

For the exam: you may use a 3"x5" note card (front and back). You must use pencil not pen. You may use any type of calculator

- Points: _____ out of 15.

3. (10 points) The article **"More Teen Drivers See Marijuana as OK; It's Dangerous Trend"** describes two surveys of US high school students. One survey was conducted in 2009 and the other was conducted in 2011. In 2009, 78% of the people in a representative sample of 2300 students said marijuana use is very distracting or extremely distracting to their driving. In 2011, 70% of the people in a representative sample of 2294 students answered this way. Construct and interpret a 99% confidence interval for the difference in the proportion of high school students who believed marijuana was very distracting or extremely distracting in 2009 and 2011.

4. Given the following null, alternative hypothesis, and test statistics, find the corresponding p-value and state whether you would reject the null hypothesis or fail to reject the null hypothesis based on the significance level of 0.05.

(a) (5 points) $H_o : p = 0.20$ $H_a : p < 0.02$ $z = -1.93$

(b) (5 points) $H_o : p = 0.40$ $H_a : p > 0.40$ $z = 1.55$

(c) (5 points) $H_o : p = 0.56$ $H_a : p \neq 0.56$ $z = -2.66$

(d) (5 points) $H_o : p = 0.10$ $H_a : p \neq 0.10$ $z = 2.11$

(e) (5 points) $H_o : p_1 - p_2 = 0$ $H_a : p_1 - p_2 < 0$ $z = -2.90$

(f) (5 points) $H_o : p_1 - p_2 = 0$ $H_a : p_1 - p_2 \neq 0$ $z = 1.83$

5. An automobile manufacturer is considering using robots for part of its assembly process. Converting to robots is expensive, so it will be done only if there is strong evidence that the proportion of defective installations is less for the robots than for human assemblers. Let p denote the actual proportion of defective installations for the robots. It is known that the proportion of defective installations for human assemblers is 0.02.

(a) (4 points) Which of the following pairs of hypotheses should the manufacturer test? Explain your choice

$$H_o : p = 0.02 \quad H_a : p < 0.02$$

or

$$H_o : p = 0.02 \quad H_a : p > 0.02$$

(b) (4 points) In context of the problem, describe Type 1 error

(c) (4 points) In context of the problem, describe Type II error

(d) (4 points) Would you prefer a test with $\alpha = 0.01$ or $\alpha = 0.10$? Explain your reasoning.

6. A number of initiatives on the topic of legalized gambling have appeared on state ballots. A political candidate has decided to support legalization of casino gambling if he is convinced that more than two-thirds of Americans adults approve of casino gambling. Suppose that 1035 of the people in a random sample of 1523 American adults said they approve of casino gambling. Is this convincing evidence that more than two-thirds (66.67%) approve?

(a) (3 points) State the hypotheses

(b) (3 points) Calculate the test statistic

(c) (3 points) Calculate the p-value

(d) (3 points) State your conclusion in context to the problem

7. Gallup surveyed adult Americans about their consumer debt. They reported that 48% of millennials (those born between 1980 and 1996) and 61% of Gen Xers (those born between 1965 and 1971) did not pay off their credit cards each month and therefore carried a balance from month to month. Suppose these percentages were based on representative sample of 450 millennials and 300 Gen Xers. Is there convincing evidence that the proportion of Gen Xers who do not pay off their credit cards each month is greater than the proportion for millennials? Test the appropriate hypotheses using a significance level of 0.05.

(a) (3 points) State the hypotheses

(b) (3 points) Calculate the test statistic

(c) (3 points) Calculate the p-value

(d) (3 points) State your conclusion in context to the problem