

# Hypothesis Testing

Name \_\_\_\_\_

ESSAY. Write your answer in the space provided or on a separate sheet of paper.

1) A researcher claims that the proportion of smoking adults in a town is less than 34%. A random sample of 233 adults in this town yields 96 smokers. Can you conclude at 5% significance level, the proportion of smoking adults in this town is greater than 34%?

(i) State the null and alternative hypothesis.

$$H_0: P = 0.34 \quad \text{Vs} \quad H_a: P > 0.34 \quad \text{right tail test}$$

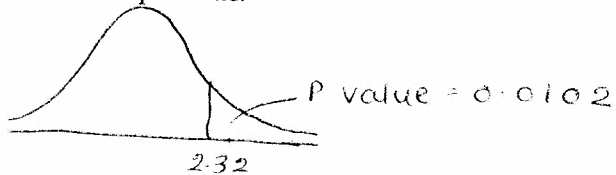
(ii) Find the sample proportion of smoking adults.

$$\hat{p} = 96/233 = 0.412$$

(iii) Calculate the test statistics.

$$Z = \frac{\hat{p} - P_0}{\sqrt{\frac{P_0(1-P_0)}{n}}} = \frac{0.412 - 0.34}{\sqrt{\frac{(0.34)(1-0.34)}{233}}} = \frac{0.072}{0.031} = 2.32$$

(iv) Find the p-value.



(v) What is your conclusion?

P value      significance value      Reject  $H_0$ .  
 0.0102 < 0.05  
 at 5% sig level

We can conclude that the proportion of smoking adults in this town is greater than 34%.

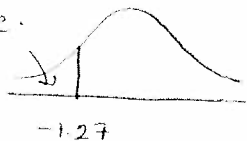
2) A reporter claims that percentage of voters who prefer health care reform bill is greater than 50%. A poll of 1000 registered voters reveals that 48% of the voters prefer the bill. Can you conclude at 0.05 significance level, that the percentage of voters who prefer the bill is less than 50%.

$$H_0: P = 0.5 \quad \text{Vs} \quad H_a: P < 0.5 \quad \hat{p} = 48\% = 0.48 \quad \text{left tail}$$

Test statistic =

$$Z = \frac{\hat{p} - P_0}{\sqrt{\frac{P_0(1-P_0)}{n}}} = \frac{0.48 - 0.5}{\sqrt{\frac{(0.5)(1-0.5)}{1000}}} = \frac{-0.02}{0.0158} = -1.27$$

0.1020  
P. value.



P value      sig value      fail to  
 0.1020 > 0.05      Reject  $H_0$

We can't conclude at 5% sig level that percentage of voters who prefer the bill is less than 50%.

3) A manager claims that the proportion of male workers in his company is 0.65. There were 336 male workers among 490 sample of workers. At 1% significance level, can you conclude that the proportion of male workers differs from 0.65?

$$H_0: p = 0.65$$

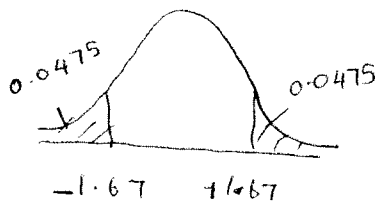
$$Vs \quad H_a: p \neq 0.65$$

Two tailed test.

$$\hat{p} = \frac{336}{490} = 0.686$$

Test statistic:

$$Z = \frac{\hat{p} - P_0}{\sqrt{\frac{P_0(1-P_0)}{n}}} = \frac{0.686 - 0.65}{\sqrt{\frac{(0.65)(1-0.65)}{490}}} = \frac{0.036}{0.0215} = 1.67$$



$$P \text{ value} = 2(0.0475) = 0.0950$$

P value

Significance value.

fail to

0.0950

>

0.01

Reject  $H_0$ .

We <sup>cannot</sup> conclude at 1% sig level, that the proportion of male workers in the company is not equal to 0.65

Check using confidence intervals.

$\hat{p} \pm$  margin of error.

$$0.686 \pm 2.575 \sqrt{\frac{(0.686)(1-0.686)}{490}}$$

$$0.686 \pm 0.054$$

$$(0.632, 0.74)$$

↑ This interval includes 0.65.