**Homework Problems**: Situation: It is a cold, dark, and stormy winter morning. Your boss has called a 5 a.m. meeting before she leaves to catch a flight to the Bahamas for her vacation, and there is a power outage. Your alarm does not go off and you sit up in bed with a fright at what you guess is about 4:45 a.m. You are trying frantically to get dressed and you need to reach into your sock drawer to get two matching socks in the dark. Naturally, your mind wanders to solving probability equations. Your sock drawer contains 20 total socks which consist of 10 matched pairs of socks. All of them are only black or white and they are loose, disorganized randomly, and not bound together. This means you have 10 black socks and 10 white socks in your disorganized drawer. You do not have a light source because your phone did not charge, and you cannot find a flashlight or a candle. You are completely in the dark! You must get dressed and go! You have to math fast!

1. **Think for a minute and describe your optimal strategy for solving this problem in 50 words or less.**

The optimal strategy I think of solving the above problem is, in a dark room we need to find a pair of socks from the drawer which contains 20 socks in which there are 10 matching pairs of two colors white and black. So, that means I have 10 white and 10 black socks in an unorganized drawer. What is the probability of finding the matching pairs either white pair or black pair.

1. **Let’s say for a moment that all 20 socks are different colors meaning that none match. What is the total number of different ways they could be combined in pairs?**

Different ways to pick no match pair of socks from all 20 socks = 20C2 = 20! / (20 - 2)! 2! = 20\*19/ 2 = 10\*19 = 190 ways.

1. **Now consider all the socks are only black and white. What is the total number of different ways they could be combined in pairs? (Suggestion: You might consider listing the sample space of all possible outcomes.)**

The total number of different combinations of pairs are three, that are pair of black socks, pair of white socks, pair has a combination of white and black socks.

**For the remaining problems, let’s go back to the assumption that there are 20 total socks, 10 white and 10 black. This makes 10 total matching pairs of 5 pair of white and 5 pair of black.**

1. **What is the probability of picking one white sock?**

The probability of picking one white sock from total number of socks that are 20 = 1/20 = 0.05%.

1. **What is the probability of picking one black sock?**

The probability of picking one black sock from total number of socks that are 20 = 1/20 = 0.05%.

1. **What is the probability of picking a second white sock after first picking a white sock?**

Total number of socks are 20. After picking the 1st sock the total reduced to 19. Probability picking the 2nd white sock after picking the 1st which are white is = 9/19.

1. **What is the probability of picking a second black sock after first picking a black sock?**

Total number of socks are 20. After picking the 1st sock the total reduced to 19. Probability picking the 2nd black sock after picking the 1st which are black is = 9/19.

1. **What is the probability of picking a black sock after first picking a white sock?**

Total number of socks are 20. After picking the 1st sock the total reduced to 19. Probability picking the black sock after picking the white sock is = 10/19.

1. **What is the total probability of picking a white sock and then another white sock (one pair of white socks)?**

The total probability of picking 2 white socks = total ways of picking 2 white socks from 10 socks / total ways of picking 2 socks from total 20 socks = 10C2/20C2 = 45/190 = 0.236%.

1. **What is the probability of picking either a pair of white socks or a pair of black socks?**

The total probability of picking 2 white socks = total ways of picking 2 white socks from 10 socks / total ways of picking 2 socks from total 20 socks = 10C2/20C2 = 45/190 = 0.236%.

The total probability of picking 2 black socks = total ways of picking 2 black socks from 10 socks / total ways of picking 2 socks from total 20 socks = 10C2/20C2 = 45/190 = 0.236%.

Probability of picking any 2 same color socks = probability of picking 2 white socks + probability of picking 2 black socks = 45/190 + 45/190 = 90 /190 = 9/19 = 0.473%.

1. **If each time you pick a sock from the drawer a sock just like it magically replaces it, what is the probability of picking either a pair of white socks or a pair of black socks?**

The probability of picking either a pair of white or black socks = (10/20\*10/20) + (10/20\*10/20) = (1/4) + (1/4) = 2/4 = ½ = 0.5%.

1. **How can you guarantee success of picking a matching pair? In other words, what is the minimum number of socks needing to be picked to guarantee a matching pair? (Hint: There is a right answer to this question!)**

The minimum number of socks that needed to be picked to guarantee a matching pair is at least three. At 1st attempt I can take black or white let us assume its black, in 2nd attempt I can take black or white, lets assume its white, and now in the 3rd attempt I can take either black or white let us assume black. So, it makes a pair with the previous black sock. If it is white it also makes pair with the white sock that has picked before.

So, I think the answer is 3.

1. **Explain dependent and independent trials and then further describe the difference between Question 10 and Question 11 as it relates to dependent and independent trials.**

Dependent trials, where the outcome of the previous events will have an impact on the outcomes of the next trail. Question 10 ‘s method is related to the dependent trials. Independent trials, this is like tossing a coin. Where the outcome of the previous trial will not have any impact on the outcomes of the next trial. Question 11’s method is related to the independent trials.