

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Test the claims given below using the Critical Value Method.

- 1) In a clinical study of an allergy drug, 108 of the 202 subjects reported experiencing significant relief from their symptoms. At the 0.01 significance level, test the claim that more than half of all those using the drug experience relief. 1) _____
- 2) In a sample of 167 children selected randomly from one town, it is found that 37 of them suffer from asthma. At the 0.05 significance level, test the claim that the proportion of all children in the town who suffer from asthma is 11%. 2) _____
- 3) An article in a journal reports that 34% of American fathers take no responsibility for child care. A researcher claims that the figure is higher for fathers in the town of Littleton. A random sample of 234 fathers from Littleton yielded 96 who did not help with child care. Test the researcher's claim at the 0.05 significance level. 3) _____
- 4) As part of a Pew Research Center poll, subjects were asked if there is solid evidence that the earth is getting warmer. Among 1501 respondents, 20% said that there is not such evidence. Use a 0.01 significance level to test the claim that less than 25% of the population believes that there is not solid evidence that the earth is getting warmer. 4) _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Use the given information to find the P-value. Also, use a 0.05 significance level and state the conclusion about the null hypothesis (reject the null hypothesis or fail to reject the null hypothesis).

- 5) The test statistic in a right-tailed test is $z = 0.52$. 5) B
A) 0.6030; fail to reject the null hypothesis B) 0.3015; fail to reject the null hypothesis
C) 0.3015; reject the null hypothesis D) 0.0195; reject the null hypothesis
- 6) The test statistic in a left-tailed test is $z = -1.83$. 6) C
A) 0.0672; fail to reject the null hypothesis B) 0.0672; reject the null hypothesis
C) 0.0336; reject the null hypothesis D) 0.9664; fail to reject the null hypothesis
- 7) The test statistic in a two-tailed test is $z = 1.95$. 7) A
A) 0.0512; fail to reject the null hypothesis B) 0.9744; fail to reject the null hypothesis
C) 0.0512; reject the null hypothesis D) 0.0256; reject the null hypothesis

① $x=108$ = the number of successes of a binomial proportion.

$n=202$ = the number of trials (subjects)

$$\hat{p} = \frac{x}{n} = \frac{108}{202} \approx 0.53$$

α = level of significance = 0.01

claim: The true proportion of all people who would experience relief from the drug treatment is greater than 50%.

Symbolic form (claim) $p > 0.50$

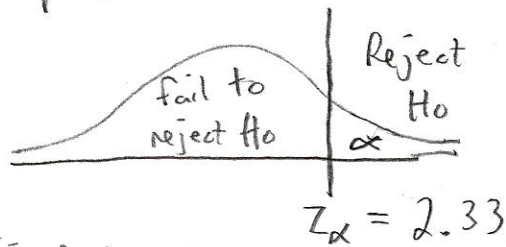
Step 1: $H_0: p \leq 0.50$

Step 2: $H_1: p > 0.50$ (claim)

Step 3 The test statistic is $z = \frac{\hat{p} - p}{\sqrt{\frac{pq}{n}}} = \frac{0.53 - 0.50}{\sqrt{\frac{(0.50) \cdot (0.50)}{202}}} \approx 0.62$

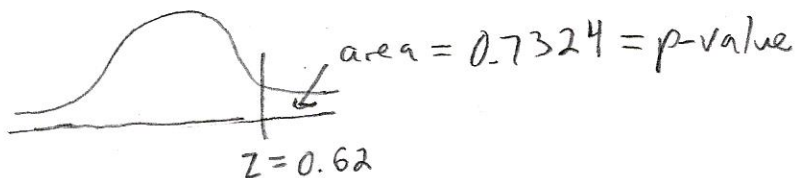
(Always show the appropriate formula and approximate the value of your test stat to 2 decimal places.)

Step 4 The CV method



Since the test statistic, $z = 0.62$, is left of the CV we fail to reject H_0

Step 4 The p-value method



Since the p-val $> \alpha$, we fail to reject H_0

Step 5: There is not sufficient sample evidence to support the claim that the true proportion of all patients taking the allergy drug is greater than 50%.

(2)

$n = 167$ = trials (subjects)

$X = 37$ = successes, with a success defined as "a child in town suffers from asthma."

$$\hat{p} = \text{sample proportion} = \frac{X}{n} = \frac{37}{167} \approx 0.22$$

$$\alpha = 0.05$$

claim: the true proportion of all kids in town who suffer from asthma is 11%

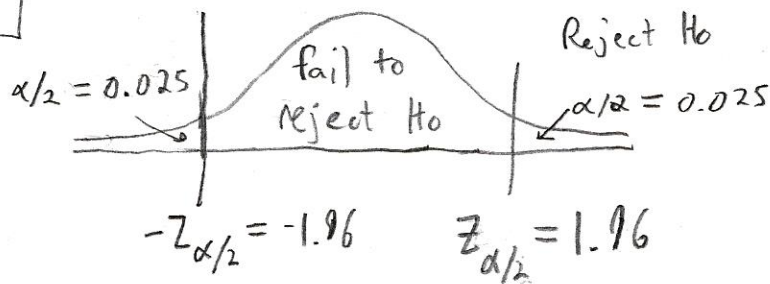
Symbolic form: $p = 0.11$

Step 1 $H_0: p = 0.11$ (claim)

