

Lab 8b: Binomial

Stat 131A, Spring 2019

Learning Objectives:

- Binomial Probability.
- Binomial Distribution.

General Instructions

- Write your solutions in an `Rmd` (R markdown) file.
 - Name this file as `lab08b-first-last.Rmd`, where `first` and `last` are your first and last names (e.g. `lab08b-gaston-sanchez.Rmd`).
 - Knit your `Rmd` file as an html document (default option).
 - Submit your `Rmd` and `html` files to bCourses, in the corresponding lab assignment.
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Problem 1

A box contains one red ball and five green ones. Four draws are made at random with replacement from the box. Find the chance that:

- a. A red ball is never drawn.
- b. A red ball appears exactly once.
- c. A red ball appears exactly twice.
- d. A red ball appears exactly three times.
- e. A red ball appears on all the draws.
- f. A red ball appears at least twice.

Problem 2

A die is rolled four times. Find the chance that:

- a. An ace (one dot) never appears.
- b. An ace appears exactly once.
- c. An ace appears exactly twice.

Problem 3

A die will be rolled 6 times. What is the chance of obtaining exactly 1 ace?

Problem 4

A fair coin is tossed 10 times.

- a. Find the chance of getting exactly 5 heads.
- b. Find the chance of obtaining between 4 and 6 heads inclusive.

Problem 5

Larry reads that one out of four eggs contains salmonella bacteria. He decides to never use more than three eggs in cooking. If eggs do or don't contain salmonella independent of each other, the number of contaminated eggs when Larry uses three chosen at random has the distribution:

- a. binomial with $n = 4$ and $p = 1/4$
- b. binomial with $n = 3$ and $p = 1/4$
- c. binomial with $n = 3$ and $p = 1/3$

Problem 6

From the previous question, the probability that at least one of Larry's three eggs contains salmonella is about: _____

Problem 7

When an opinion poll calls landline telephone numbers at random, approximately 30% of the numbers are working residential phone numbers. The remainder are either non-residential, non-working, or computer/fax numbers. You watch the random dialing machine make 20 calls.

- a. What is the probability that exactly three calls reach working residential numbers?
- b. What is the probability that at most three calls reach working residential numbers?
- c. What is the probability that at least three calls reach working residential numbers?
- d. What is the probability that fewer than three calls reach working residential numbers?
- e. What is the probability that more than three calls reach working residential numbers?

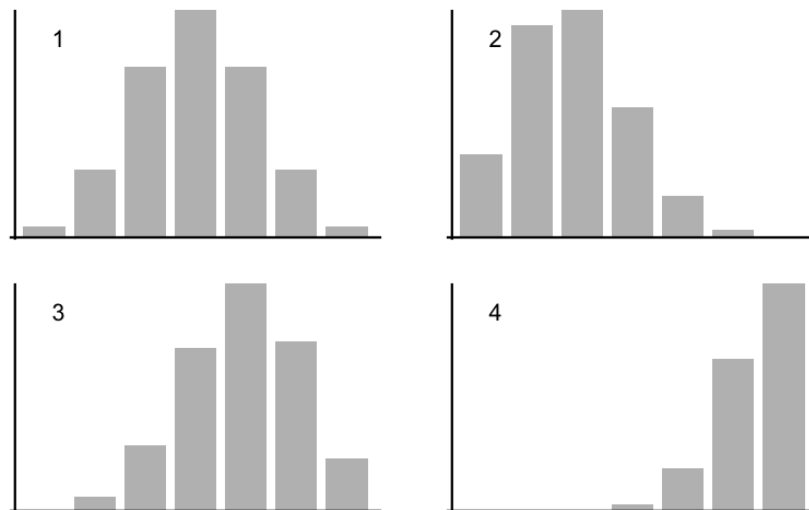
Problem 8

Let X be a binomial random variable such that $E(X) = 6$, and $Var(X) = 2.4$. You can try using the function `dbinom()` for this problem. Find:

- a. $P(X = 5) =$
- b. $P(X > 2) =$
- c. $P(X \leq 9) =$
- d. $P(X = 12) =$

Problem 9

The following figure shows four binomial distributions with $n = 6$ trials. Match the given probability of success with the corresponding graph.



- a) $p = 0.30$ goes with graph:
- b) $p = 0.50$ goes with graph:
- c) $p = 0.65$ goes with graph:
- d) $p = 0.90$ goes with graph:

Problem 10

70% of the people in a certain population are adults. A random sample of size 15 will be drawn, with replacement, from this population.

- a. What is the most likely number of adults in the sample? Use the function `dbinom()`, and graph the distribution to find the answer.

b. What is the chance of getting exactly this many adults?