Class 2 - Pandemic Exercises

Here is an exercise where you will have to do a bit coding :)

You can solve everything by using the methods in Chapter 2 and 3.

Have fun :)

(Trigger alert for anyone who has recently experienced a global pandemic)

# Pandemic Exercise - Testing Efficiency

Imagine there was a global pandemic.

It's a bit difficult, I know.

Maybe a new version of the old SARS-CoV turns out to be really infectious,   
or something like that.

A test is developed that is cheap and quick to use, and the government asks you to determine its efficiency.

To do this, they find X people that they know for sure are infected, and X people that they know for sure are not infected.   
 *NB: This is not always possible. For example, there is an ongoing global pandemic in the real world - maybe you heard of it -* *where a 100% sure test doesn't exist, as far as I know. But let's ignore that. The government finds a wizard who can tell for sure, but he wants a lot of money and he's really slow too.*

Okay, so X infected people take the test, and X uninfected people take the test. See the results below. P means positive, N means negative.

Infected:

[P, N, P, P, N, P, P, N, N, N, P, P, N, P, P, N, N, P, N, P]

Uninfected:

[P, N, N, P, N, P, P, N, N, N, P, N, N, N, N, P, P, N, N, N]

**A)** Estimate the probabilities of testing positive given that you're infected, and given that you're not infected. Use the grid approximation method as in the book. Use a prior you can defend using. Report the full posterior probability distribution for each case (we can do better than just a single value!).

**B)** The government says that they find probability distributions difficult to use. They ask you to provide them with a confidence interval of 95% within which the 'real' probability can be found. Do it.

**C)** The government says that the doctors and the voters find confidence intervals difficult to use. In addition, they are so wide that it looks like the government doesn't know what they're doing. They want a point estimate instead. Give them one.