STATISTICS FOR MANAGEMENT (IDS 570)

HOMEWORK 10
DUE DATE: FRIDAY, NOVEMBER 28 AT 11:59 PM

Problem 1. Can People Delay Death? A new study indicates that elderly people are able to postpone death for a short time to reach an important occasion. The researchers studied deaths from natural causes among 1200 elderly people of Chinese descent in California during six months before and after the Harbor Moon Festival. Thirty-three deaths occurred in the week before the Chinese festival, compared with an estimated 50.82 deaths expected in that period. In the week following the festival, 70 deaths occurred, compared with an estimated 52. "The numbers are so significant that is would be unlikely to occur by chance," said one of the researchers.

(a) [3 pts] Given the information in the problem, is the χ^2 statistic likely to be relatively large or relatively small?

(b) [3 pts] Is the p-value likely to be relatively large or relatively small?

(c) [3 pts] In the week before the festival, which is higher: the observed count or the expected count? What does this tell us about the ability of elderly people to delay death?

(d) [3 pts] What is the contribution to the χ^2-statistic for the week before the festival?

(e) [4 pts] In the week after the festival, which is higher: the observed count or the expected count? What does this tell us about the ability of elder people to delay death?

(f) [4 pts] What is the contribution to the χ^2-statistic for the week after the festival? Chinese descent, the same effect was not seen. Why did the researchers also include a control group?

Problem 2. Students were given different drug treatments before revising for their exams. Some were given a memory drug, some a placebo drug and some no treatment. The exam scores (%) are shown below for the three different groups:

	Memory Drug	Placebo	No Treatment
	70	37	3
	77	43	10
	83	50	17
	90	57	23
	97	63	30
Mean	83.40	50.00	16.60
Variance	112.30	109.00	112.30
Total mean		50.00	
Total variance		892.14	

(a) [5 pts] What is MSG and MSE? (give the formula too)

(b) [5 pts] What is the ration F? (give the formula too)

(c) [5 pts] Carry Out a one-way ANOVA to test the hypothesis that the treatments will have different effects.

(d) [5 pts] What is your decision?

Problem 3. Sandwich Ants and Bread. An experiment studies how different sandwich fillings might affect the mean number of ants attracted to pieces of a sandwich. The students running this experiment varied the type of break for the sandwiches, randomizing between four types: Multigrain, Rye, Wholemeal, and White. The ant counts in 6 trials and summary statistics for each type of break and the 24 trials as a whole are given in the table below.

Bread	Ants						Mean	Std. Dev.
Multigrain	42	22	36	38	19	59	36.00	14.52
Rye	18	43	44	31	36	54	37.67	12.40
Wholemeal	29	59	34	21	47	65	35.83	13.86
White	42	25	49	25	21	53	42.50	17.41
						Total	38.00	13.95

(a) [10 pts] Show how to use the summary information to compute the three sums of squares needed for using ANOVA to test for a difference in mean number of ants among these four types of bread.

(b) [10 pts] Use the sums of squares from part (a) to construct the ANOVA table and complete the details for this test. Be sure to give a conclusion in the context of this data situation.

Problem 4. Metal Tags on Penguins. We perform a test for the difference in the proportion of penguins who survive over a 10-year period, between penguins tagged with metal tags and those tagged with electronic tags. We are interested in testing whether the type of tag has an effect on penguin survival rate using a chi-square test. In the study, 33 of the 167 metal-tagged penguins survived while 68 of the 189 electronic-tagged penguins survived. The two-way table of penguin survival vs type tag is shown below

	Metal	Electronic	Total
Survived	33	68	101
Died	134	121	255
Total	167	189	356

(a) [5 pts] State the null and alternative hypotheses.

(b) [5 pts] Give a table with the expected counts for each of the four categories.

(c) [5 pts] Calculate the chi-square test statistic.

(d) [5 pts] Determine the p-value and state the conclusion.

Problem 5. Suppose the National Transportation Safety Board (NTSB) wants to examine the safety of compact cars, midsize cars, and full-size cars. It collects a sample of three for each of the treatments (cars types). Using the hypothetical data provided below, test whether the mean pressure applied to the drivers head during a crash test is equal for each types of car. Use $\alpha = 5\%$.

	Compact cars	Midsize cars	Full-size cars
	643	469	484
	655	427	456
	702	525	402
$\bar{x}$	666.67	473.67	447.33
s	31.18	49.17	41.68

(a) [5 pts] State the null and alternative hypotheses.

(b) [5 pts] Calculate the appropriate test statistic.

(c) [5 pts] Obtain the Critical Value .

(d) [5 pts] What is your decision and how do interepret it.