

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. Previous polling results put the proportion of independents at 35%. The Registrar of Voters believes that the proportion has increased. The polling company reports that a sample of 1000 people found that the proportion of independents was 37%. Is there sufficient evidence to support the Registrar’s claims? Be sure to state the null and alternative hypotheses, the test statistic and either the p-value or critical value ($\alpha = 0.05$), and the conclusion of your test.

$$H_0: p = 0.35$$

$$H_a: p \geq 0.35$$

Test

Null hypothesis	$H_0: p = 0.35$
Alternative hypothesis	$H_1: p > 0.35$
P-Value	
	0.098

There is not sufficient evidence since the p-value is greater than 5%.

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. Conduct a test to determine if the company’s claims are substantiated.

$$H_0: \mu = 1000$$

$$H_a: \mu \geq 1000$$

Test

Null hypothesis	$H_0: \mu = 1000$
Alternative hypothesis	$H_1: \mu > 1000$
T-Value	P-Value
6.71	0.000

The p-value is so small it doesn’t register. It’s much less than 5%. Since the null is unlikely to be true, there is sufficient evidence to support the alternative.

3. Use the data in the file **143quiz10data.xlsx** and Minitab to conduct two hypothesis tests. State the null and alternative hypotheses and all major components of your analysis including the conclusion.
 - a. Separate the data into two groups by marital status. Determine if there is a difference between the number of children married and single households have. (Hint: this is a difference of means; if there is no difference, the hypothesized difference is zero.)

Test

Null hypothesis	$H_0: \mu_1 - \mu_2 = 0$
-----------------	--------------------------

Alternative hypothesis $H_1: \mu_1 - \mu_2 \neq 0$		
T-Value	DF	P-Value
3.74	14018	0.000

Since the p-value is small, there is sufficient evidence to think that married and single households have different number of children.
 However, this is a large sample size, so it's possible that the difference is very small.

- b. Also separate the data into two groups by marital status. Determine if there is a difference in the proportion of homeownership between married and single households.

Test

Null hypothesis	$H_0: p_1 - p_2 = 0$	
Alternative hypothesis	$H_1: p_1 - p_2 \neq 0$	
Method	Z-Value	P-Value
Normal approximation	37.04	0.000
Fisher's exact		0.000

There is sufficient evidence to think that there is a different in proportions between homeownership among married and single households.