Mat 152

Project 4

The Central Limit Theorem

**Student Learning Outcomes:**

1. The student will demonstrate and compare properties of the central limit theorem.

**The Data**

A central tenet to being a good instructor, I believe, is to be a reflective practitioner of your craft. From time to time I find it to be necessary to review and reflect on my work as an instructor from a grade perspective. On our moodle page you will find a link to a second word document titled “300 Grades”. This data sheet contains both the alphanumeric grade (page 1) and the numerical equivalent (page 2) for every grade I have given for the last 300 students that have attempted this very course.

After your readings in chapter 7 and examining this 300 grades document, it should be relatively obvious that it is not uncommon to find an individual student that would achieve an A in my class. However, logically, it would be much more difficult to find a FULL CLASS (25 students) that would achieve an A average for my course. This project will help us answer this question… together.

**Objective 1 (28 points)**

Using excel or statcato, stack all ten columns together into a single column. Once you have all 300 grades in a single column, calculate:

1. The average numeric grade for all 300 students

The average grade for the 300 final grade data points provided is 85.63

1. The standard deviation for numeric grade for all 300 students

The standard deviation of the 300 final grades came to 12.5

1. If we were to assume the population of grades was normally distributed (which it certainly isn’t) calculated the probability that an individual would have a final grade higher than a 90.

The probability of a grade received higher that 90 is approximately 36.4%

1. Again, assuming normality, calculate the probability that an individual was have a final grade higher than 80.

The probability of a final grade that is above an 80 is 67.3%

**Objective 2 (21 points)**

Since we are attempting to examine the behavior of a class of students, the behavior of an individual (as we calculated in objective 1) is really of little concern to us. Assuming that there are 30 students enrolled for a typical class, use the central limit theorem to calculate the following:

1. What would be the shape of the distribution of the average class grade of these 30 students?

Bell shaped with a fairly normal distribution.

1. What would be the average class average of these 30 students be?

The class average for the 30 students

1. What would the standard deviation of the class average be for these 30 students?

For 30 students the SD for the class average would be 2.28

**Objective 3 (3 points)**

Watch this [video](https://youtu.be/4W7dLxY4SYw).

**Objective 4 (28 points)**

After watching the simulation video in objective 3, address the following questions:

1. What is the probability that a **class of 30 students** would have a final average grade higher than a 90?

The probability a class containing 30 students will have a final average higher than 90% is 2.77%

1. Compare your results from objective 4 question 1 to your answer in objective 1 question 3. At face value, the two questions seem very similar, but you should have quite different responses. Is the probability of the 30 students higher or lower than just the individual? Why?

The probability of an individual getting higher than a 90 (which was 36.4%) is much higher than the probability of a group of thirty students collectively getting higher than a 90%. Why? Due sandbaggers (like myself) bring the average down due to being particularly nonacademic. This concept being the reason why such programs like “No Child Left Behind” took off I’m sure.

1. What is the probability that a **class of 30 students** would have a final average grade higher than an 80?

99.31%

1. Compare your results from objective 4 question 3 to your answer in objective 1 question 4. At face value, the two questions seem very similar, but you should have quite different responses. Is the probability of the 30 students higher or lower than just the individual? Why?

The likelyhood of a class of 30 receiving over an 80% final grade ends up being 99.3%. The reason for it being higher than the individual probability/likeliness of getting over an 80% (which was 67.3%) is due to the SD being narrower from the reduction in sample size.

**Objective 5 (20 points)**

At the beginning of this document I prompted the discussion referring to this activity as a reflection of my teaching. Now that you have calculated two different distributions (one for individual student performance and one for class average performance) which of the two distributions is more appropriate for my reflection as an instructor? Would it benefit me more to discuss the behavior of one of my students with the math coordinator at CCC&TI or to discuss the behavior of my classes? Be descriptive in your answer.

Individuals decisions, lifestyle and other extraneous factors aren’t represented in the data. Bad class averages being correlated to the educators is a silly thing to pin on the educator when ultimately it’s the students responsibility to pass the class and achieve the highest final grade that they can. Accounting for all the external factors is not practical. So far as I know calculating for such things is a fictitious concept and you’re not Harry Seldon so far as I can tell. To be more precise in my answer, neither course of action is useful to the educator or the student or collective of students. Perhaps a better course of action would be to implement a private (per student) start of course survey asking the students to detail their educational pathway, goals, skill based proclivities, and interests and give an option to tailor some projects or assignments to create a link of relevancy to what the student is attempting to achieve scholastically or career-wise. In my case I re-attempted this assignment on Sunday after my mentor, who is teaching me ARM CPU assemble and Rust systems programming, suggested I practice my Python programming skills using some python libraries designed for statistics and demography calculations. I did so and I wish I had started doing so sooner as it actually got me interested in this course all the sudden. To little to late I’m sure. In any case, I’ve submitted the link to a github repo where I’ve pushed the python script to for demonstration purposes or just for your entertainment.