Math 121 **Test #3** **Spring 2005**

1. (12 pts) Suppose that the weekly sales receipts of a drug store follow a normal distribution with mean \$50,000 and standard deviation \$12,000.

   (a) If a single week is chosen at random, what is the probability that the receipts for that week exceed \$56,000?

   (b) If a random sample of 16 weeks is chosen, what is the probability that the average receipts for those 16 weeks exceeds \$56,000?

2. (12 pts) The non-profit group Action on Smoking and Health reports that 28% of men in Great Britain smoked in the year 2003. A researcher would like to know whether that figure dropped in 2004, so he conducts a survey of 500 British men selected at random. He finds that 130 of them smoked in 2004.

   (a) State the appropriate null and alternative hypotheses.

   (b) Compute the value of the appropriate test statistic.

   (c) Compute the p-value.

   (d) At the 5% level, are the results statistically significant?

   (e) State the conclusion about the smoking rate of men in Great Britain in 2004.

3. (12 pts) According to a 1998 study, 60% of UPS employees were employed part-time in 1996. (This rate seems to go up when the economy goes down, and vice versa.) Suppose we wish to estimate the proportion of part-time UPS employees today. We take a random sample of 100 UPS employees and find that 55 of them are part-time.

   (a) Use this sample to find a 95% confidence interval for the proportion of UPS employees who are part-time.

   (b) What is the margin of error in your confidence interval?

4. (15 pts) The Bureau of Labor Statistics reports that in January 2005 the average hourly earnings were \$15.90. A researcher would like to see if that average is higher in April 2005. Assume that the population of all hourly earnings is normal.

   (a) State appropriate null and alternative hypotheses.

   (b) Suppose that a sample of 16 workers reveals an average hourly earnings of $\overline{x} = \$16.25$ with a standard deviation of $s = \$2.20$. Which is the appropriate sampling distribution of

   $$\frac{\overline{x} - \mu_0}{s/\sqrt{n}},$$

   the standard normal distribution or the t distribution?

(c) Compute the value of the appropriate test statistic.

(d) Find the p-value.

(e) State the appropriate conclusion about the average hourly earnings in April.

5. (8 pts) Researchers conduction a medical study select at random a group of 60 men who have suffered at least one heart attack in the past 5 years. The researchers divide the group randomly into two samples of 30 men each. The men in the first sample receive drug A while the men in the second sample receive drug B. Over the course of the next 5 years, the researchers observe the number of heart attacks suffered by each subject. Are these two samples paired samples or independent samples? Explain.

6. (15 pts) Suppose that SAT-M scores are normally distributed for both men and women and that the two populations have the same standard deviation. A sample of 20 men and another sample of 10 women produce the following statistics:

	Sample size	Mean	St. dev.
Men	20	556	74.6
Women	10	483	72.4

(a) Does the assumption of equal standard deviations appear to be justified? Explain.

(b) Find a pooled estimate for the standard deviation.

(c) At the 5% level of significance, test the claim that the average SAT-M score of men is higher than the average score of women. Show all steps.

7. (12 pts) Use the data in the previous problem to find a 90% confidence interval to estimate the difference between the average SAT-M scores of men and women.

8. (14 pts) As cited in an earlier problem, the group Action on Smoking and Health reports that in 2003 28% of the men in Great Britain smoked. They also report that 24% of the women in Great Britain smoked in 2003. Suppose that this information is based on a survey of 1000 men and 600 women. Test the hypothesis at the 5% significance level that more men than women smoked in Great Britain in 2003. Show all steps.