

# Statistics I Lab 2

**Submission Instructions:** Welcome to Lab 2. Upon completion, you *should upload* your **Word Document** and **Minitab Project files** to Blackboard by 11:59 PM of the due date Feb 8th.

## 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  $X_1$  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  $X_1$ , 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  $X_1, X_2, X_3, \dots, X_{100}$  denote the weights of 100 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.