NAME: _____

Math 124 FALL 2004: Section 12 MWF 11-12
Midterm 2   Date: Nov 5, 2004

Instructions: Answer questions 1-4. Show all work where reasonable to do so. You have 50 minutes. To allow others to fully concentrate at the end please do not leave in the last 10 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.) *Placebo*

(c.) *Matched pairs*

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

(e.) *Replication*

Question 2. (*25 points*)

Few people want to eat discolored french fries. Potatoes are kept refrigerated before being cut to make fries to prevent spoiling. However, immediate processing of cold potatoes causes discoloration due to a complex chemical reaction. The potatoes must therefore be brought to room temperature before processing. Potatoes may be either fresh picked, stored for a month at room temperature or stored for a month in a refrigerator. They will either be sliced and cooked immediately or after waiting for an hour.

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

(b.) Describe and outline the design of this experiment (you may assume that you have 24 large potatoes).

Question 3. (*25 points*)

Suppose that for a particular type of flower, genetic theory says that 3/4 will have long petals and the remaining 1/4 short petals. Assume that the petal lengths are independent between flowers.

(a). What is the probability that 6 out of a set of 9 flowers have long petals?

(b). Suppose instead that there are 100 flowers. What is the mean number of long petal flowers? What is the standard deviation?

(c). What is the probability of 70 or more of these 100 flowers having long petals?

Question 4. (*25 points*)

For a study of possible iron deficiency in infants, researchers compared several groups of infants who were following different feeding patterns. One group of 26 infants was being breast-fed. At 6 months of age, these children had a mean hemoglobin level of $\bar{x} = 12.9$ grams per 100 milliliters of blood. Assume that the standard deviation is 1.6 grams per 100 milliliters.

(a). Give the 95% confidence interval for the mean hemoglobin level of breast-fed infants.

(b). Interpret the confidence interval by explaining what it tells you. Is the true mean in your interval?

(c). What would you expect to see happen to the confidence interval if you increased the sample size (suppose you kept the confidence level the same)?

(d). What assumptions are you making when producing the confidence interval?

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

Carefully explain the relationship between confidence intervals and hypothesis testing (you may do this in the context of confidence intervals and hypothesis tests for μ).