Math 338 – Pineda Lab 6 Statistics Applied to Natural Sciences

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**Last Name: First Name:**

**Lab 6: Sampling Distribution of the Sample Mean **

Write your name, class time, lab title and date. Print out commands and outputs. Make sure to answer all parts of each question and show work when possible.

1. Let’s illustrate the idea of a sampling distribution in the case of a small sample from a small population. The population is the 32 students in Mr. Pineda’s Math 120 course. A survey was done and they were asked multiple questions. One of the questions was: How much money did you spend this semester on books and materials for school? The results are under the variable “Money”. Import the data set Math120Survey available under the folder “Datasets” on Website and answer the following questions.

a) Construct a histogram of the total money spent and titled it “Population Distribution.” What is the overall shape of the distribution?

A: The overall shape of the distribution is slightly skewed to left.

b) Find the population mean, *μ,* and population standard deviation, σ, for the 32 students in the population.

A: The population mean is 298.9688 and the population standard deviation is 104.9293.

c) Use RStudio to draw 1000 random samples of size 5 from this population and calculate the mean for each. See example 1. You are approximating the sampling distribution of . Just print your code for this question since there is no output.

d) Construct a histogram of the values you generated and titled it “Sampling Distribution”. What is the overall shape of the distribution of ?

A: The overall shape of the distribution is symmetric to the center.

e) What are the sampling distribution mean and the standard deviation? How do they compare to the population mean and standard deviation in part (b)?

A: The sampling distribution mean is 300.5602 and the standard deviation is 44.61026. It turns out the sampling distribution mean is slightly more than the population mean, but the standard deviation is significantly less than the population’s standard deviation.

2. Total SAT scores of high school seniors are roughly Normal with a mean of 1000 and a standard deviation of 200.

a) Julie scored 1050. What is her percentile? That is, she did better than what proportion of students?

A: The percentile is 59.87%.

b) Now consider the scores of 30 randomly chosen students. What is the probability that their average score is more than 1050?

A: The probability is 8.545%.

c) How high must a student score in order to place in the top 10% of all students taking the SAT?

A: To be on the top 10%, the student must score 1256.

d) Now consider the scores of 45 randomly chosen students. What is the probability that their average scores are between 1100 and 1150?

A: The probability is 0.0398%.

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