

## STAT 31-Section 5 (Fall 2005): Quiz 3

Name: \_\_\_\_\_

Date: Dec 01, 2005

### PRACTICE ONLY - NOT DUE

#### Problem 1.

Patients with a certain type of cancer can choose traditional treatments or a new medication. Patients have a survival rate of 55% after one year using traditional treatments. 75% of patients choose to take a new medicine that can prolong their life. However, the medicine causes severe side-effects such as blindness in 15% of all patients who take it. In addition, 11% of patients who take the medicine will die within one year.

*Hint: To answer the following questions, consider a tree-diagram.*

- (a) (3 pts) What is the probability that a patient who chooses not to take the medication will die within one year?
  
- (b) (4 pts) What is the probability a patient will live with no side-effects given that they take the medication?
  
- (c) (6 pts) What is the overall one-year survival rate with no side effects in patients with this type of cancer?

#### Problem 2.

You are taking an 8 question multiple choice exam with 5 choices for each question. The questions are independent. If you decided to guess on each of the questions in the exam, answer the following: *Hint: If you guess, each of the possible answers is equally likely for a given question.*

- (a) (3 pts) If  $X$  is the number of correct answers on the exam, what type of distribution is it?
  
- (b) (3 pts) Calculate the mean and variance of  $X$ :
  
- (c) (4 pts) What is the probability that you guess and get exactly 5 answers correct on the test?
  
- (d) (5 pts) A similar test has 50 multiple choice questions with 5 possible choices. What is the probability that you guess on each question and get at least 18 questions correct (for a score of 36%)?

**Problem 3.** You are interested in fuel consumption rate of a new model of car.

The car company claims that the true mean fuel consumption rate is 44 miles per gallon. A sample of 30 cars are tested and a mean fuel consumption rate of 43.2 mpg is observed. The standard deviation of the original population is  $\sigma = 2.2$ .

- (a) (4 pts) Calculate a 95% confidence interval for the true mean fuel consumption rate.
- (b) (3 pts) Explain what a confidence interval means, so that your friend who may buy the car understands your results.
- (c) (4 pts) Dateline is doing an expose and is very interested in your analysis. They ask you to calculate a 99% confidence interval with a margin of error no larger than .5 mpg. How many cars must you observe in order to do so?
- (d) (2 pts) The Central Limit Theorem plays a role in the calculation of the confidence interval.

**TRUE**

**FALSE**

**Problem 4.**

Consider the fuel consumption problem above.

- (a) (3 pts) You believe that the car company's claimed mean fuel consumption rate is too high. Set up the null and alternative hypothesis for a test of significance for the manufacturer's claim.
- (b) (2 pts) Find the test statistic need to conduct a test of significance for the manufacturer's claim.
- (c) (4 pts) Carry out the significance test, stating your conclusion and corresponding level of significance.