University of Central Punjab

Assignment: Chapter 09 Date:

Null and Alternative Hypotheses

H_o	H_a
Equal (=)	Not equal ($\neq$) or (>) or (<)
Greater then or equal to ($\geq$)	Less then (<)
Less then or equal to ($\leq$)	more then (>)

Example 9.1

$H_o: P \leq 30$

$H_a: P > 30$

[redacted] Try It 9.1

$H_o: P = 25$

$H_a: P \neq 25$

Example 9.2

$H_o: \mu = 2.0$

$H_a: \mu \neq 2.0$

Try It 9.2

$H_o: \mu = 66$

$H_a: \mu \neq 66$

Example 9.3

$H_o: \mu \geq 5$

$H_a: \mu < 5$

Try It 9.3

$H_o: \mu \geq 45$

$H_a: \mu < 45$

Example 9.4

$6.6\% \rightarrow \frac{6.6}{100} = 0.066$

$H_0: p \leq 0.066$

$H_a: p > 0.066$

Try It 9.4

$40\% \rightarrow \frac{40}{100} = 0.40$

$H_0: \leq 0.40$

$H_a: > 0.40$

Example 9.5

Type I Error

Frank thinks that his rock climbing equipment may not be safe when, in fact it realy is safe.

Type II Error

Frank thiks that his rock climbing equipment may be safe, when it fact it is not safe.

Try It 9.5

Type I Error

The researcher thinks the blood cultures do contain traces of pathogen X, when in fact they do not.

Type II Error

The researcher thinks the blood cultures do not contain traces of pathogen X, when in fact they do.

Example 9.6

Type I Error

The emergency crew thinks that the victim is dead, in fact the victim is alive.

Type II Error

The emergency crew does not know if the victim is alive, when in fact the vitim is dead.

Try it 9.6

Type I Error

The patient will not be thought well in fact he is not sick.

Type II Error

The patient will be thought well, when in fact he is sick.

Example 9.9

Formulation

$H_o : \mu \leq 15$

$H_a : \mu > 15$

$\alpha = 0.05$

Test Statistic

$$Z = \frac{\bar{x} - \mu_o}{\sigma / \sqrt{n}}$$

Calculation

$\mu_0 = 15, \bar{x} = 17, \sigma = 0.5, n = 10$

$$Z = \frac{17 - 15}{0.5/\sqrt{10}}$$

$$Z = 2$$

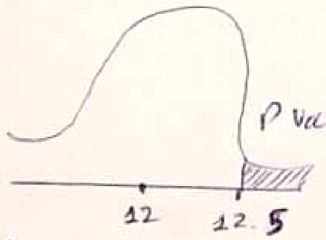
Try It 9-9

$H_0: \mu \leq 12$

$H_a: \mu > 12$

The P value is 0.0013

Draw the graph



P value is approximately

Try It 9-10

Since the P value is greater then the established value of α, we do not rejected the null hypothesis.

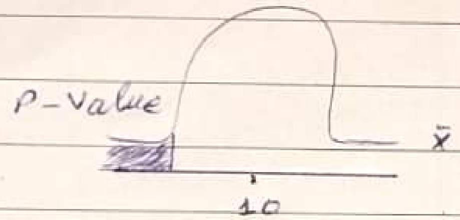
There is not enough evidence to support cutebody Genetics Lab's stated claim that their proceduer improve the chances of boy being born.

Try It 9.11

$H_0 : \mu = 10$

$H_a : \mu < 10$

Assume the P-value is 0.0935. Draw the picture of P value



Try It 9.12

$H_0 : \mu \leq 1$

$H_a : \mu > 1$

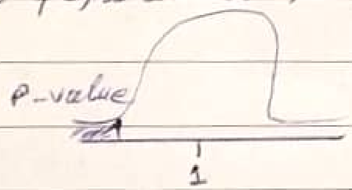
Since P-value > α we do not reject null hypothesis,

Assume the P-value is 0.1243

$H_0 : \mu \leq 1$, we donot have enough evidence to conclude that $\mu > 1$

Right-tailed test

Test of a population mean

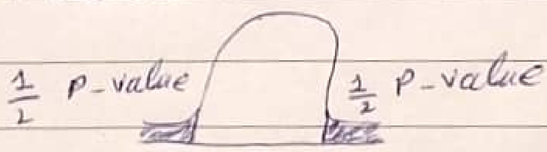


Tray It 9.13

$H_0 : p = 0.5$

$H_a : p \neq 0.5$

Assume what type of this test Draw the picture of the P value.



