

December 18, 2002 NJIT

<b>Name:</b> _____	<b>SS#</b> _____	<b>Section #</b> _____
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→ **Must show all work to receive full credit.**

*I pledge my honor that I have abided by the Honor System.* \_\_\_\_\_  
 (Signature)

Scores	
#1	
#2	
#3	
#4	
#5	
#6	
#7	
#8	
#9	
Total	

1. (12 points) The reaction time of a driver to visual stimulus is normally distributed with a mean of 0.4 seconds and a standard deviation of 0.05 seconds.

(a) What is the probability that a reaction requires more than 0.5 seconds?

(b) What is the value of the reaction time  $t'$  such that the probability of the reaction time exceeding  $t'$  is 90%?

2. (a) and (b) (10 points) PVC pipe's diameter is normally distributed random variable with a mean of 1.01 inch and a standard deviation of 0.003 inch.

(a) Find the probability that a random sample of  $n = 9$  sections of pipe will have a sample mean diameter greater than 1.009 inch and less than 1.012 inch.

2(b) What would be the answer to part 2(a) if the sample size was  $n = 16$  sections of pipe?

3. (12 points) A melting point test of  $n = 10$  samples of a binder used in manufacturing a rocket propellant resulted in a sample mean of  $154.5^{\circ}\text{F}$ . Assume that melting point is normally distributed with  $\sigma = 1.5^{\circ}\text{F}$ .

(a) Test  $H_0: \mu = 155$  versus  $H_1: \mu \neq 155$  using  $\alpha = 0.01$ .

(b) What is the P-value for this test?

(c) Find a 95% confidence interval for  $\mu$ .

4. (12 points) The inspection division of the County Weights and Measures Department is interested in estimating the actual amount of soft drink that is placed in 2-liter bottles at the local bottling plant of a large nationally known soft drink company. From previous studies, it is known that the standard deviation for the 2-liter bottling process is .05 liter. A random sample of 400 2-liter bottles obtained from a month's production of this bottling plant indicated a sample mean of 1.99 liters. Is there evidence at the 10% significance level that the average bottle content is less than 2 liters?

5. (12 points) The Mathematics Department collected data on the scores of Quiz # 9 from one of the Math 333 classes.

(a) Assuming that data are normally distributed, construct a 95% confidence interval of the mean score. The data are given below:

60 49 54 58 47  
51 50 44 61 67  
60 72 67 67 70  
46 62 60 55 61  
68 47 68 61 76

$$\sum_{i=1}^{25} x_i = 1,481 \text{ and}$$

$$\sum_{i=1}^{25} x_i^2 = 89,659.$$

(b) From previous years, the Mathematics Department knows that the average score for this quiz is 60. Test the hypothesis at the 0.01 significance level that the mean score equals 60 against the alternative hypothesis that the mean score exceeds 60?

6. (10 points) It was reported in the 1990 National Health Interview Survey that 28.4 percent of all men in the United States smoked cigarettes. A later study conducted to determine the smoking habits of physicians was reported in the American Journal of Public Health. From a random sample of 337 male physicians, 34 reported that they are current smokers. Test the hypothesis at the 0.01 level that the percent of all male physicians who are smokers is less than 28.4

7. (12 points) The time between calls to a plumbing supply business is an exponentially distributed random variable with a mean equal to 15 minutes.

(a) What is the probability that there are no calls within a 30-minute interval?

(b) What is the probability that at least one call arrives within a 10-minute interval?

(c) Determine the length of an interval of time such that the probability of at least one call in the interval is 0.90.

8. (10 points) Suppose 2% of cotton fabric rolls and 3% of nylon fabric rolls contain flaws. Of the rolls used by a manufacturer, 70% are cotton and 30% are nylon.

(a) What is the probability that a randomly selected roll used by the manufacturer contains flaws?

(b) If a randomly selected roll contains flaws, what is the probability that the roll is cotton?

9. (10 points) Suppose that the number of customers that enter a bank in an hour is a Poisson random variable, and suppose that  $P(X = 0) = 0.05$ . Determine the mean and variance of  $X$ .