Quiz 8

Name: ________________

Red ID: ________________

1. We are interested in whether mean income in Seattle is different than for the national average. Assume we know the mean national income is \$27,000. We take a sample of residents in Seattle, record their income and find an average income of \$28,100. We conduct a hypothesis test using $\alpha = 0.05$, and reject the null hypothesis. If we were to create a 95% confidence interval using the same data, which of the following would be correct:

1 sample

$H_0: \mu = 27000 \quad H_a: \mu \neq 27000$

RTN

a) Our confidence interval would not include \$28,100
b) Our confidence interval would include \$27,000
c) Our confidence interval would not include \$27,000
d) None of the above

2. We would like to know whether the average cholesterol of those on a vegetarian diet is different than the average cholesterol of those on a regular diet. We take a sample of those on a vegetarian diet, and another sample of those on a regular diet. We create the following 95% confidence interval for the parameter of interest: (-7, 13). If we were to conduct a hypothesis test using the same data, at $\alpha = 0.05$, what would be the result?

2 sample

$H_0: \mu_1 - \mu_2 = 0 \quad H_a: \mu_1 - \mu_2 \neq 0$

a) We would reject the null hypothesis, and conclude the mean cholesterol levels of those on a vegetarian diet are the same
b) We would reject the null hypothesis, and conclude the mean cholesterol levels of those on a vegetarian diet are different
c) We would fail to reject the null hypothesis, and find there is not enough evidence to conclude the mean cholesterol levels of those on a vegetarian diet are different
d) We would fail to reject the null hypothesis, and conclude the mean cholesterol levels of those on a vegetarian diet are different
e) Not enough information to answer this question

0 in C.I. so FTRN

3. We would like to estimate the proportion of adults who own a car, with 90% confidence, and have an estimate within 10% of the true proportion. How many should we sample?

a) 67
b) 68
c) 135
d) 136
e) Not enough information to answer this question

$n = \frac{z^2 \hat{p}\hat{q}}{ME^2} = \frac{(1.645)^2 (0.5)(0.5)}{(0.1)^2} = 67.7 \Rightarrow 68$

4. 3 students have their short term memory tested before and after a nap. Before a nap we give them a test where we record the number of sequential digits they can recall, then give them the same test after a nap, obtaining the following data:

	Subject A	Subject B	Subject C
Digits recalled before nap	5	8	7
Digits recalled after nap	7	9	8
d	-2	-1	-1

Same subjects before + after so correlated pairs

Which of the following is the correct 90% confidence interval for the parameter of interest?

a) (-3.14, -1.06)
b) (-4.41, 1.74)
c) (-2.02, -0.65)
d) (-2.31, -0.36)
e) (5.70, 8.96)

$\bar{d} = -1.333$

$s_d = 0.577$

$df = n-1 = 3-1 = 2$

$\bar{d} \pm t^* \left(\frac{s_d}{\sqrt{n}}\right) \quad -1.333 \pm 2.92 \left(\frac{0.577}{\sqrt{3}}\right)$

5. We know that 53% of adults in Kansas own their own home. We would like to know whether the proportion of residents in Texas that own their own home is different. In a sample of 97 Texas residents, 68 owned their own home. Which would be the correct null and alternative hypotheses?

1-sample

a) $H_o: p_1 - p_2 = 0 \quad H_a: p_1 - p_2 \neq 0$
b) $H_o: \hat{p}_1 - \hat{p}_2 = 0 \quad H_a: \hat{p}_1 - \hat{p}_2 \neq 0$
c) $H_o: p = 0 \quad H_a: p \neq 0$
d) $H_o: p = 0.53 \quad H_a: p \neq 0.53$
e) $H_o: p = 0.70 \quad H_a: p \neq 0.70$

6. We are interested in whether the percentage of adults who get a flu vaccine in California is different the percentage that get a flu vaccine in New York. We take a sample of residents in California and find that 32% get a vaccine. We take a sample of residents in New York and find that 41% get a vaccine. We conduct a hypotheses test using α = 0.05 and our decision is to fail to reject the null hypothesis. Given the results of your hypotheses test, if you were to create a 95% confidence interval for the parameter of interest using the same data, which of the following would be correct:

2-sample $H_o: p_1 - p_2 = 0 \quad H_a: p_1 - p_2 \neq 0$

FTRN so think $p_1 - p_2$ might be 0

a) The interval would include 0.41
b) The interval would include 0.32
c) The interval would include 0
d) The interval would not include 0
e) The interval would not include 0.32

7. You would like to know whether the survival rate of shrimp raised at 30 degrees Celsius is different than the survival rate of shrimp raised at 35 degrees Celsius. In a sample of 80 shrimp raised at 30 degrees, 68 survived. In a sample of 60 shrimp raised at 35 degrees, 45 survived. What would be the p-value under the appropriate hypotheses test?

2-sample

$H_o: p_1 - p_2 = 0 \quad H_a: p_1 - p_2 \neq 0$

$\hat{p}_1 = \frac{68}{80} = 0.85$

$\hat{p}_2 = \frac{45}{60} = 0.75$

$z = \frac{\hat{p}_1 - \hat{p}_2}{\sqrt{\frac{\hat{p}_1\hat{q}_1}{n_1} + \frac{\hat{p}_2\hat{q}_2}{n_2}}} = \frac{0.85 - 0.75}{\sqrt{\frac{(0.85)(0.15)}{80} + \frac{(0.75)(0.25)}{60}}} = 1.46$

0 1.46

$2(0.0721) = 0.14$

a) 0.07
b) 0.14
c) 0.04
d) 0.93
e) 0.02

8. We know mean wing length of male dragonflies is 1.7 cm. We would like to know whether mean wing length of female dragonflies is different than that of males. We take a sample of 3 females, measure their wing length, and obtain the following data:

1-sample $H_o: \mu = 1.7 \quad H_a: \mu \neq 1.7$

wing length: 3.4 3.1 3.8

$\bar{x} = 3.43 \quad s = 0.35$

$t = \frac{\bar{x} - \mu}{s/\sqrt{n}} = \frac{3.43 - 1.7}{\left(\frac{0.35}{\sqrt{3}}\right)} = 8.56$

What would be the p-value under the appropriate hypotheses test?

0 8.56

a) 0.02 < p-value < 0.025
b) 0.005 < p-value < 0.01
c) 0.04 < p-value < 0.05
d) 0.025 < p-value < 0.05
e) 0.01 < p-value < 0.02

$df = n - 1 = 3 - 1 = 2$

$2(0.005) < \text{p-value} < 0.01(2)$

$0.01 < \text{p-value} < 0.02$

9. In 2000 we had taken a sample of independent voters, and from this sample calculated the average age and standard deviation of age, finding a standard deviation of 6 years. We would like to have an estimate of the average age of independent voters today, and have an estimate within 3 years of the true mean age with 90% confidence. Using the standard deviation found from 2000, how many independent voters should we sample?

$s = 6$

$n = \left(\frac{z^* \sigma}{ME}\right)^2 = \left(\frac{1.645(6)}{3}\right)^2 = 10.8 \Rightarrow 11$

$df = n - 1 = 11 - 1 = 10$

$n = \left(\frac{t^* s}{ME}\right)^2 = \left(\frac{1.812(6)}{3}\right)^2 = 13.1 \Rightarrow 14$

a) 11
b) 12
c) 13
d) 14
e) 15