# MA 519: Homework 6

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## Problem 6.1 (Handout 8, # 2)

Identify the parameters $n$ and $p$ for each of the following binomial distributions:

(a) # boys in a family with 5 children;

(b) # correct answers in a multiple choice test if each question has a 5 alternatives, there are 25 questions, and the student is making guesses at random.

*Solution.* ■

## Problem 6.2 (Handout 8, # 10)

A newsboy purchases papers at 20¢ and sells them for 35¢. He cannot return unsold papers. If the daily demand for papers is modeled as a $\mathrm{Binom}(50, 0.5)$ random variable, what is the optimum number of papers the newsboy should purchase?

*Solution.* ■

## PROBLEM 6.3 (HANDOUT 8, # 12)

How many independent bridge dealings are required in order for the probability of a preassigned player having four aces at least once to be 1/2 or better? Solve again for some player instead of a given one.

*SOLUTION.* ∎

## Problem 6.4 (Handout 8, # 13)

A book of 500 pages contains 500 misprints. Estimate the chances that a given page contains at least three misprints.

*Solution.* ■

## Problem 6.5 (Handout 8, # 14)

Colorblindness appears in 1 per cent of the people in a certain population. How large must a random sample (with replacements) be if the probability of its containing a colorblind person is to be 0.95 or more?

*Solution.* ∎

## Problem 6.6 (Handout 8, # 15)

Two people toss a true coin $n$ times each. Find the probability that they will score the same number of heads.

*Solution.* ■

## Problem 6.7 (Handout 8, # 16)

Binomial approximation to the hypergeometric distribution. A population of TV elements is divided into red and black elements in the proportion $p : q$ (where $p + q = 1$). A sample of size $n$ is taken without replacement. The probability that it contains exactly $k$ red elements is given by the hypergeometric distribution of II, 6. Show that as $n \to \infty$ this probability approaches $\mathrm{Binom}(n, p)$. (Originally said "approaches $b(k; n, p)$.")

*Solution.* ■

## Problem 6.8 (Handout 9, # 3)

Suppose $X, Y, Z$ are mutually independent random variables, and $E(X) = 0$, $E(Y) = -1$, $E(Z) = 1$, $E(X^2) = 4$, $E(Y^2) = 3$, $E(Z^2) = 10$. Find the variance and the second moment of $2Z - Y/2 + eX$, where $e$ is the number such that $\ln e = 1$.

*Solution.* ■

## Problem 6.9 (Handout 9, # 14)

(*Variance of Product*). Suppose $X$, $Y$ are independent random variables. Can it ever be true that $\mathrm{Var}(XY) = \mathrm{Var}(X)\,\mathrm{Var}(Y)$?
If it can, when?

*Solution.* ■