Practice Problems for Final

(1) Labor times for golden retrievers are uniformly distributed between 30 minutes and 200 minutes.

(a) If a dog is about to go into labor, how long would you expect her to be in labor?

(b) If the dog has already been in labor for 60 minutes, what's the probability that she'll be in labor for more than 100 minutes total?

(2). A researcher is interested in the mean height of all UCSB students. The heights of a sample of 45 randomly selected UCSB students are recorded and the sample mean is calculated. Suppose that the average height of 45 UCSB students is 66.3 inches. Assume that $\sigma = 3.12$

(a) Develop a 95% confidence interval for the parameter of interest. Interpret the confidence interval.

(b) What is the margin of error if 99% confidence is desired?

(3) In a random sample of 400 Berkeley residents taken by a polling organization, only 30% expressed support for the mayor. Find a 95% confidence interval for the corresponding percentage in the whole population of Berkeley.

(4) In the preceding five years, entering students at a certain university had an average SAT verbal score of 612 points. A random sample of 100 students is taken from this year's entering class. The average SAT verbal score for these students is 594 points with an SD of 80 points. Does this show a decline in entering student's verbal abilities?

(5) A psychology grad student wants to know if the men and women at UCSB sleep enough every night. Studies say that college students need to sleep at least 7.5 hours every night. She talks to 34 men and 37 women at UCSB and found out that 18 men and 23 women get at least 7.5 hours of sleep each night. At 5% level of significance, construct a hypothesis test to determine if there is a significant difference between the proportions of UCSB men and women that sleep at least 7.5 hours each night.

(6) A survey of 47 hotels in Las Vegas conducted by AAA resulted in an average room price of $172.64 per night with a standard deviation of $28.62. Suppose now that I tell you that the true standard deviation for *all* hotels in Las Vegas is $34.15. How many hotels would you need to sample in order to be 97% confident that the you're within $20 of the true average price of a hotel room?

(7) At State University, the average score of first-year students on the verbal part of the SAT is 565, with standard deviation of 75. Find the 60th percentile of the verbal SAT scores, assuming that the scores follow the normal curve. Show your calculations.

(8) A large oil company conducted a sample survey to determine whether people's attitudes towards the company's corporate image tended to be favorable or unfavorable. The sample results indicated that for the survey with the following results:
Unfavorable opinions: 3465
Favorable opinions: 2502
No opinion: 821
(a) Do the sample data support the hypothesis that more than 50% of the general public holds unfavorable opinions about the company? Test at 5% level.
(b) Construct a 90% confidence interval for the proportion of individuals with no opinion.

(9) A pain reliever currently being used in a hospital is known to bring relief to patients in a mean time of 3.5 minutes. To compare a new pain reliever with the one currently being used, the new drug is administered to a random sample of 50 patients. The mean time to relief is 2.8 minutes, and the standard deviation is 1.1 minutes. Do the data provide sufficient evidence to conclude that the new drug is effective in reducing the mean time until a patient receives relief from pain?

(10) In one trial of an experiment, a nickel and a dime, both fair coins, are flipped together. On each of 100 such trials, you win $1 if and only if both coins come up heads; otherwise you receive nothing.
(a) What is the chance you win on the first trial?
(b) What is the expected total amount you would win on the 100 trials?
(c) What chance do you have to win at least $10?

(11) A courier service advertises that its average delivery time is less than 6 hours for local deliveries. A random sample of the amount of time this courier takes to deliver packages to an address across town produced the following times (rounded to the nearest hour): 7, 3, 4, 6, 10, 5, 6, 4, 3, 8. Is this sufficient evidence to support the courier's advertisement?

(12) Given are five observations for two variables, x and y.

x_i	1	2	3	4	5
y_i	3	7	5	11	14

a. Develop a scatter diagram for these data. What does the scatter diagram developed in part(a)

indicate about the relationship between the two variables?

b. Given the following quantities:

$$\bar{x} = \frac{\Sigma x_i}{n} = \frac{15}{5} = 3 \qquad \bar{y} = \frac{\Sigma y_i}{n} = \frac{40}{5} = 8$$

$$\Sigma(x_i - \bar{x})(y_i - \bar{y}) = 26$$

$$\Sigma(x_i - \bar{x})^2 = 10$$

$$\Sigma(y_i - \bar{y})^2 = 80$$

Develop the estimated regression equation by computing the values of b_0 and b_1.

c. Use the estimated regression equation to predict the value of y when x=4.
d. Compute SSE, SST and SSR.
e. Compute the coefficient of determination r^2. Comment on the goodness of fit.
f. Compute the sample correlation coefficient r_{xy}.
g. Compute the mean square error (MSE).
h. Compute the standard error of the estimate S_E.
i. Compute the estimated standard deviation of b_1 (S_{b1}).
j. Use the t test to test the following hypotheses(α=0.05):

$$H_0: \beta_1 = 0$$

$$H_a: \beta_1 \neq 0$$

k. Develop a 95% CI for the expected value of y when x=4
l. Develop a 95% prediction interval for an individual value of y when x=4