Problem 1

Supposed we have 3 identical cards, except that both sides of the first card are colored red, both sides of the second card are colored black, and on the third card, one side is black and one side is red.

If we see that a card (laying face-up on the ground) is red, what is the probability that the other side is colored black?
Problem 2

Your computer is broken. You know that you can take it to repair shop A, and the repair time (in hours) follows an exponential distribution with parameter $\lambda = 1/2$. You also know that at repair shop B, the repair time follows a Weibull distribution with parameters $\alpha = 1/2$ and $\beta = 2$.

You also know that the wait time to turn in your computer at repair shop A will be 60 minutes, but the wait at shop B will be 45 minutes. Which shop do you choose?

After thinking about this for a bit, you become concerned about how accurate your estimated wait time will be, particularly since you are only going in this once. What else do you calculate?
Problem 3

You are a graduate student in the engineering building at CU and you want a spacious office (assume all offices are square). To find the best office, you go around and measure all of them. In doing this, you find that the width of the offices have a uniform(8, 12) distribution.

What is the average width of an office? What is the average area of an office?

What is the probability that you will get an office that is larger than the median?
The number of years a radio functions is exponentially distributed with $\lambda = 1/8$. If you buy a new radio, what is the probability that it will be working after 8 years? What is the median number of years the new radio will work?

Let’s say you buy the radio used, but you don’t know how long it was used before you purchased it? What is the probability the radio will work an additional 8 years?

What if you buy 10 new radios, what is the probability that more than 5 of them stop working before 4 years?
Problem 5

An ATM PIN consists of four digits: 0, 1, ...., 9.

a) How many different possible PINs are there if there are no restrictions on the digits?

b) How many possible PINs are there if the following rules exist:
   i) All four digits cannot be identical
   ii) Sequences of consecutive digits not allowed
   iii) Sequences starting with ‘19’ not allowed

c) A thief has stolen a card, and knows that the first number is an 8, and the last number is a 1. If he gets three chances to guess the right number to the account, what is the probability that he gets in?
Problem 6

Supposed that the diameter of a certain type of tree (at chest height) is normally distributed, with \( \mu = 8.8 \) and \( \sigma = 2.8 \) (in inches).

What is the probability that a randomly selected tree will have a diameter greater than 8.8?

What is the value of \( c \) such that \((8.8-c, 8.8+c)\) includes 98% of the tree diameter values?

You are looking for a tree with a diameter greater than 10”. So you go around measuring trees until you find this tree. What is the probability you will find this tree within 4 measurements?