STAR 511 HW #2

See Canvas Calendar for due date.
26 points total, 2 points per problem unless otherwise noted.

Note: I recommend using R to answer the normal probability questions (Q1 – Q10).

Questions 1 through 3 (Standard Normal): Assume the random variable Z has a standard normal distribution (with mean 0 and standard deviation 1). In other words, $Z \sim N(\mu = 0, \sigma = 1)$.

1. Find $P(Z \leq -0.21)$.
2. Find $P(-1.44 < Z \leq 0.53)$
3. Find the value of z such that $P(Z \leq z) = 0.4180$

Questions 4 through 10 (SAT scores): More than a million high school students take the SAT exams each year. Suppose SAT reading/writing scores follow a normal distribution with mean 510 and standard deviation 115. In other words, let Y be the random variable representing SAT reading/writing score and assume $Y \sim N(\mu = 510, \sigma = 115)$.

4. What proportion of scores will be greater than 600? In other words, find $P(Y > 600)$.
5. What proportion of scores will be less than or equal to 450?
6. What proportion of scores will be between 450 and 600?
7. Jane scored 620 on the SAT reading/writing exam. Calculate the corresponding Z-score (or standardized score).
8. Briefly interpret the Z-score from the previous question to discuss whether Jane did unusually well on the exam. Hint: Think in terms of standard deviations above/below the mean. Discussion is more important than a firm conclusion.
9. Suppose an (literary) honor society wishes to invite those scoring in the top 10% on the SAT reading/writing exam. What score is required to join the honor society? In other words, find the 90^{th} percentile for the SAT reading/writing exam.
10. Suppose a random sample of 100 student scores is selected from the population. What is the probability that the sample mean is 485 or less? In other words, find $P(\bar{Y} \leq 485)$.

Questions 11 through 14 (Hormone): The hormone thyrotropin is also known as thyroid stimulating hormone (TSH). Suppose we have TSH measurements (in μIU/ml) from a random sample of n = 75 healthy adults. The data is available from Canvas as Hormone.csv.
Reminders: (1) Use read.csv() to import the data. (2) Check the data after importing. (3) Use $ to access the TSH column.

11. Construct an appropriate summary graph of the data. Based on this graph, which best describes the distribution of TSH: symmetric, skewed, or bimodal?

12. If we had access to a larger sample (say n = 1000 healthy adults), would you expect the distribution of TSH to be (approximately) normally distributed? answer yes or no and give brief explanation.
13. Calculate the sample median, mean and standard deviation for TSH.