AP STATISTICS INFERENCE EXAM – STUDENT CREATED

**Purpose**:

The purpose of this exam is to review all of the confidence intervals and significance tests that students will need to know for the AP Exam.

**Format:**

The exam will be composed of four questions with each question being on its own page. The first two questions will ask students to create a confidence interval. The last two questions will ask students to perform a significance test. The context for each question should be unique. The exam should take around 60 minutes.

**Grading:**

The exam is worth 30 points total. Each confidence interval will be worth 6 points and each significance test will be worth 9 points.

**Confidence Intervals (6 points each)**

***(1 point)*** STATE: parameter being estimated is identified (1/2 point) along with a specific confidence level (1/2 point)

***(2 points)*** PLAN: Correctly identify the type of confidence interval (1/2 point), and then correctly check the three conditions (1/2 point each) with the 🡪 “so what?”

***(2 points)*** DO: Correct general formula for a confidence interval (1/2 point), correct specific formula with variables (1/2 point), correct numbers substituted into the formula (1/2 point), and correct answer (1/2 point)

***(1 point)*** CONCLUDE: The confidence interval is correctly interpreted in the context of the problem with appropriate units.

**Significance Tests (9 points each)**

(2 points) STATE: Parameter is identified (1/2 point), hypotheses are stated correctly (1 point), and the appropriate alpha level is given (1/2 point)

(2 points) PLAN: Correctly identify the type of significance test (1/2 point), and then correctly check the three conditions (1/2 point each) with the 🡪 “so what”

(3 points) DO: Correct general formula for a test statistic (1/2 point), correct specific formula with variables (1/2 point), correct numbers substituted into the formula (1/2 point), correct test statistic (1/2 point), and correct P-value (1/2 point). Also included is a picture of the sampling distribution (1/2 point).

(2 points) CONCLUDE: The conclusion is stated correctly and includes context.

Students will be responsible to create and grade these exams. Grading should be done in a fashion that is similar to the way the teacher grades exams. Your own grade on the exam will be affected by the quality of the exam you write.

**Example question: Confidence Interval**

**Mr. Wilcox believes that his AP Stats students have a much better grasp of inference than the average AP Stats student. To test his idea, Mr. Wilcox randomly selects 7 of his students and gives them a standardized inference exam that is given to students nationally. Nationally, the exam scores follow an approximately normal distribution. The average score by the students sampled was 84.2% with a standard deviation of 7.2%.**

**Create and interpret a 95% confidence interval for the average exam score for all of Mr. Wilcox’s AP Stats students.**

**STATE:  = the true mean exam score for all of Mr. Wilcox’s students.**

**We are trying to estimate  at a 95% confidence level.**

**PLAN: ONE SAMPLE T-INTERVAL FOR MEAN**

**Check conditions (1) Random : “randomly selects 7 of his students”**

**🡪 so we can generalize to the population**

**(2) 10% : 7 < 1/10 (94)**

**🡪 so sampling without replacement is OK.**

**(3) Normal : The population distribution is approximately normal**

**🡪 so the sampling distribution of is approximately normal.**

**DO: Estimate  Margin of Error**

** with df = 6**

** = ( 77.5, 90.9 )**

**CONCLUDE: We can be 95% confident that the interval from 77.5% and 90.9% captures the true mean exam scores for all of Mr. Wilcox’s AP Stats students.**

**Example question: Significance Test**

**Mrs. Gallas believes that the proportion of students at East Kentwood High School (EKHS) that take a statistics class during their Senior year is higher than it was five years ago. She took a random sample of 150 EKHS Seniors from 2014 and found that 45 took a statistics class. A random sample of 120 EKHS Seniors from 2019 revealed that 60 took a statistics class.**

**Do the data provide convincing evidence that the proportion of EKHS Seniors that take a statistics class has increased over the past five years?**

**STATE: Ho:  = 0 = true difference in proportion of EKHS Seniors that**

**take a statistics class (2019 – 2014)**

**Ha:  > 0 = 0.05 **

**PLAN: TWO SAMPLE Z-TEST FOR DIFFERENCE OF PROPORTIONS**

**Check conditions (1) Random : Two independent random samples**

**🡪 so we can generalize to both populations**

**(2) Independent : 150 < 1/10 (2000+ students in 2014)**

**120 < 1/10 (2000+ students in 2019)**

**🡪 so sampling without replacement is OK.**

**(3) Normal: 58.3, 91.7, 46.7, 73.3 > 10**

**🡪 so the sampling distribution of**  **is approximately normal.**

**DO:**

**Test Statistic = **

** **

**z = 3.35**

**P-value = 0.0004**

**CONCLUDE:**

**Assuming Ho is true ( = 0), there is a .0004 probability of obtaining an** **value of 0.20 or greater purely by chance. Because the P-value of 0.0004 < = 0.05, we reject Ho and we do have convincing evidence that the proportion of EKHS Seniors that take a statistics class has increased over the past five years.**