

NAME: \_\_\_\_\_

**Math 124 FALL 2004: Section 6 TTh 8:10-9:25 AM**

**Midterm 2**

**Date: Apr 28, 2005**

**Instructions:** Answer questions 1-4. There is a bonus question, but you can get a perfect score without attempting it. Show as much work as you feel reasonable. You have 75 minutes. To allow others to fully concentrate at the end please do not leave in the last 5 minutes. You should submit your page of notes with your test paper.

**Question 1. (25 points)**

Define each of the following and explain why or how it is used (in the context of an experiment)

(a.) *Randomization*

(b.) *Confounding*

(c.) *Block and Block Design*

(d.) *Single-blind* and *Double-blind*

(e.) *Replication*

**Question 2.** (*25 points*)

An factory manager is interested in the bond strength of a new adhesive product which is being considered for routine use on a production line. The adhesive is used to join together two plastic parts, of which there are unlimited supplies. The adhesive supplier has provided 27 equal sized samples of the adhesive. In the factory the machine which performs the gluing has three different temperature settings (280F, 300F and 320F) and three different pressure settings(100, 150 and 200 psi). A machine which measures the breaking strength is available for use.

(a.) Identify the factors, their levels, the treatments and a response variable for this experiment.

(b.) Describe and outline an appropriate design for this experiment.

**Question 3.** (*25 points*)

The life time of a particular brand of automobile tire is known to be normally distributed with mean 35000 miles and standard deviation 5250 miles. Suppose the manufacturer offers a warranty that guarantees free replacement if a tire does not last at least 20000 miles.

(a.) What is the probability that a tire lasts between 27500 and 40000 miles?

(b.) What is the probability that a tire will not need warranty replacement?

(c.) Above how many miles will the top 1% of tires of this brand last?

**Question 4.** (*25 points*)

The number of flaws per square meter of carpet material varies with mean 1.8 and standard deviation 1.0 flaws per square meter. An inspector studies 150 square meters of carpeting, selected at random from a particular run of carpet, records the number of flaws per square meter and then calculates  $\bar{x}$  which is the sample mean number of flaws found per square meter of carpet. Suppose that if the mean number of flaws per square meter is above 2 then the run of carpet will have be sold at a discounted price.

(a.) What is the standard deviation of the sample mean?

(b.) What is the distribution of the sample mean?

(c.) Calculate the probability that a run of carpet will have to be discounted.

**Non-compulsory bonus question.** (*up to 10 points*)

Discuss the differences between association and causation. Be sure to indicate which types of studies would lead you to which sort of conclusions and any potential problems that arise.