Step 2 $H_1: p \neq 0.11$

Step 3 The test statistic is $z = \frac{\hat{p} - p}{\sqrt{\frac{pq}{n}}} = \frac{0.22 - 0.11}{\sqrt{\frac{(0.11)(0.89)}{167}}} \approx 4.54$

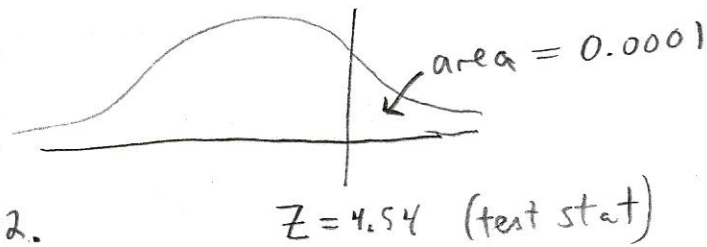
Step 4 CV method



The test stat., $z = 4.54$, is located along the horizontal axis, right of the CV, in the rejection region.

Step 4 P-value method

The p-value is twice the area right of the test statistic, $2 \cdot (0.0001) = 0.0002$.



Since $p\text{-val} \leq \alpha$ reject H_0

Step 5: Conclusion: There is sufficient evidence to warrant rejection of the claim that the true proportion of all children in town suffering from asthma is 11%.

③ $p = 0.34 = \%$ of american fathers who take no responsibility for child care.

$n = 234$ fathers

$x = 96$ who didn't help w/ child care.

$$\hat{p} = \frac{x}{n} = \frac{96}{234} = 0.41$$

$\alpha = 0.05$

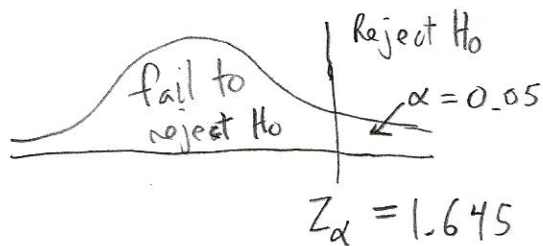
Claim the true proportion of Littleton fathers who take no responsibility for childcare is greater than 34%, or $p > 0.34$.

Step 1: $H_0: p \leq 0.34$

Step 2: $H_1: p > 0.34$ (claim)

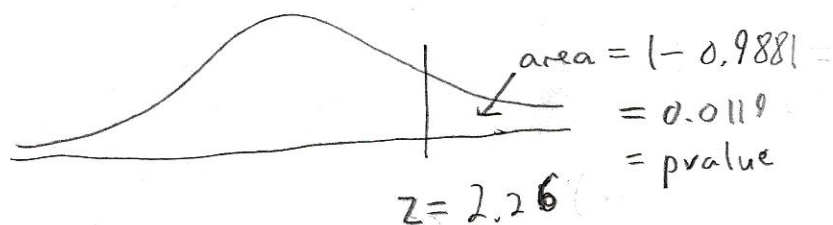
Step 3: the test statistic is $z = \frac{\hat{p} - p}{\sqrt{\frac{pq}{n}}} = \frac{0.41 - 0.34}{\sqrt{\frac{(0.34)(0.66)}{234}}} \approx 2.26$

Step 4: CV method



Since the test statistic is located along the horizontal axis right of the CV, we reject H_0 .

Step 4 P-value method



Since $p\text{-val} \leq \alpha$, we reject H_0 .

Step 5: The sample data support the claim that the true percentage of Littleton fathers who take no responsibility for child care is greater than 34%, the hypothesized value of p .

④ $n = 1501$

$\hat{p} = 0.20$

$\alpha = 0.01$

$p = 0.25$ hypothesized value

Claim: less than 25% of the population believes there is not solid evidence of global warming.

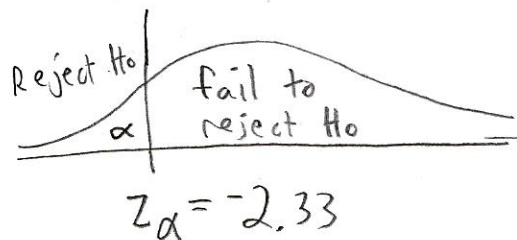
Symbolic form (claim) $p < 0.25$

Step 1: $H_0: p \geq 0.25$

Step 2: $H_1: p < 0.25$ (claim)

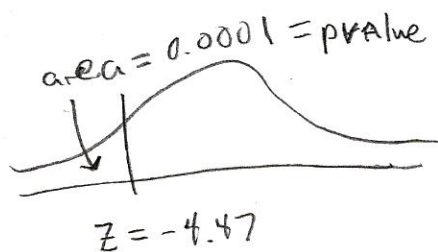
Step 3: The test statistic is $z = \frac{\hat{p} - p}{\sqrt{\frac{pq}{n}}} = \frac{0.20 - 0.25}{\sqrt{\frac{(0.25)(0.75)}{1501}}} \approx -4.47$

Step 4: CV method



Since the test stat lies left of the CV, we reject H_0 .

Step 4: P-value method



Since $p\text{-val} \leq \alpha$ reject H_0

Step 5: The sample data support the claim that less than 25% of the population believe there is not solid evidence of global warming.