

## Chapter 13 Review Sheet

1. **Men versus Women.** The National Assessment of Education Progress (NAEP) Young Adult Literacy Assessment Survey interviewed a random sample of 1917 people 21 to 25 years old. The sample contained 840 men, of whom 775 were fully employed. There were 1077 women, and 680 of them were fully employed.

a) Use a 99% confidence interval to describe the difference between the proportions of young men and young women who are fully employed.

conditions: SRS stated,  $N_m \geq 8400$ ,  $N_w \geq 10770$

Normal:  $840\left(\frac{775}{840}\right) \geq 10$ ,  $840\left(\frac{65}{840}\right) \geq 10$ ,  $1077\left(\frac{680}{1077}\right) \geq 10$ ,  $1077\left(\frac{397}{1077}\right) \geq 10$

calculations: 2 proportion z-interval  
(0.2465, 0.3359)

conclusion: I am 99% confident that the true difference between the proportions of men and women who are fully employed lies within 0.2465 and 0.3359.

b) Is the difference statistically significant at the 1% level?

The difference is statistically significant at the 1% level because zero is not captured in this confidence interval. Therefore there is a significant difference between the true proportions of men and women who are fully employed.

2. An automobile manufacturer tries two distinct assembly procedures. In a sample of 350 cars coming off the line using the first procedure there are 28 with major defects, while a sample of 500 autos from the second line shows 32 with defects. Is the difference significant at the 10% significance level?

$H_0: P_1 = P_2$   $P_1$  = the true proportion of cars in 1<sup>st</sup> procedure with defects.  
 $H_a: P_1 \neq P_2$   $P_2$  = the true proportion of cars in 2<sup>nd</sup> procedure with defects.

SRS assumed,  $N_1 \geq 3500$ ,  $N_2 \geq 5000$

For normal use  $\hat{p}_c = \frac{28+32}{350+500} = .07$

$350(.07) \geq 10$ ,  $350(.93) \geq 10$ ;  $500(.07) \geq 10$ ,  $500(.93) \geq 10$

~~2 sample z~~ 2 proportion z-test,  $\alpha = .05$

$z = .8963$   $p\text{-value} = .37$

Since  $p\text{-value} (.37)$  is greater than  $\alpha (.05)$ , I do not have statistically significant evidence to reject  $H_0$ . therefore I cannot support the claim that the true proportions of cars with defects are different using the different procedures.

KEY

3. Can you define what each of the following represents:

- a.  $p$  population parameter for proportions  
 b.  $\hat{p}_1$  sample proportion for a population  
 c.  $\hat{p}_2$  sample proportion for another population  
 d.  $\hat{p}_c$   $\hat{p}_c = \frac{x_1 + x_2}{n_1 + n_2}$   
 e.  $p$ -value  $p$ -value tells us how likely it is to get the sample we got (or more extreme) by chance if  $H_0$  is true.  
 f.  $p_1$  population proportion for a population  
 g.  $p_2$  population proportion for another population.

4. Researchers at the National Cancer Institute released the results of a study that examined the effect of weed-killing herbicides on house pets. Dogs were examined for the presence of malignant lymphoma. We want to estimate the difference between the proportion of exposed dogs that develop lymphoma and the proportion of unexposed dogs that develop lymphoma.

Group	Sample Size	# with Lymphoma
Exposed	827	473
Unexposed	130	19

Find a 95% confidence interval for the difference between the proportion of exposed dogs that develop lymphoma and the proportion of unexposed dogs. What is your conclusion?

conditions: SRS assume,  $N_E \geq 8270$   $N_u \geq 1300$

normal:  $827 \left( \frac{473}{827} \right) \geq 10$ ,  $827 \left( \frac{354}{827} \right) \geq 10$ ;  $130 \left( \frac{19}{130} \right) \geq 10$ ,  $130 \left( \frac{111}{130} \right) \geq 10$

calculations: 2 proportion z-interval  
 (.35633, .49525)

conclusion: I am 95% confident that the true difference between the proportions of dogs with Lymphoma who were exposed to herbicides and those who were not, lies within .356 and .495.

5. Identify if each of the following represents a "Two sample" or "Matched Pairs":

a) To test the wear characteristics of two tire brands, A and B, Brand A is mounted on 50 cars and Brand B on 50 other cars.

two-sample

b) To test the wear characteristics of two tire brands, A and B, one Brand A tire is mounted on one side of each car in the rear, while a Brand B is mounted on the other side. Which side gets which brand is determined by flipping a coin. The same procedure is used on the front.

matched pairs

c) To test the effect of background music on productivity, factory workers are observed. For one month they had no background music. For another month they had background music.

matched pairs

d) A random sample of 10 workers in Plant A is to be compared with a random sample of 10 workers in Plant B in terms of productivity.

two-sample

e) A new weight-reducing diet was tried on 10 women. The weight of each woman was measured before the diet and again after 10 weeks on the diet.

matched pairs