MATH 362—Work Sheet 05

Dr. Justin M. Curry

Due on Saturday February 20th, 2021

Name: _____

1. (2 points) You are dealt two cards, one at a time, from a standard 52 card deck.
   (a) (1 point) What's the probability that the second card is black?

   (b) (1 point) What's the probability that the second card is black, given that the first card is black?

2. (4 points) *The Two Queens Problem:* In Texas Hold-em, every player is dealt two cards from a standard 52 card deck.
   (a) (1 point) What's the probability of being dealt two Queens?

   (b) (1 point) What's the probability of having two Queens assuming you know you have at least one queen?

   (c) (1 point) What's the probability of having two Queens assuming you know you have the Queen of Hearts?

   (d) (1 point) How do these probabilities compare?

3. (2 points) Describe *The Monty Hall Problem.* Should you switch doors?

4. (3 points) *Electrical Components:* Suppose there are two electrical components in a device. The chance that the first component fails is 10%. If the first component fails then the chance that the second component fails is 20%. If the first component works, the chance the second component fails is only 5%.

   (a) (1 point) What's the probability at least one component works.

   (b) (1 point) What's the probability exactly one component works?

   (c) (1 point) What's the probability the second component works?

5. (1 point) Suppose $P(\text{snow today}) = 40\%$ and $P(\text{snow tomorrow}) = 50\%$ and $P(\text{snow today and tomorrow})$ 30%, what is $P(\text{snow tomorrow} \mid \text{snow today}) = ?$

6. (3 points) *Two Urns:* One urn contains 2 black and 3 white balls. The other urn contains 4 black balls and 3 white balls. An urn is chosen uniformly at random and a ball is chosen uniformly at random from that urn.

(a) (1 point) Draw a tree diagram illustrating the possible outcomes of this experiment.

(b) (1 point) Assign probabilities and conditional probabilities to branches in the tree.

(c) (1 point) Calculate the total probability that the urn is black.

7. (2 points) A light bulb company has factories in two cities. The factory in city A produces two thirds of the company's light bulbs. The remainder are produced in city B, and of these, 1% are defective. Among all bulbs manufactured by the company, what proportion are not defective and made in city B?