Lab03

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2023-12-07

# AIM: Testing of hypothesis for different population mean when sd is known

# DATASET:

iris

## Sepal.Length Sepal.Width Petal.Length Petal.Width Species  
## 1 5.1 3.5 1.4 0.2 setosa  
## 2 4.9 3.0 1.4 0.2 setosa  
## 3 4.7 3.2 1.3 0.2 setosa  
## 4 4.6 3.1 1.5 0.2 setosa  
## 5 5.0 3.6 1.4 0.2 setosa  
## 6 5.4 3.9 1.7 0.4 setosa  
## 7 4.6 3.4 1.4 0.3 setosa  
## 8 5.0 3.4 1.5 0.2 setosa  
## 9 4.4 2.9 1.4 0.2 setosa  
## 10 4.9 3.1 1.5 0.1 setosa  
## 11 5.4 3.7 1.5 0.2 setosa  
## 12 4.8 3.4 1.6 0.2 setosa  
## 13 4.8 3.0 1.4 0.1 setosa  
## 14 4.3 3.0 1.1 0.1 setosa  
## 15 5.8 4.0 1.2 0.2 setosa  
## 16 5.7 4.4 1.5 0.4 setosa  
## 17 5.4 3.9 1.3 0.4 setosa  
## 18 5.1 3.5 1.4 0.3 setosa  
## 19 5.7 3.8 1.7 0.3 setosa  
## 20 5.1 3.8 1.5 0.3 setosa  
## 21 5.4 3.4 1.7 0.2 setosa  
## 22 5.1 3.7 1.5 0.4 setosa  
## 23 4.6 3.6 1.0 0.2 setosa  
## 24 5.1 3.3 1.7 0.5 setosa  
## 25 4.8 3.4 1.9 0.2 setosa  
## 26 5.0 3.0 1.6 0.2 setosa  
## 27 5.0 3.4 1.6 0.4 setosa  
## 28 5.2 3.5 1.5 0.2 setosa  
## 29 5.2 3.4 1.4 0.2 setosa  
## 30 4.7 3.2 1.6 0.2 setosa  
## 31 4.8 3.1 1.6 0.2 setosa  
## 32 5.4 3.4 1.5 0.4 setosa  
## 33 5.2 4.1 1.5 0.1 setosa  
## 34 5.5 4.2 1.4 0.2 setosa  
## 35 4.9 3.1 1.5 0.2 setosa  
## 36 5.0 3.2 1.2 0.2 setosa  
## 37 5.5 3.5 1.3 0.2 setosa  
## 38 4.9 3.6 1.4 0.1 setosa  
## 39 4.4 3.0 1.3 0.2 setosa  
## 40 5.1 3.4 1.5 0.2 setosa  
## 41 5.0 3.5 1.3 0.3 setosa  
## 42 4.5 2.3 1.3 0.3 setosa  
## 43 4.4 3.2 1.3 0.2 setosa  
## 44 5.0 3.5 1.6 0.6 setosa  
## 45 5.1 3.8 1.9 0.4 setosa  
## 46 4.8 3.0 1.4 0.3 setosa  
## 47 5.1 3.8 1.6 0.2 setosa  
## 48 4.6 3.2 1.4 0.2 setosa  
## 49 5.3 3.7 1.5 0.2 setosa  
## 50 5.0 3.3 1.4 0.2 setosa  
## 51 7.0 3.2 4.7 1.4 versicolor  
## 52 6.4 3.2 4.5 1.5 versicolor  
## 53 6.9 3.1 4.9 1.5 versicolor  
## 54 5.5 2.3 4.0 1.3 versicolor  
## 55 6.5 2.8 4.6 1.5 versicolor  
## 56 5.7 2.8 4.5 1.3 versicolor  
## 57 6.3 3.3 4.7 1.6 versicolor  
## 58 4.9 2.4 3.3 1.0 versicolor  
## 59 6.6 2.9 4.6 1.3 versicolor  
## 60 5.2 2.7 3.9 1.4 versicolor  
## 61 5.0 2.0 3.5 1.0 versicolor  
## 62 5.9 3.0 4.2 1.5 versicolor  
## 63 6.0 2.2 4.0 1.0 versicolor  
## 64 6.1 2.9 4.7 1.4 versicolor  
## 65 5.6 2.9 3.6 1.3 versicolor  
## 66 6.7 3.1 4.4 1.4 versicolor  
## 67 5.6 3.0 4.5 1.5 versicolor  
## 68 5.8 2.7 4.1 1.0 versicolor  
## 69 6.2 2.2 4.5 1.5 versicolor  
## 70 5.6 2.5 3.9 1.1 versicolor  
## 71 5.9 3.2 4.8 1.8 versicolor  
## 72 6.1 2.8 4.0 1.3 versicolor  
## 73 6.3 2.5 4.9 1.5 versicolor  
## 74 6.1 2.8 4.7 1.2 versicolor  
## 75 6.4 2.9 4.3 1.3 versicolor  
## 76 6.6 3.0 4.4 1.4 versicolor  
## 77 6.8 2.8 4.8 1.4 versicolor  
## 78 6.7 3.0 5.0 1.7 versicolor  
## 79 6.0 2.9 4.5 1.5 versicolor  
## 80 5.7 2.6 3.5 1.0 versicolor  
## 81 5.5 2.4 3.8 1.1 versicolor  
## 82 5.5 2.4 3.7 1.0 versicolor  
## 83 5.8 2.7 3.9 1.2 versicolor  
## 84 6.0 2.7 5.1 1.6 