Statistics I Lab 6

Submission Instructions: Welcome to Lab 6. Upon completion, you *should upload* your **Word Document** and **Minitab Project files** to Blackboard by 11:59 PM of the due date March 28th.

Problems

Chapter 7 Lab - Sampling Distribution.

Answer the following questions using Minitab. Copy your results to a Word document with the questions stated clearly using statistical symbols where necessary. Also provide explanations as needed.

1. **Question 1** (70 points)
   Let X1 be a random variable representing the outcome of rolling a fair 6-sided dice. The random variable can take on the values x = 1, 2, 3, 4, 5, 6 with probability 1/6 for each.

   To graph the distribution of X1, we will use Minitab to sample 700 data points from the integer distribution x = 1, 2, 3, 4, 5, 6 with equally likely probabilities.

   Minitab 19

   - Using a blank Minitab worksheet, choose Calc > Random Data > Integer.
   - In Number of rows of data to generate, enter 700.
   - In Store in column(s), enter C1.
   - In Minimum value, enter 1.
   - In Maximum value, enter 6.
   - Click OK.

   Minitab 19 (Mac)

   - Using a blank Minitab worksheet, choose Calc > Random Data
   - In Number of rows of data to generate, enter 700.
   - In Store in column(s), enter C1.
   - From Distribution, select Integer.
   - In Minimum value, enter 1.
   - In Maximum value, enter 6.
   - Click OK.

   Column C1 now contains 700 randomly sampled values with equally likely probabilities chosen from x = 1, 2, 3, 4, 5, 6. Take a look at the column to make sure the distribution of values makes sense – just imagine these are the outcomes from someone rolling a die 700 times.

   We can create a histogram for column C1 to see the shape of the distribution. We expect to see approximately the same heights for values x = 1, 2, 3, 4, 5, 6 around the value $1 \div 6 * 700 \cong 116.67$.

   Minitab 19

   - Choose Graph > Histogram.

- Choose Simple, then click OK.
- In Graph variables, enter C1.
- Click OK.

Minitab 19 Mac

- Choose Graph > Histogram.
- Choose One Y Variable - Simple.
- In Y-variable, enter C1.
- Click OK.

This graph is fairly flat. This is not unusual for a random process, such as rolling a die. We can definitely see, though, that the distribution does not exhibit the shape of a normal curve.

In order to examine the shape of the average $\bar{x}$ of two die rolls, we'll create another 700 die rolls the column C2 in Minitab. Take a look at the histogram of C2.

Before creating a histogram for the average of these two rolls, we need to use Minitab to calculate the average of columns C1 and C2.

- Name column C3 as "Average of 2 Dice Rolls."
- Open the dialog.
  - Minitab 19: Choose Calc > Calculator. For Store result in variable, enter C3.
- For Expression, enter $(C1 + C2)/2$.
- Click OK.

Column "Average of 2 Dice Rolls" contains 700 averages of two dice. Take a look down the column to make sure the distribution of values makes sense. These are the outcomes from someone rolling two dice and averaging their values.

We will make a histogram for the column "Average of 2 Dice Rolls" to see the shape of the distribution. We expect the highest bin to be around the average 3.5 since 6 dice roll averages ((1, 6); (2, 5); (3, 4); (4, 3); (5, 2); (6, 1)) yield 3.5. Minitab histogram plot instructions are given above.

- Create a report of the mean of the distribution of C1, C2, and the Average of 2 Dice Rolls.
- Create a report of the standard deviation of the distribution of C1, C2, and the Average of 2 Dice Rolls.
- What are your interpretations of the means and standard deviation from this simulation?
- What can you say about the shape of the distribution of the Average of 2 Dice Rolls in relation to C1 and C2?

2. **Question 2** (30 points)
Let X1, X2, X3, ..., X200 denote the weights of 200 independent and identically distributed bags of candy corn. If the mean weight of each bag is 2 lb. and its standard deviation is 0.07 lb., determine the probability that the average of 200 bags weighs between 1.997 lb. and 2.06 lb. Show your answer using Minitab.