Hypothesis of a single population proportion

Hypothesis of a single population

Since P-value > α so we do not rejected null hypothesis ($H_0: P = 0.5$). We donot have sufficient ovidence to conclude $H_a: P \neq 0.5$

Practice (only Answer)

Question. 1

The random variable is the mean internet speed in Megabits per second

Question. 2

or

$H_0: \mu \leq 3$
$H_a: \mu > 3$

The random variable is the mean internet speed in Megabits

Question. 3

The random variable is the mean number of children an American family has.

Question. 4

The null hypotheses is that the mean entery level salary for IT Propessionals at the company is equal to $58.000.

The alternative hypotheses greater then

Question. 5

The random variable is the proportion of people picked at random in time square visiting the city.

Question. 6

The null hypotheses is that the proportion of people picked at random in time square in New York visiting is equal to 0.83.

The alternative hypothese, different from

Question. 7

$42\% \quad \frac{42}{100} = 0.42$

$H_0 : = 0.42$

$H_a : < 0.42$

Question. 8

$H_0 : \mu = 2.5$

$H_a : \mu > 2.5$

Question. 9

$H_0 : \mu = 15$

$H_a : \mu \neq 15$

Question. 10

$9.5\% = \frac{9.5}{100} = 0.095$

$H_0 : p = 0.095$

$H_a : p < 0.095$

Question. 35

$H_0 : \mu \geq 73$

$H_a : \mu < 73$

Question. 36

Question. 37

The shaded region shows a low p-value.

Example 9.14

Formulation

$H_0 : \mu = 16.43$

$H_a : \mu < 16.43$

Level of signification

$\alpha = 0.05$

Test Statistic

$$Z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}}$$

Calculation

$\mu = 16.43, \sigma = 0.8, n = 15, \bar{x} = 16$

$$Z = \frac{16 - 16.43}{0.8/\sqrt{16}}$$

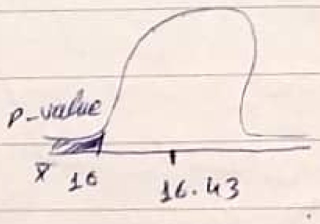
$$Z = \frac{-0.43}{0.8/4}$$

$$Z = \frac{-0.43}{0.2}$$

$(z < -2.15) = 0.01578$

P-value

0.01578



Try It 9.14

Formulation

$H_0 : \mu = 40$

$H_a : \mu > 40$

Level of Signification

$\alpha = 0.05$

Test Statistic

$$z = \frac{\bar{x} - \mu}{\sigma / \sqrt{n}}$$

calculation

$\bar{x} = 45$, $\mu = 40$, $\sigma = 2$, $n = 20$

$$z = \frac{45 - 40}{2 / \sqrt{20}}$$

$$z = \frac{5}{2 / 4.4721}$$

$$z = \frac{5}{0.4472}$$

$$z = 11.1803$$

P-value

concultion

Beause $p > \alpha$ reject the null hypothesis to ~~suffect~~ there is sufficied evidence to sugged that the change in grip

Assignment: Date:

Example 9.15

$H_0 : \mu = 275$

$H_a : \mu > 275$

$\bar{x} = \frac{\Sigma x}{n}$

$\bar{x} = \frac{205+205+205+215+215+215+---+385}{30}$

$\bar{x} = \frac{8585}{30}$

$\bar{x} = 286.2$

$\sigma = 55, \ n = 30, \ \mu = 275$

$z = \frac{\bar{x} - \mu}{\sigma / \sqrt{n}}$

$z = \frac{286.2 - 275}{55/\sqrt{30}}$

$z = \frac{11.2}{55/5.4772}$

$z = \frac{11.2}{10.0416}$

$z = 1.1154$

Example 9-16

$H_0 : \mu = 65$

$H_0 : \mu > 65$

$\bar{x} = \frac{\Sigma x}{n}$

$\bar{x} = \frac{65+65+ - - - - + 71}{10}$

$\bar{x} = \frac{670}{10}$

$\bar{x} = 67$

$S = \sqrt{\frac{(x-\bar{x})^2}{n-1}}$

$S = \sqrt{\frac{(65-67)^2 + (65-67)^2 + - - - - (71-67)^2}{10-1}}$

$S = \sqrt{\frac{92}{9}}$

$S = \sqrt{10.2222}$

$S = 3.2$

$t = \frac{\bar{x} - \mu}{S/\sqrt{n}}$

$t = \frac{67-65}{3.2/\sqrt{10}}$

$t = \frac{2}{3.2/3.1623}$

$t = \frac{2}{1.0119}$

$t = 1.98$