AP Statistics Chapter 13 Quiz: Comparing Two Proportions :

PART 1 : Multiple-Choice Questions:

First year high school students were randomly put into either traditional classes or innovative math classes. In a standard algebra test, 230 traditionally taught students had a mean score of 76.5 with SD of 7.4. While 185 innovatively taught students had a mean score of 78.8 with a SD of 5.6. Is there sufficient evidence of a difference in the test results?

Q1: Which of the following is the correct Null and Alternative hypothesis?

a) $\begin{matrix} Ho: \mu_1 = \mu_2 \\ Ha: \mu_1 > \mu_2 \end{matrix}$ b) $\begin{matrix} Ho: \mu_1 = \mu_2 \\ Ha: \mu_1 < \mu_2 \end{matrix}$ c) $\begin{matrix} Ho: \mu_1 = \mu_2 \\ Ha: \mu_1 \neq \mu_2 \end{matrix}$ d) $\begin{matrix} Ho: p_1 = p_2 \\ Ha: p_1 > p_2 \end{matrix}$ e) $\begin{matrix} Ho: p_1 = p_2 \\ Ha: p_1 \neq p_2 \end{matrix}$

Q2: What test should be performed to test the null hypothesis?

a) One sample z test can be performed by integrating both samples together and getting the averages of both means
b) One sample t test, since population SD are not given.
c) Two sample z test since we are comparing the statistics from two independent samples.
d) Two sample t – test, since we are comparing two independent samples and no population samples are given.
e) Chi square test for goodness of fit test since we are comparing the statistics of more than one sample.

Q2: Which of the following is the correct formula for the test statistics?

a) $t = \dfrac{76.5 - 78.8}{\sqrt{\dfrac{(7.4)^2}{230} + \dfrac{(5.6)^2}{185}}}$ b) $z = \dfrac{0.788 - 0.765}{\sqrt{\dfrac{(0.765)(1-0.788)}{185+230}}}$ c) $t = \dfrac{76.5 - 78.8}{\left(\dfrac{6.5}{\sqrt{\frac{1}{2}(230+185)}}\right)}$

c) $z = \dfrac{0.788 - 0.765}{\sqrt{(0.788)(0.765) + \left(\dfrac{1}{230}\right)\left(\dfrac{1}{185}\right)}}$ d) $t = \dfrac{76.5 - 78.8}{\sqrt{\dfrac{7.4}{230} + \dfrac{5.6}{185}}}$ e) $t = \dfrac{76.5 - 78.8}{\sqrt{\dfrac{(7.4)^2}{230} - \dfrac{(5.6)^2}{185}}}$

f) $t = (78.8 - 76.5) \pm 1.96\sqrt{\dfrac{(7.4)^2}{230} + \dfrac{(5.6)^2}{185}}$

Q3: If all variables remain constant, which of the following will not increase the power of a hypothesis test?

a) Increasing the sample size will not increase the power
b) Increasing the significance level will only increase the spread but not the power
c) Increasing the probability of a Type II error will not increase the power
d) Decreasing the variability in the data will not increase power but increases it instead
e) Increasing the distance between the true and hypothesized parameter

Before televised debates, a poll of 800 registered voters showed 560 in favor of Biden. After the debates a poll of 600 voters showed 450 in favor of Biden. Is there sufficient evidence that the Biden's popularity has increased?

Q4: Which of the following is the correct Null and Alternative hypothesis?

a) $Ho: \mu_1 = \mu_2$ $Ha: \mu_1 > \mu_2$ b) $Ho: \mu_1 = \mu_2$ $Ha: \mu_1 < \mu_2$ c) $Ho: \mu_1 = \mu_2$ $Ha: \mu_1 \neq \mu_2$ d) $Ho: p_1 = p_2$ $Ha: p_1 > p_2$ e) $Ho: p_1 = p_2$ $Ha: p_1 \neq p_2$

Q5: What test should be performed to test the null hypothesis?

a) One sample z test can be performed by integrating both samples together and getting the averages of both means
b) One sample t test, since population SD are not given.
c) Two sample z test since we are comparing the statistics from two independent samples.
d) Two sample t – test, since we are comparing two independent samples and no population samples are given.
e) Chi square test for goodness of fit test since we are comparing the statistics of more than one sample.

Q6: Which of the following is the correct formula for the test statistics?

a) $t = \dfrac{0.7 - 0.75}{\sqrt{\dfrac{(560)^2}{800} + \dfrac{(450)^2}{600}}}$ b) $z = \dfrac{0.7 - 0.75}{\sqrt{\dfrac{(0.75)(1-0.75)}{800+600}}}$ c) $t = \dfrac{600 - 450}{\left(\dfrac{0.75}{\sqrt{\frac{1}{2}(800+600)}}\right)}$

d) $z = \dfrac{0.7 - 0.75}{\sqrt{\dfrac{0.7(0.3)}{800} + \dfrac{0.75(0.25)}{600}}}$ e) $z = \dfrac{0.7 - 0.75}{\sqrt{(0.7214)(1-0.7214)\left(\dfrac{1}{800} + \dfrac{1}{600}\right)}}$

f) $z = \dfrac{0.7 - 0.75}{\sqrt{\left(\dfrac{560+450}{800+600}\right)\left(1 - \dfrac{560+450}{800+600}\right) + \dfrac{1}{800} + \dfrac{1}{600}}}$

Q7: When performing a hypothesis test, which of the following will increase with an increase in sample size?

a) The probability of a Type I error
b) The probability of a Type II error
c) The power of the test
d) The significance level a
e) 1 – power

Part 2: Written Response Questions

Q8: A professor believes that human skull sizes increased between two time periods. She plans to randomly sample 30 skulls from each period and will reject any equality claim if the mean skull circumference in the second time period sample is at least 1 inch greater than the mean skull circumference from the first period sample. If the SD of the skull circumference in all time periods is known to be 2.3inches, what is the probability the professor will mistakenly reject a correct null hypothesis of equality?

a) State the null and alternative hypothesis

b) Find the z-score and p-value. Explain your results

c) Am I looking for α, ß, or power? Please explain?

Q9) A researcher things that people under the age of thirty have vocabularies that are different than those of people over fifty five years of age. The researcher administers a vocabulary test to a group of 50 younger subjects and to a group of 65 older subjects. Higher scores reflect better performance. The mean score for younger subjects was 13.5 with a SD of 5.0. The mean older score for older subjects was 21.3 with a SD of 6.2. Does this experiment provide evidence for the researcher's theory?

a) Please provide in word the null and alternative hypothesis. Is this one tail or two tail. Please explain

b) Please indicate the decision rule for rejecting the null hypothesis, including critical value(s) for the appropriate statistic

c) Using an alpha level of 0.01, test the null hypothesis. As part of this test, please compare the actual value for the appropriate statistic against the critical value(s) for the appropriate statistic

d) State your conclusion regarding the results from this test in simple language that someone without a statistical background would be able to understand.

Q10: Aspirin prevents blood from clotting and so helps prevent strokes. A study asked whether adding another anticlotting drug, named dipyridamole, would be more effective for patients who had already had a stroke. Here are the data on strokes and deaths during the two years of the study:

	Number of Patients	Number of Strokes	Number of Deaths
Aspirin alone	1649	206	182
Aspirin + dipyridamole	1650	157	185

a) The study was a randomized comparative experiment. Outline the design of the study

b) Is there a significant difference in the proportion of strokes between these two treatments? Carry out an appropriate test to help answer this question

c) Construct and interpret a 95% confidence interval for the difference in the proportion of deaths for these two treatments

d) Describe a Type I and Type II error in this setting. Which is more serious? Explain