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**Lab #4B** STAT 204 Mehta

You may refer to your notes or any materials on Canvas, including Excel instructions.

**Your lab should be submitted as a Word document or PDF.** Please copy and paste any graphs that you create in Excel into your lab document. You should also save your Excel workbook so that you can refer to it later. Any responses must be easy to read and labeled with the appropriate problem number. Please submit the lab via Canvas.

The scenario: A company is conducting a study on cola. Many advertisements are promoting certain brands of cola by claiming that their cola is preferred over other popular brands. The company wants to test these claims. They choose to focus on the two most common colas, Coca-Cola and Pepsi –Cola. Suppose that Coca-Cola is claiming that it is generally preferred by consumers. The company claims to test this theory by travelling across the U.S. and running many taste tests. They wish to investigate how accurate they can expect samples to be in the future. So the company begins by doing the taste test with every student at a particular university. They find that 54.8% of the students prefer Coca-Cola. Now they send out students to do the same taste test with random samples of 100 fellow students.

1. If a student goes and asks a random sample of 100 fellow students their preference, let X be the number of students who prefer Coca-Cola. X has the binomial distribution. Identify the values of the parameters *n* and π for this problem.

**n= 100 π= 0.548**

**Recall: These are the functions for the Binomial distribution in Excel.**

P(X=x|n,π)**=BINOM.DIST(x,n,π,FALSE)**

P(X≤x|n,π)=**BINOM.DIST(x,n,π,TRUE)**

1. If a student goes and asks a random sample of 100 fellow students their preference (based on a taste test) what is the probability that 50% of them will prefer Coca-Cola? Represent this using probability notation and use Excel to find the probability. Below please include the function that you typed into Excel along with the probability value that you found. For this, use the actual values required by the function, not the cell values from your excel sheet.

P(X=50) = 0.05009606

Excel Function used: “=BINOM.DIST(50, 100, 0.548, FALSE)”

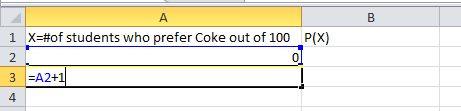
1. Another student goes and asks a random sample of 100 fellow students their cola preference (based on a taste test). What is the probability that less than 55% of those asked will prefer Coke? Represent this using probability notation and use Excel to find the probability. Below please include the function that you typed into Excel along with the probability value that you found. For this, use the actual values required by the function, not the cell values from your excel sheet.

P(X<55) = 0.474706193

Excel Function used: “=BINOM.DIST(54,B2,B1,TRUE)”

1. Now you are going to generate the entire probability distribution. First we will create it in a spreadsheet and then we will make a plot. Follow the steps below.

* In a new sheet start by putting the labels in the first row of columns A and B, 0 in cell A2, and the function =A2+1 in cell A3 (as shown below).



* Now place your cursor in the bottom right hand corner of A3. A black cross will appear. Highlight down the entire column until you reach row 102. You should see the integers 0 to 100 displayed in column A.
* Next we need to assign probabilities to each value. Let’s start with 0. Use the =BINOM.DIST function to find the probability that X=0. When you do this click on cell A2 to select the *x* value. This way we will be able to extend the formula to the rest of the column. Once the probability is calculated extend the formula to the rest of the column up to row 102. Now you should have a complete list of all of the probabilities.
* Confirm that your distribution is correct by verifying that your answer from #2 is properly represented.
* Finally, highlight both columns and create a scatter plot where probabilities appear on the y-axis and X values appear on the x-axis. Label each axis and give the plot an appropriate title.

**Copy the completed scatter plot from your excel sheet and paste it below.**

**A graph of a graph with blue dots

Description automatically generated**

1. Now use Excel to find the mean (Expected Value) and standard deviation (SD). Consult your class handouts/powerpoints for these formulas. Below please include the functions that you typed into Excel along with the values that you found. For this, use the actual values required by the function, not the cell values from your excel sheet.

**Μ=E(X)=**

**μ** (Mean) **=** 54.8

Excel Function for mean: “=100\*0.548” ( “=n\*pi” )

**σ** (Standard Deviation)= 0.02161256

Excel Function used for Standard Deviation: “=SQRT(B2\*B1\*(1-B1))” ( “=SQRT(n\*pi\*(1-pi))” )