Homework 3

Quantitative Reasoning II

due: **1/29/25**

Instructions: There are two parts to this homework. The first are free response questions on readings and course material. The second is a computing tutorial to be completed and submitted on our computing site. Please submit solutions for the first part on Populi, written professionally and saved as a `pdf`. Note: The first part may involve some local R computing work as well.

1. Free Response

Problem 1: Suppose a person is randomly drawn from a large population and tested for COVID-19.

Let $D = 1$ if the person has COVID-19 and 0 otherwise.
Let $T = 1$ if the person tests positive and 0 otherwise.

Suppose:

$P(D = 0) = .99$.
$P(T = 1 \mid D = 0) = .01$.
$P(T = 1 \mid D = 1) = .97$.

a. Draw the diagram depicting the marginal of D and the conditional of $T \mid D$.
(the one that branches as you go left to right).

b. Give the joint distribution of D and T in the two way table format.

c. What is $P(D = 1 \mid T = 1)$?

Problem 2: This problem is named after the host of the long running TV show *Let's Make a Deal*. There has been a vigorous debate about what the correct answer is!

A contestant must choose one of three closed doors.
There is a prize (typically a car) behind one of the three doors.
Behind the other two doors, there is something worthless (traditionally a goat).
After the contestant chooses one of the three doors, Monty opens one of the other two, revealing a goat (never the car!).
There are now two closed doors.
The contestant is asked whether he would like to switch from the door he initially chose to the other closed door.
The contestant will get whatever is behind the door he has finally chosen.
Should he switch?

2. Computing Tutorial

Problem 1: Complete the appendix for Tutorial 2, Activities B.1–B.3. Scroll to the bottom of the page, collect your answers, and submit them using your UATX email address.