

8.2 - Testing a Claim About a Proportion

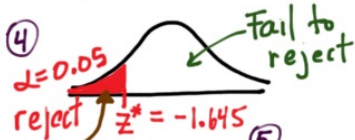
Example 1 A TNS poll of 1000 randomly selected adults showed that 460 of them say that public speaking is an activity they dread most. Test the claim that fewer than half of adults say that public speaking is the activity they dread most at the 0.05 significance level.

① $n=1000$ $x=460$ $\hat{p} = \frac{460}{1000} = 0.46$ $\alpha = 0.05$

② Fewer than half \Rightarrow < one tail or left-tail

③ $H_0: p = 0.5$
 $H_a: p < 0.5$ claim

⑦ since $z < z^*$ we reject H_0



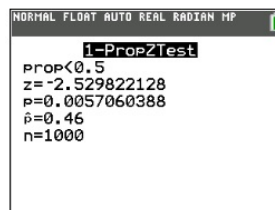
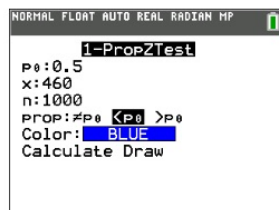
⑧ P-value = normalcdf(-1E99, -2.5298)
 P-value = 0.0057
 P-value < $\alpha \Rightarrow$ reject H_0

⑥ $z = \frac{\hat{p} - p}{\sqrt{\frac{pq}{n}}}$
 $= \frac{0.46 - 0.5}{\sqrt{\frac{0.5 \times 0.5}{1000}}}$

⑨ There is sufficient evidence to support the claim that fewer than 50% of adults say that public speaking is the activity they dread most.

$z = -2.53$

⑩ $n=1000$ $x=460$ $\alpha=0.05$
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Hypothesis Test for a Single Proportion

x = 460
 n = 1000
 Sample Proportion = 0.4600

Hypothesized Proportion: p = 0.5
 Type: $H_a: p < 0.5$

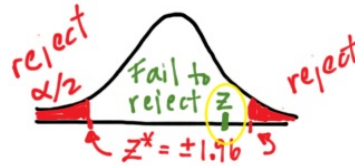
z-statistic = -2.5298

P-value = 0.0057

Ignore the confidence interval.

Example 2 In a Gallup poll of 1003 randomly selected subjects, 373 said that they have a gun in their home. Test the claim that 35% of homes have guns in them at the 0.05 significance level.

$n = 1003$
 $x = 373$
 $\alpha = 0.05$
 $\hat{p} = \frac{373}{1003} \approx 0.372$
 $H_0: P = 0.35$ claim
 $H_1: P \neq 0.35$
 two tail test



Hypothesis Test for a Single Proportion

$x = 373$
 $n = 1003$
 Sample Proportion = 0.3719
 Hypothesized Proportion: $p = 0.35$
 Type: $H_a: p \neq 0.35$
 $z\text{-statistic} = 1.4531$
P-value = 0.1462
 Confidence Interval
 Confidence Level: 0.95
 0.3420 0.4018

$P = 0.146 > \alpha \Rightarrow$ FAIL TO REJECT H_0

There is not enough evidence to reject the claim that 35% of households have guns in them

P-value by hand
 $\text{normalcdf}(1.4531, 1E99) = 0.073$
 $2 \cdot 0.073 = 0.146$
 $P\text{-value} \rightarrow 0.146 > \alpha$

EXAMPLE 3 The Pew Research Center conducted a survey of 1007 adults and found that 856 of them know what Twitter is. Use a 0.01 significance level to test the claim that more than 75% of adults know what Twitter is.

$n = 1007$
 $x = 856$
 $\hat{p} = \frac{856}{1007} \approx 0.85$
 $P > 0.75$ claim
 $H_0: P = 0.75$
 $H_1: P > 0.75$ claim
 $\alpha = 0.01$



Hypothesis Test for a Single Proportion

$x = 856$
 $n = 1007$
 Sample Proportion = 0.8500
 Hypothesized Proportion: $p = 0.75$
 Type: $H_a: p > 0.75$
 $z\text{-statistic} = 7.3321$
P-value = 0.0000
 Confidence Interval
 Confidence Level: 0.98
 0.8239 0.8762

$P\text{-value} < \alpha \Rightarrow$ reject H_0

There is enough evidence to support the claim that more than 75% of adults know what Twitter is.