draw at which the first black ball comes out. Find the mean the variance of X.
(b) Let X be the draw at which the second black ball comes out. Find the mean (meman? what the fuck) the variance of X.

Solution. ■

Problem 5.4 (Handout 7, # 10)

Suppose X has a *discrete uniform distribution* on the set $\{1, \ldots, N\}$.

Find formulas for the mean and the variance of X.

Solution. ■

Problem 5.5 (Handout 7, # 11 (Be Original))

Solution. ■

Problem 5.6 (Handout 7, # 13)

Solution. ■

Problem 5.7 (Handout 7, # 14)

Solution. ■

Problem 5.8 (Handout 7, # 15)

Solution. ■

Problem 5.9 (Handout 7, # 16)

Solution. ■

Problem 5.10 (Handout 7, # 17)

Solution. ■