***Confidence Intervals Lab Activity***

*We are creating three separate confidence intervals using skills learned in this chapter. We will need three groups of data: (A) at least thirty data points for the sum of rolling two dice, (B) the height in cm of pop in each cup in the classroom, and (C) the proportion of brown M&Ms in your candy bag. The height of pop must be taken before anyone drinks any of the pop. The proportion of M&Ms must be taken before you eat any M&Ms.*

*You will complete each lab activity and then place these into a report. The report may be created in MS Word, PowerPoint, or another approved medium. A list of items to be included for each lab is given.*

**Confidence Intervals (Large Samples)**

Create a 95% confidence interval for the sum of two dice.

*Lab Steps:*

1. Gather data points $x$ by calculating the sum after rolling two dice (sample size $n\geq 30$).
2. Compute the mean $\overbar{x}$ by taking $\frac{\sum\_{}^{}x}{n}$.
3. Use the population standard deviation $σ=2.415$ for the sum of two dice.
4. Identify the critical value $z\_{c}$ for the given confidence level using the table.
5. Calculate the margin of error by $E=z\_{c}\frac{σ}{\sqrt{n}}$
6. Determine the confidence interval using (mean – margin of error) and (mean + margin of error).

*On your report include:*

(1) Your data values of $x$ (the heights).

 (2) The mean $\overbar{x}$ and standard deviation $s$ of the sample.

 (3) The degrees of freedom $d.f.$ and the critical value $t\_{c}$ for the confidence level.

 (4) The margin of error $E$.

 (5) The confidence interval $\overbar{x}-E<μ<\overbar{x}+E$

**Confidence Intervals (Small Samples)**

Create a 90% confidence interval for the height (in cm) of pop in each cup in the classroom.

*Lab Steps:*

1. Measure all of the heights of pop in each cup in the classroom and record the data.
2. Input all of the data into L1 in the calculator by going to STAT: Edit…
3. Compute the statistics on your sample by going to STAT: CALC: 1-Var Stats and hitting ENTER twice.
4. Find the mean $\overbar{x}$ and sample standard deviation $s$ ($Sx$ in calculator).
5. Identify the degrees of freedom ($n-1$)
6. Locate the critical value $t\_{c}$ for the given confidence level and degrees of freedom in the table.
7. Calculate the margin of error by $E=t\_{c}\frac{s}{\sqrt{n}}$
8. Determine the confidence interval using (mean – margin of error) and (mean + margin of error).

*On your report include:*

(1) Your data values of $x$ (the heights).

 (2) The mean $\overbar{x}$ and standard deviation $s$ of the sample.

 (3) The degrees of freedom $d.f.$ and the critical value $t\_{c}$ for the confidence level.

 (4) The margin of error $E$.

 (5) The confidence interval $\overbar{x}-E<μ<\overbar{x}+E$

**Confidence Intervals (Proportions)**

Create a 95% confidence interval for the proportion of brown M&Ms in your bag of the candy.

*Lab Steps:*

1. Count the total number of M&Ms (sample size $n$) as well as the number of brown M&Ms (successes $x$).
2. Compute the point estimate $\hat{p}$ using the formula $\hat{p}=\frac{x}{n}$ and $\overbar{q}$ using the formula $1-\overbar{p}$.
3. Verify we can use the normal distribution to approximate the sampling ($n\hat{p}\geq 5$ and $n\hat{q}\geq 5$).
4. Find the critical value $z\_{c}$ for the given confidence level using the table.
5. Calculate the margin of error by $E=z\_{c}\sqrt{\frac{\hat{p}\hat{q}}{n}}$
6. Determine the confidence interval using (point est. – margin of error) and (point est. + margin of error).

*On your report include:*

(1) Your data values of $x$ and $n$.

 (2) The point estimate $\hat{p}$.

 (3) The verification that we can use the normal distribution to approximate the sampling distribution.

 (4) The critical value $z\_{c}$ .

 (5) The margin of error $E$.

 (6) The confidence interval $\hat{p}-E<p<\hat{p}+E$

*The lab/report is worth a total of 20 points.*