

Instructions: Show all work. Answers without work can only be graded all or nothing. Partial credit is available only when work is shown. Answer all parts of each problem. Provide explanations as indicated. You may use Minitab or any other statistical software (such as a calculator or Excel) to complete any required statistical calculations or graphs.

1. A polling company would like to determine the proportion of the population that considers themselves independents (rather than Democrats or Republicans) in their town.
 - a. Previous polling results put the proportion of independents at 35%. Using that information, what sample size is required to update the results with 95% and a margin of error of 3.5%.

$$n \geq (0.35)(0.65) \left(\frac{1.96}{0.035} \right)^2 = 713.44$$
$$n = 714$$

- b. If they assumed no previous information on the proportion, how large would the same have to be then?

$$n \geq (0.5)(0.5) \left(\frac{1.96}{0.035} \right)^2 = 784$$
$$n = 784$$

2. A company claims that their lightbulbs burn for more than 1000 hours. To test that claim, a consumer agency buys 75 lightbulbs and determines that the mean burn time is 1009.3 hours with a standard deviation of 12 hours. State the null and alternative hypotheses in proper notation. (You do not need to conduct the test.)

$$H_0: \mu = 1000$$
$$H_a: \mu \geq 1000$$

3. In the above scenario, it turns out that the company's claims are actually false, but your hypothesis test concludes that they are true. What kind of an error is this? Type I or Type II? Explain your reasoning.

If the claim (alternative hypothesis) is false, then the null hypothesis is true, but we concluded that it was not. This is a Type I error.