

Stat 134: Section 3

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Conceptual Review

Please discuss these short questions with those around you in section. These problems are intended to highlight concepts that will be relevant for today's problems

- a. When do we want to use the binomial distribution? Which assumptions have to be met?
- b. What is the formula for the binomial distribution?

Problem 1

Given that there were 12 heads in 20 independent coin tosses, calculate the chance that

- a. the first two tosses landed heads;
- b. at least two of the first five tosses landed heads.

Try to do this problem with as little tedious work as possible.

Ex 2.1.5 in Pitman's Probability

Problem 2

A gambler decides to keep betting on red at roulette where there are 18 reds out of 38 tiles in total, and stop as soon as she has won a total of five bets.

- What is the probability that she has to make exactly 8 bets before stopping?
- What is the probability that she has to make at least 9 bets?

Ex 2.1.12 in Pitman's Probability

Problem 3: The matching problem

There are n letters addressed to n people at n different addresses. The n addresses are typed on n envelopes. A disgruntled secretary shuffles the letters and puts them in the envelopes in random order, one letter per envelope.

- What is the chance that the i_{th} letter is put in the correctly addressed envelope? How about both i_{th} letter and j_{th} letter ($i \neq j$)? And the chance that the letters at positions i_1, i_2, \dots, i_k are put in correctly?
- Find the probability that at least one letter is put in a correctly addressed envelope;
- What is the probability in part *b*. approximately, for large n ?

Hint: Use the inclusion-exclusion formula: $P(\cup_{i=1}^n A_i) = \sum_{i=1}^n P(A_i) - \sum_{i < j} P(A_i A_j) + \dots + (-1)^{n+1} P(A_1 A_2 A_3 \dots A_n)$

Ex 2.rev.28 in Pitman's Probability