Assignment 3

Due Tuesday February 4 at 11:59pm on Quercus

As before, the questions without solutions (here, the last one) are an assignment: you need to do these questions yourself and hand them in (instructions below).

The assignment is due on the date shown above. An assignment handed in after the deadline is late, and may or may not be accepted (see course outline). My solutions to the assignment questions will be available when everyone has handed in their assignment.

You are reminded that work handed in with your name on it must be *entirely your own work*.

Assignments are to be handed in on Quercus. See `https://www.utsc.utoronto.ca/~butler/c32/quercus1.nb.html` for instructions on handing in assignments in Quercus. Markers' comments and grades will be available there as well.

As ever, you'll want to begin with:

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library(tidyverse)
```

1. Work through problem 8.1 of PASIAS.
2. This question is about obtaining the power by simulation for a test of a proportion (specifically, a test that the population probability of success p is 0.5).
   (a) (3 marks) The function `prop.test` takes as input an observed number of successes and a number of trials (in that order), and tests whether the population probability of success is (by default) 0.5. Suppose you toss a coin 125 times, and you obtain 80 heads. Using `prop.test`, can you conclude that the coin is biased in favour of heads?
   (b) (3 marks) Suppose you are going to carry out 125 binomial trials. By trial and error, find the smallest number of successes that would lead you to reject $H_0 : p = 0.5$ in favour of $H_a : p > 0.5$.
   (c) (2 marks) The function `rbinom` takes random samples from a binomial distribution. Find out how it works. The first three inputs are what concern you. Obtain three random binomials with $n = 4$ and $p = 0.3$.
   (d) (4 marks) Use simulation to estimate the power of the z-test for a proportion to reject $H_0 : p = 0.5$ in favour of $H_a : p > 0.5$, when in fact $p = 0.6$. For full marks, do this without using `prop.test`, `rerun` or any `map`; in the previous parts, you worked out what numbers of successes would lead to rejection and what numbers would not, and how to generate any number of random binomials from distributions with given n and p.