

Recitation 6¹
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1. Problem 2.26, page 124 of the text.

PMF of the minimum of several random variables. On a given day, your golf score takes values from range 101 to 110, with probability 0.1, independent of other days. Determined to improve your score, you decide to play on three different days and declare as your score the minimum X of the scores X_1 , X_2 , and X_3 on the different days.

- (a) Calculate the PMF of X .
 - (b) By how much has your expected score improved as a result of playing on three days?
2. A family has 5 children. The first child is an adopted girl, and the remaining four have equal a priori probability of being male or female, independent of the other children. Let G be the number of daughters out of the remaining four children in the family. If the parents had a pie to distribute evenly among their daughters, what is the expected amount of pie that they will distribute to each of their daughters?
 3. In the first lecture of the semester on 09/03/2008, Professor Wyatt posed the *baby girl probability problem* and promised that one day we would come back to it fully prepared with the 6.041 material and take an educated look at it. He just informed us that such day has arrived and we now know enough to be able to assess the hypothesis mathematically and form an opinion based on the theory of probabilities. So, let us give it a try...

In a certain country every child is a boy or girl with exactly 50% probability, regardless of the sex of any other children in that (or any other) family. Every family wants to raise a baby girl, so the country has adopted a policy that every family continues to give birth to more children until they have their baby girl, and then that family must stop. In this fertile population, no family is unable to have another child if they try.

HYPOTHESIS: After many generations of this policy, the expected number of girls in the population becomes larger than the expected number of boys.

- (a) **ARGUMENT IN FAVOR:** In the usual individualistic family planning practices, half of the population is female on average, although some families have only boys. But in the country above, every family with children has a girl. Therefore, the average number of girls born must be greater than the average number of boys.
- (b) **ARGUMENT AGAINST:** Choosing or not choosing to have another child does not alter the probability that the next child is female. Therefore, the policy in that country cannot make the average number of girls exceed the average number of boys.

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