

STAT370/Section #12745/Final Exam

Dec. 15, 2011

Student's Name (Please print) \_\_\_\_\_

SSN (Last 4 digits only) \_\_\_\_\_

(Total: 150 points) There are 6 questions in this quiz. Solutions for each question must exhibit a clear, complete line of reasoning in order to receive full credit. Show all your work. An answer by itself is worth 0 points.
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1 (20 (= 7 + 7 + 6) points). Groundwater from 40 wells was classified as low or high in alkalinity and low or high in dissolved iron. There were 20 wells with low alkalinity, 15 that were low in iron, and 8 that were low in both.

(i) Based on these data, complete the following two-way frequency table.

Alkalinity	Iron	
	Low	High
Low		
High		

(ii) Calculate the relative frequencies of the cells and put in the table below.

Alkalinity	Iron	
	Low	High
Low		
High		

(iii) Calculate the relative frequencies separately for each column.

Alkalinity	Iron	
	Low	High
Low		
High		

2 (20(= 4 × 5) points). A population has distribution

Value	Probability
-8	0.2
0	0.3
8	0.5

Let  $X_1$  and  $X_2$  be independent and each have the same distribution as the population. Determine the missing elements in the table for the sampling distribution of  $\bar{X} = \frac{X_1+X_2}{2}$ .

$\bar{x}$	Probability
-8	0.04
-4	
0	
4	
8	

$$\begin{aligned}
 P(\bar{X} = -8) &= P(X_1 = -8, X_2 = -8) = P(X_1 = -8) \times P(X_2 = -8) \\
 &= 0.2 \times 0.2 \\
 &= 0.04
 \end{aligned}$$

$$\begin{aligned}
 P(\bar{X} = -4) &= \\
 &= \\
 &=
 \end{aligned}$$

$$\begin{aligned}
 P(\bar{X} = 0) &= \\
 &= \\
 &=
 \end{aligned}$$

$$\begin{aligned}
 P(\bar{X} = 4) &= \\
 &= \\
 &=
 \end{aligned}$$

$$\begin{aligned}
 P(\bar{X} = 8) &= \\
 &= \\
 &=
 \end{aligned}$$

**3** (30 (=5 × 6) points). Within a 45 days time period, United Airlines flew 150 flights from Chicago to Austin. Of these, 50 arrived late. Treat this as a random sample and conduct a test with the intent of establishing that the population proportion of late flights is greater than 0.25.

(i) Formulate the null and alternative hypotheses.

(ii) Determine the test statistic.

(iii) Give the form of the rejection region, with  $\alpha = 0.10$ .

(iv) What is the conclusion to your test? Take  $\alpha = 0.10$

(v) Calculate a P-value.

4 (30 (=3 × 10) points). Times to finish a sixteen ounce bottle of mayonnaise were recorded by a sample of 17 purchases. It is determined that  $\sum x_i = 612$  days, and  $\sum (x_i - \bar{x})^2 = 256$ . Assume that the population follows a normal distribution with mean  $\mu$  and standard deviation  $\sigma$ .

(i) Obtain a point estimate of  $\mu$ .

(ii) Obtain a 90% confidence interval for  $\mu$ .

(iii) Obtain a 90% confidence interval for  $\sigma$ .

5 (30 (=3 × 10) points). Two gel pens, Gel-1 and Gel-2, are compared on the basis of the number of weeks before they stop writing. Out of 30 persons available, 18 are randomly chosen to receive Gel-1 and the other 12 receive Gel-2. These are the only pens they use for writing.

$$n_1 = 18, \quad \bar{x} = 10, \quad \sum (x_i - \bar{x})^2 = 54$$

$$n_2 = 12, \quad \bar{y} = 15, \quad \sum (x_i - \bar{x})^2 = 58.$$

(i) Obtain  $s_{pooled}^2$  and  $s_{pooled}$

(ii) Test  $H_0 : \mu_1 = \mu_2$  against  $H_1 : \mu_1 < \mu_2$  with  $\alpha = 0.10$ .

(iii) Determine a 90% confidence interval for  $\mu_1 - \mu_2$ .

6 (20 (=2 × 10) points). In a comparative study of two new drugs, A and B, 150 patients were treated with drug A and 120 patients with drug B, and the following results were obtained.

	Drug A	Drug B
Cured	80	65
Not cured	70	55

(i) Do these results demonstrate a significant higher cure rate with drug B than drug A? Test at  $\alpha = 0.10$ .

(ii) Construct a 90% confidence interval for the difference of the cure rates of the two drugs.