**Activity 7.5.4 – Finding Areas Under Normal Curves**

Normal curves model continuous random variables that have a bell-shaped and symmetric distribution. This activity will explore how to use the TI-83 graphing calculator to find areas below normal curves. As we saw previously, areas below normal curves correspond to percentages and probabilities.

**Modeling SAT Writing Scores**

In a recent year SAT writing scores for high school seniors in a state were normally distributed with a mean of 480 and a standard deviation 85. The normal curve below models this distribution. The numbers on the *x*-axis indicate the location of the mean and the scores that are one, two and three standard deviations from the mean.



Instructions for Using the TI-83 or TI-84 Plus or TI-84 Silver Plus to Find Areas Under Normal Curves

* Go to the *DISTR* menu
* Select the *normalcdf* command
* Enter the interval of *x* values, the population mean, and the population standard deviation. The command has the form: *normalcdf(lower limit, upper limit, mean, std. deviation)*

Examples:



(A) Find the percent of scores less than 429.

Enter the command: normalcdf(0, 429, 480, 85).

In this command, the interval of *x*-values is 0 to 429, the mean is 480, and the standard deviation is 85.

(B) Find the percent of scores greater than 600.

Enter the command: normalcdf(600, 905, 480, 85).

In this command, the interval of *x*-values is 600 to 905.

The upper limit 905 is five standard deviations above the mean, the mean is 480, and the standard deviation is 85.

1. For each question below, shade in the area corresponding to the percentage on the normal curve below, and use the calculator to find the exact area. Round your answers to three decimal places.
2. What percent of scores are less than 380?
3. What percent of scores are between 460 and 550?
4. What percent of scores are greater than 700?



1. What is more likely: randomly selecting a SAT writing score greater than 700 or randomly selecting a SAT writing score less than 380? Explain.
2. Suppose 100 SAT writing scores are randomly selected. How many of them would you expect to be less than 470?

A normal random variable value is considered *unusual* if it is two or more standard deviations from the mean of its distribution (in either direction).

1. What SAT writing scores are considered unusual?
2. What is the probability of randomly selecting a SAT writing score that is considered unusual?

**Modeling Major League Baseball (MLB) Players’ Batting Averages**

A baseball player’s batting average is found by dividing the player’s total number of hits by their total number of at-bats. So, for example, if a player made 36 hits in 150 at-bats, the player’s batting average is 36/150 = 0.240. Batting averages are typically expressed as decimals.

In a recent year batting averages in major league baseball were normally distributed with a mean 0.260 and a standard deviation of 0.017.

1. Label the mean and the batting averages that are one, two, and three standard deviations from the mean below the *x*-axis on the diagram below.



1. What does the Empirical Rule tell us about batting averages in this distribution?
2. Find the percent of batting averages that are less than 0.250? Shade in the corresponding area on the curve above. Round your answer to three decimal places.
3. What percent of batting averages are between 0.275 and 0.300? Shade in the corresponding area on the curve above. Round your answer to three decimal places.
4. A sports reporter states that players with batting averages over 0.300 are exceptional and deserve higher salaries. Make an argument using evidence to refute or support his position.