Homework #4: Z-Scores, P-Values, and Standard Errors

Be as complete as possible in your answers. On this and all future assignments, put all answers in prose (sentence) form; single-word or phrase answers are not sufficient. Be explicit and complete in explaining your answers. Show all work done, including any calculations, & explain all of the steps involved and all of the parts of each calculation; I can only give partial credit if you show partial success. *Hint for all problems: Draw a picture 1st!*

I. From Agresti & Finlay (p101 in 4th edition, p96 in 5th), do problems 4.18 and 4.20

II. Answer the following five problems, which use hypothetical data:

(1) A survey is taken of the 10 students in an electrical engineering class regarding their use of email. One variable in the survey measures the number of messages sent per day, and the values given by the students (the number of messages sent by each student in this population) were 6, 7, 7, 8, 8, 8, 8, 9, 9, and 10.
   (a) How would you describe this distribution of email activity?
   (b) What is the mean and standard deviation of the population values?
   (c) Compute a z-score for each case (the number of standard deviations each case's value is from the mean.)
   (d) What specific type of distribution is this distribution of z-scores?
   (e) What is the mean and standard deviation of these z scores?

(2) For a normal distribution, find the probability that a measurement is:
   (a) more than two standard deviations above the mean
   (b) more than two standard deviations below the mean
   (c) more than 1.67 standard deviations above the mean
   (d) more than 0.85 standard deviations below the mean
   (e) less than 1.33 standard deviations below the mean

(3) Find the z-value for which the probability that a normal variable exceeds M + z(s) equals:
   (a) .05000 (b) 0.3300 (c) 0.0980 (d) 0.3015

(4) At Wilson High School, SAT verbal scores have approximately a normal distribution with a mean of 500 and a standard deviation of 100.
   (a) What proportion of the students has SAT verbal scores that are at least 600?
   (b) What proportion of the students has SAT verbal scores that are at least 400?
   (c) Find an SAT verbal score such that only 10 percent of the students have scores above that value.

(5) Forbin County Jail has a mean monthly inmate population of 20,000 with a standard deviation of 500. If the inmate population (considered on a monthly basis) is normally distributed…
   (a) What is the probability of there being between 19,000 and 21,000 inmates in a given month?
   (b) What is the probability of there being fewer than 16,000 inmates?
   (c) What percentile is associated with there being 12,345 inmates?

III. Bonus:

(6) The jazz band Cheesesteak Cardigan performed five shows last week. The show in Atlanta was all of original material by the band, the show in Charlotte included two cover versions of songs by other bands, the show in Richmond included four "covers", the show in New York included six covers, and the show in Detroit included eight covers. Considering these five shows as a population:
   (a) Identify every possible sample of two shows that can be drawn from the population.
   (b) Compute a population mean, a mean for each sample, and a mean of the sample means.
   (c) Construct a frequency distribution of the sample means. What specific type of distribution is this?
   (d) Treating these shows as a sample rather than a population, compute a standard error for the sample mean.