Final Exam Practice Problems- Math 263-009 - Fall 13 -Kennedy

1. An effort is currently under way to cap (or limit) awards given by the courts to patients who successfully sue doctors for malpractice. If the cap were established, and if the cap affected only a few very large awards, check all true statements:

   _ _ _ _ _ The median award would be reduced

   _ _ _ _ _ The mean award would be reduced

   _ _ _ _ _ The IQR (inter-quartile range) of the awards would be reduced

   _ _ _ _ _ The standard deviation of the awards would be reduced.

   _ _ _ _ _ The range of the awards would be reduced.

2. Malaria infection rates may be affected by changing climates. To test this, data was collected from four cities in west Africa: in each city, the total daily precipitation (in mm) was measured, and the percent of the citys population who tested positive for malaria was measured.

rainfall (mm)	2.1	3.2	4.8	7.8
percentage	4.5	4.2	3.8	3.0

   (a) Name the explanatory variable and give its units.

   (b) Name the response variable and give its units.

   (c) Find the regression line and the value of the correlation coefficient r.

   (d) Give the units of the y-intercept, and then interpret the value of the y-intercept in the context of this problem.

   (e) Give the units of the slope, and then interpret the value of the slope in the context of this problem.

   (f) What can you conclude from the value of r?

3. A group of doctors has a new drug that is supposed to reduce the incidence of heart attacks. They give the drug to patients who have a family history of heart attacks. After a year they look at how many

patients who got the drug had a heart attack and how many who did not get the drug had a heart attack.

(a) What is wrong with this experimental design?

(b) How would you change the experimental design to fix this problem?

4. In a certain large city, 72% of the people own a cell phone, 38% have a land line, and 29% have both a cell phone and a land line.

   (a) What proportion of people in the city own neither a cell phone nor a land line?

   (b) If we choose a person who owns a cell phone at random, what is the probability that this person also has a land line?

   (c) If we choose a person who has a land line at random, what is the probability that this person also owns a cell phone?

   (d) Are having a land line and owning a cell phone independent events? Explain why or why not.

5. The probability distribution of a random variable X is given in the table.

value	8	12	15	20
probability	0.2	0.1	0.4	0.3

   (a) Compute the mean and variance of X.

   (b) Find the probability that X is greater than 14.

   (c) Find the probability that X is greater than 14 given that X is even.

6. Male diastolic blood pressure (in mmHg) is normally distributed, with mean 72 and standard deviation 6.

   (a) A large group of men each measures their diastolic blood pressure. What percent of them will find a blood pressure above 80?

(b) A random sample of 3 men each measures their diastolic blood pressure. They then take the average of these 3 measurements. What is the probability that they will find an average blood pressure above 80?

(c) A certain drug is aimed at men who have blood pressure higher than 99% of all men. What blood pressure measurement will these men have?

7. A newspaper surveys the inhabitants of a city to ask whether they are satisfied with the number of hospitals in the city.

   (a) The newspaper reports that $30\% \pm 4\%$ are satisfied, with 95% confidence. Assuming that the newspaper did its statistics correctly, how many people did the newspaper survey?

   (b) The newspaper editor is unsatisfied with the $\pm 4\%$ and the 95% confidence. In order to reduce the 4% to 1% and increase the 95% to 99%, how many people must the newspaper survey?

8. An ANOVA test (or F-test) is performed to compare IQ scores in Arizona, New Mexico, Texas, and Nevada.

   (a) State the null hypothesis and the alternate hypothesis. Define any parameters you use.

   (b) A computer performs the F-test and finds a p-value of 0.98. What conclusion can you make about IQ scores in Arizona, New Mexico, Texas, and Nevada?

   In the next four problems you should

   - State the null hypothesis and the alternate hypothesis.
   - Calculate the statistic.
   - Find the P-value.
   - State your conclusion about the null hypothesis.
   - State your conclusion in terms of the original question.

9. On March 15, 2005, a court in Oakland, California, was told that for 25 years a judge had attempted to exclude Jews from juries in death row cases because they would not vote for the death penalty. Court

records show that during this time, 29 people who were Jewish or had Jewish- sounding names had been called to serve on a jury for a death row case. Of these, 27 were excluded. Is there evidence that Jews were excluded more often than the rest of the population, whose exclusion rate is 49.97%? Use a significance level of $\alpha = 5\%$.

10. A 1999 study surveyed 1500 college students (600 male, 900 female) nationwide about their drinking. Among other questions, students were asked whether they had drank alcohol in the past month. 438 men reported having had an alcoholic drink in the past month, while 603 women reported having had an alcoholic drink in the past month. Decide whether college students of one gender were more likely to drink than the other gender. Use a significance level of $\alpha = 2\%$.

11. Six students were chosen at random to test two new shoe types. Each student wore one type of shoe and ran a 100 meter sprint; the next day, each student wore the other type of shoe and ran a 100 meter sprint. Their times (in seconds) are listed below:

	Student 1	Student 2	Student 3	Student 4	Student 5	Student 6
Shoe A	15.5	18.3	14.5	11.3	12.0	13.7
Shoe B	15.5	19.9	13.5	11.7	12.8	14.9

Decide whether students run significantly faster in one type of shoe than the other. Use a significance level of $\alpha = 2\%$.

12. A researcher studied the relationship between coffee drinking and heart attacks in young women. The table below summarizes the results.

	No attack	attack
light drinker	172	88
moderate drinker	132	70
heavy drinker	45	40

(a) Find the probability that a randomly selected light coffee drinker has a heart attack.

(b) Are the amount of coffee drunk and heart attacks related? Use a significance level of $\alpha = 5\%$.

13. The nation-wide average salary of a full professor is \$84,173 with standard deviation \$22,063. The mean salary for 15 randomly chose full professors at the U of A was \$79,143. Assuming the standard deviation for the U of A population is the same as the national population, find a 85% confidence interval for the mean salary of a full professor at the U of A.

14. Here is a list of the statistics we have seen:

(a)
$$z = \frac{\overline{x} - \mu_0}{\sigma/\sqrt{n}}$$

(b)
$$z = \frac{\overline{x}_1 - \overline{x}_2}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$$

(c)
$$t = \frac{\overline{x} - \mu_0}{s/\sqrt{n}}$$

(d)
$$t = \frac{\overline{x}_1 - \overline{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

(e)
$$z = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}}$$

(f)
$$z = \frac{\hat{p}_1 - \hat{p}_2}{\sqrt{\hat{p}(1-\hat{p})(\frac{1}{n_1} + \frac{1}{n_2})}}$$

(g) χ^2 (chi-squared)

(h) ANOVA (or F)

For each of the following situations, choose an appropriate statistic for the hypothesis test. Some of them may have two correct answers; in this case, you should give both correct answers.

(a) Decide which of two tuberculosis drugs is more likely to work. (Each drug either cures a person or fails to cure a person.)

(b) Decide which of two tuberculosis drugs works more quickly.

(c) Decide whether the gender of a job applicant affects whether the applicant is offered a job.

(d) Decide whether the ethnicity of a job applicant affects whether the applicant is offered a job.

(e) Decide whether the gender of a job applicant affects the applicants starting salary.

(f) Decide whether the ethnicity of a job applicant affects the applicants starting salary.

(g) Decide which of two candidates for a school election is likely to win.

(h) Decide whether a certain city's average annual income is above the national average.