Student: sohel Mohammed **Date:** 10/07/24	**Instructor:** Elizabeth Diluzio **Course:** Fall 2024 BAN-6001-7A01 DiLuzio	**Assignment:** Chapter 6 Review Homework

A population that is uniformly distributed between a = 0 and b = 10 is given in sample sizes 50( ), 100( ), 250( ), and 500( ). Find the sample mean and the sample standard deviations for the given data. Compare your results to the average of means for a sample of size 10, 5.1208, and use the empirical rules to analyze the sampling error. For each sample, also find the standard error of the mean using formula given below.

$$\text{Standard Error of the Mean} = \frac{\sigma}{\sqrt{n}}$$

Start with the sample sizes of 50. Copy the data and then paste it into cell A1 of an Excel spreadsheet.

The mean is the sum of the observations divided by the number of observations. The Excel function AVERAGE(data range) is used to calculate the mean.

To find the mean of Sample 1, in column B, enter = AVERAGE(B2:B51) in cell B53.

Use the Excel output to determine the mean of Sample 1, rounding to four decimal places.

4.7388

Drag the cell to the right, until I53, to calculate the remaining means.

Calculate the average of these means by entering = AVERAGE(B53:I53).

Calculate the standard deviation of these means by entering = STDEV.S(B53:I53).

Use the Excel output to determine the average and standard deviation, rounded to four decimal places.

Sample Size	Average of 8 Sample Means	Standard Deviation of 8 Sample Means
50	5.0522	0.4063

Calculate the standard error using the formula given in the problem statement. Since a = 0 and b = 10, the variance, σ^2, is $(10 - 0)^2/12 = 8.333$. Round the standard error to four decimal places.

$$\text{Standard Error of the Mean} = \frac{\sigma}{\sqrt{n}}$$

$$= \frac{\sqrt{8.333}}{\sqrt{50}} \quad \text{Substitute.}$$

$$= 0.4082 \quad \text{Simplify.}$$

Repeat the above steps for sample sizes 100, 250, and 500. The following table shows the results from the sampling experiment, rounded to four decimal places.

Sample Size	Average of 8 Sample Means	Standard Deviation of 8 Sample Means	Standard Error
50	5.0522	0.4063	0.4082
100	4.9959	0.2147	0.2887
250	5.0714	0.1664	0.1826
500	4.9920	0.1018	0.1291

Compare the results to the average of means for a sample of size 10. First find the true expected value μ.

$$\mu = \frac{a + b}{2}$$

$$= \frac{0 + 10}{2}$$

$$= 5$$

Now compare 5.1208 and the average of the sample means to μ = 5.

Notice that the average of the sample means are closer to the true expected value of 5 as the sample size increases.

Use this information to make a conclusion about the distribution of means.

Analyze using empirical rules. Use 3 standard deviations.

The distribution of sample means should fall within three standard deviations of the population mean. Use the values obtained in the previous steps to calculate the distributions.

For a sample of size 50, we would expect the sample means to fall between $5 - 3(0.4063)$ and $5 + 3(0.4063)$, rounded to two decimal places, is 3.78 and 6.22.

Repeat the above step for sample sizes 100, 250, and 500, rounded to two decimal places.

For a sample of size 100, we would expect the sample means to fall between 4.36 and 5.64. For a sample of size 250, we would expect the sample means to fall between 4.50 and 5.50. For a sample of size 500, we would expect the sample means to fall between 4.69 and 5.31.

Find the difference between the distributions, and decide if the error increases or decreases with the sample size.