

NAME: _____

SOLUTIONS

Math 124 FALL 2004: Section 11 MWF 2-3
Final Exam

Date: Dec 13, 2004

Instructions: Answer questions 1-8. Show all work where reasonable to do so. You have 2 hours 30 minutes. To allow others to fully concentrate at the end please do not leave in the last 10 minutes. You should submit your pages 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

5pts
- this refers to a procedure for assigning subjects/units/individuals to treatments in a non systematic way. We could use a computer to generate random numbers or toss coins to figure out how to do the assigning. It is used to avoid bias.

(b.) Placebo

5pts
- a treatment known to be ineffective. In medical experiments this is often a dummy pill (eg sugar pill). It is used to avoid the "placebo effect" which is where patients who receive a treatment get better even when the treatment is ineffective. It is used to avoid bias.

(c.) Matched pairs

5pts
- This is a particular type of experiment where pairs of individuals are matched together as closely as possible on the basis of other variables (eg gender, age, medical history etc). Within each pair one gets one treatment and the other gets one treatment (only two treatments) It is done to reduce variability.

(d.) Single-blind and Double-blind

5 pts

- Single blind means that the recipient (ie patient) does not know whether they receive the drug or a placebo
- Double blind means neither the experimenter (eg physician) or the patient know whether they received the treatment or placebo. For avoiding bias

(e.) Replication

5 pts

- repeating an experiment at the same factor level many times. It is done to reduce chance variation.

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.

Factors: Storage Method, Processing Time

Levels

fresh | 1 mo room temp | 1 mo refrigerator | immediately | after 1 hour

treatments: fresh-immediate
fresh-1 hour
room temp - immediate
room temp - 1 hour
refrigerator - immediate
refrigerator - 1 hour

response - coloration of fries.

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

Randomly assign the 24 potatoes into 6 groups

13pts

		Storage Method		
		Fresh	Room temp	Refridgerator
processing Time	Immediate	4 potatoes	4 potatoes	4 potatoes
	1 hour	4 potatoes	4 potatoes	4 potatoes

Prepare fries then measure discoloration (or perhaps test them on eager samplers!)

Question 3. (25 points)

Suppose that you have the following data

x	12.8	12.9	12.9	13.6	14.5	14.6	15.1	17.5	19.5	20.8
y	5.5	6.2	6.3	7.0	7.8	8.3	7.1	10.0	10.8	11.0

where each x and y are a pair of measurements taken on the same individual. Note that $\sum_{i=1}^n y_i = 80$, $\sum_{i=1}^n y_i^2 = 675.16$ and $\sum_{i=1}^n x_i y_i = 1282.74$.

(a) Compute $\sum_{i=1}^n x_i$, $\sum_{i=1}^n x_i^2$, \bar{x} and \bar{y} .

$$\sum x_i = 154.2 \quad \sum x_i^2 = 2452.18$$

7pts

$$\bar{x} = \frac{154.2}{10} = 15.42 \quad \bar{y} = \frac{80}{10} = 8$$

(b) Compute the standard deviations s_x and s_y .

$$s_x = \sqrt{\frac{2458.18 - 10(15.42)^2}{10-1}} = \sqrt{2.2684} = 2.8755 \text{ (4dp)}$$

$$s_y = \sqrt{\frac{675.16 - 10(8)^2}{10-1}} = \sqrt{3.9067} = 1.9765 \text{ (4dp)}$$

(c) Compute the correlation between x and y .

$$r = \frac{1}{9} \frac{1}{2.8755} \frac{1}{1.9765} (1282.74 - 10(8)(15.42))$$
$$= .9607 \text{ (4dp)}$$

(d) Interpret your correlation. What does it say about the relationship between x and y .

$r = .9607$ is positive and near 1 so we would say that there is a strong positive linear relationship between x and y

Question 4. (25 points)

A machine produces nails in a factory. Acceptable nails have a mean length 1.25in. A quality inspector working for the factory takes a random sample of 50 nails from all the nails produced each hour and decides whether or not the machine is producing acceptable nails. If the machine is

For solutions to Q4 - Q8 SEE OTHER VERSION OF THE EXAM