CMSC 57 Discrete Mathematical Structures in Computer Science II
Exercise 8: Probability Distributions

On your paper, write the exercise number and title, your name, student number, and a drawing of your favorite plant/zombie in Plants vs Zombies (I'm getting out of drawing ideas to be honest).
Read and discuss the problem and the possible solutions with your partner before writing on your papers. Answer each item as neatly as possible. Minimize erasures. Review your solutions before submitting your papers. Do not discuss your work with any other group. Show your complete solutions and **final answers as much as possible**.

1. The probability that a zombie crosses the lawn is 0.3. If 5 zombies try to cross the lawn, what is the probability that at most 2 crosses successfully?

2. Zombie Lakers and Plant Celtics are settling their feud via a Best of 7 (race to 4 wins) Basketball series. Assuming that the games are **evenly matched**,

   a. what is the probability that the Zombie Lakers will sweep the first four games and win the series for doing so?

   b. what is the probability that the series will end in the 5th game, in favor of the Plant Celtics?

   c. what is the probability that the series will end in the 6th game, either way (either the Zombie Lakers or the Plant Celtics will win)

Hint: There would be no problem in your calculations, with (a): sweeping the series in 4 games. Your calculations will have a problem with (b) and (c). Take note that in order for a team to win the series on an nth game, they should win that nth game, and win also 3 games prior to that nth game.
To clarify, if the series ends in the 7th game, the winning team should take the 7th game (in order for the series to end on the 7th game), and 3 games from games 1 to 6 (in any order).
Lastly, it should be improbable (probability=0) for the series to end on the 1st to the 3rd games, since 4 games **at least** are needed to conclude the series. Having said that, the probability of the series ending in the game 4 to game 7 should be equal to 100%.

3. Cabbage-pult, the cabbage-throwing plant, is a 70% free throw shooter (due to his constant practice of throwing cabbages to the zombies). What is the probability that Cabbage-pult will make his first free throw in his third shot?

4. Snorkel Zombie only goes to attack the house if he obtains 2 or fewer hearts from picking 5 cards from a standard deck of cards. What is the probability of him obtaining such a result?

5. Conehead Zombie joins one of those stupid noon-time shows. He wins as the winner of the segment "Brains o Bayong". He gets to win a trip to Brainland if he gets two of the three bayongs containing the word "Brainland". He only gets to pick 4 of the 11 bayongs to choose from. What is the probability of him winning the trip to Brainland?

6. Suppose we are to breed certain peashooters that posses a certain dominant trait H. We successfully bred a 1st generation of peashooters by breeding a

peashooter with pure HH strain with a half-breed peashooter with the Hh strain. The generation produced from this pairing will result in 50% pure HH peashooters and 50% Hh half-breeds.

Suppose we randomly take a peashooter form this generation and pair it with a half-breed peashooter to produce the 2nd generation fishes. We then randomly took 10 samples from the 2nd generation. Find the probability of obtaining 4 peashooters carrying the pure HH strain.

Hint: HH and Hh parents will result in 50% HH and 50% Hh. Two Hh parents will result in 25% HH 50% Hh and 25% hh peashooters.

7. Newspaper Zombie draws cards from a deck of 52 playing cards until a Queen is drawn. What is the probability of him drawing a Queen at the 7th draw?

Note: Every time he draws a card that is not a queen, he shuffles it back to the deck.

8. Dancing Zombie has a playlist where there are 5 distinct genre and each genre have several songs as listed: 7 rock tracks, 10 classical tracks, 8 pop songs, 3 country songs and 2 jazz tracks. Find the probability of randomly playing 12 songs where 3 are rock, 4 are classical, 1 is country, 1 is jazz, and 3 are pop songs. Assume that any song may be played only once.

9. Suppose we roll a 14 sided die 5 times. The faces of the die are as follows: the faces of Ma'ams Lanie, Kat, Marge, Kei, and Yvette, and Sirs Mir, Rein, Mark, Regie, Andrel, Mykmyk, Bulacs, Martee, and Arian (yes, they are your top favorites from the last exercise).

a. What is the probability of obtaining 1 girl and 4 boys as a result?

b. What is the probability of obtaining 1 face each from C-112, 114, and 118; and 2 faces from C-116?

c. What is the probability of obtaining 2 Bulacs's, 2 Arian's and 1 Ma'am Marge?