Math 121 **Test #2** **Fall 2011**

1. (12 pts) A forester selects a sample of 20 trees in a tract of land. He selects only trees whose diameters are between 6 and 24 inches. He measures their diameters, thereby obtaining the following sample.

23.9	8.7	13.1	20.9	7.0	9.6	17.0	8.8	9.8	18.1
6.0	12.2	19.2	16.3	8.9	11.5	21.1	9.7	12.1	17.0

   (a) (8 pts) Draw a histogram of the data.

   (b) (4 pts) Describe the shape of the distribution, using appropriate terminology.

2. (30 pts) Prof. Jones teaches one section of statistics and Prof. Smith teaches another section of the same course. They each gave a test and obtained the following test scores.

Prof. Smith	50	60	64	72	76	77	80	84	86	88
Prof. Jones	65	70	76	78	80	84	87	90	95	100

   (a) (5 pts) Find the mean and median of Prof. Smith's test scores.

   (b) (5 pts) Find the sample variance and sample standard deviation of Prof. Smith's test scores.

   (c) (5 pts) Find a five-number summary for Prof. Smith's class.

   (d) (6 pts) Draw a box plot of Prof. Smith's test scores.

   (e) (3 pts) Describe the shape of the distribution of Prof. Smith's test scores, using appropriate terminology.

   (f) (3 pts) Find the z-score of 77 in Prof. Smith's class.

   (g) (3 pts) Find the z-score of 78 in Prof. Jones's class.

3. (16 pts) For the standard normal distribution, find each of the following.

   (a) (4 pts) The area to the left of $z = 1.34$.

   (b) (4 pts) The area to the right of $z = 0.63$.

   (c) (4 pts) The area between $z = -1.282$ and $z = 1.282$.

   (d) (4 pts) The 60^{th} percentile.

4. (16 pts) Theoretically SAT math scores have a normal distribution with mean 500 and standard deviation 100. Assume that this is the case.

   (a) (6 pts) What is the probability that a single SAT math score selected at random is greater than 600?

   (b) (4 pts) What is the probability that a single SAT math score selected at random is between 650 and 680?

   (c) (6 pts) A school is offering a scholarship to any applicant who scores in the top 10% on the SAT math test. What is the cutoff score for the scholarship?

5. (16 pts) A recent study[1] reports that there may be a link between high doses of vitamin E and prostate cancer in men. The study gave a group of men high doses of vitamin E. The sample size in the study was very large, but for this problem we will assume that $n = 2000$. After 10 years, 7.6% of the treatment group had developed prostate cancer (152 out of 2000 men). The rate of prostate cancer in the general population for men in the same age group is only 6.5%.

   Let p be the prostate-cancer rate for men who take high doses of vitamin E. The hypotheses are

$$\begin{aligned} H_0: &\quad p = 0.065 \\ H_1: &\quad p > 0.065 \end{aligned}$$

   (a) (8 pts) Use the Central Limit Theorem for Proportions to describe the distribution of $\hat{p}$ under the assumption that H_0 is true.

   (b) (5 pts) Using the distribution in part (a), find the p-value of $\hat{p} = 0.076$.

   (c) (3 pts) At the 5% level of significance, are the results of the study significant? Explain.

6. (10 pts) According to pollster Scott Rasmussen, 20% of the population strongly approves of President Obama's performance[2]. Suppose we take a sample of 2 individuals and let $\hat{p}$ be the proportion of that sample who strong approve of President Obama's performance. Find the sampling distribution of $\hat{p}$. (Hint: Use a tree diagram.)

[1] http://www.reuters.com/article/2011/10/11/us-prostate-cancer-idUSTRE79A6VE20111011

[2] http://www.rasmussenreports.com/public_content/politics/obama_administration/daily_presidential_tracking_poll