versicolor  
## 85 5.4 3.0 4.5 1.5 versicolor  
## 86 6.0 3.4 4.5 1.6 versicolor  
## 87 6.7 3.1 4.7 1.5 versicolor  
## 88 6.3 2.3 4.4 1.3 versicolor  
## 89 5.6 3.0 4.1 1.3 versicolor  
## 90 5.5 2.5 4.0 1.3 versicolor  
## 91 5.5 2.6 4.4 1.2 versicolor  
## 92 6.1 3.0 4.6 1.4 versicolor  
## 93 5.8 2.6 4.0 1.2 versicolor  
## 94 5.0 2.3 3.3 1.0 versicolor  
## 95 5.6 2.7 4.2 1.3 versicolor  
## 96 5.7 3.0 4.2 1.2 versicolor  
## 97 5.7 2.9 4.2 1.3 versicolor  
## 98 6.2 2.9 4.3 1.3 versicolor  
## 99 5.1 2.5 3.0 1.1 versicolor  
## 100 5.7 2.8 4.1 1.3 versicolor  
## 101 6.3 3.3 6.0 2.5 virginica  
## 102 5.8 2.7 5.1 1.9 virginica  
## 103 7.1 3.0 5.9 2.1 virginica  
## 104 6.3 2.9 5.6 1.8 virginica  
## 105 6.5 3.0 5.8 2.2 virginica  
## 106 7.6 3.0 6.6 2.1 virginica  
## 107 4.9 2.5 4.5 1.7 virginica  
## 108 7.3 2.9 6.3 1.8 virginica  
## 109 6.7 2.5 5.8 1.8 virginica  
## 110 7.2 3.6 6.1 2.5 virginica  
## 111 6.5 3.2 5.1 2.0 virginica  
## 112 6.4 2.7 5.3 1.9 virginica  
## 113 6.8 3.0 5.5 2.1 virginica  
## 114 5.7 2.5 5.0 2.0 virginica  
## 115 5.8 2.8 5.1 2.4 virginica  
## 116 6.4 3.2 5.3 2.3 virginica  
## 117 6.5 3.0 5.5 1.8 virginica  
## 118 7.7 3.8 6.7 2.2 virginica  
## 119 7.7 2.6 6.9 2.3 virginica  
## 120 6.0 2.2 5.0 1.5 virginica  
## 121 6.9 3.2 5.7 2.3 virginica  
## 122 5.6 2.8 4.9 2.0 virginica  
## 123 7.7 2.8 6.7 2.0 virginica  
## 124 6.3 2.7 4.9 1.8 virginica  
## 125 6.7 3.3 5.7 2.1 virginica  
## 126 7.2 3.2 6.0 1.8 virginica  
## 127 6.2 2.8 4.8 1.8 virginica  
## 128 6.1 3.0 4.9 1.8 virginica  
## 129 6.4 2.8 5.6 2.1 virginica  
## 130 7.2 3.0 5.8 1.6 virginica  
## 131 7.4 2.8 6.1 1.9 virginica  
## 132 7.9 3.8 6.4 2.0 virginica  
## 133 6.4 2.8 5.6 2.2 virginica  
## 134 6.3 2.8 5.1 1.5 virginica  
## 135 6.1 2.6 5.6 1.4 virginica  
## 136 7.7 3.0 6.1 2.3 virginica  
## 137 6.3 3.4 5.6 2.4 virginica  
## 138 6.4 3.1 5.5 1.8 virginica  
## 139 6.0 3.0 4.8 1.8 virginica  
## 140 6.9 3.1 5.4 2.1 virginica  
## 141 6.7 3.1 5.6 2.4 virginica  
## 142 6.9 3.1 5.1 2.3 virginica  
## 143 5.8 2.7 5.1 1.9 virginica  
## 144 6.8 3.2 5.9 2.3 virginica  
## 145 6.7 3.3 5.7 2.5 virginica  
## 146 6.7 3.0 5.2 2.3 virginica  
## 147 6.3 2.5 5.0 1.9 virginica  
## 148 6.5 3.0 5.2 2.0 virginica  
## 149 6.2 3.4 5.4 2.3 virginica  
## 150 5.9 3.0 5.1 1.8 virginica

## DATASET DESCRIPTION:

This famous Fisher’s or Anderson’s iris data set gives the measurements in centimeters of the variables sepal length, sepal width, petal length and petal width, respectively, for 50 flowers from each of 3 species of iris. The species are Iris setosa, Iris versicolor, and Iris virginica.

# DIMENSION OF THE DATASET:

dim(iris)

## [1] 150 5

Here we can see that our dataset has 150 rows and 5 columns.

# FIRST 6 OBSERVATIONS:

head(iris)

## Sepal.Length Sepal.Width Petal.Length Petal.Width Species  
## 1 5.1 3.5 1.4 0.2 setosa  
## 2 4.9 3.0 1.4 0.2 setosa  
## 3 4.7 3.2 1.3 0.2 setosa  
## 4 4.6 3.1 1.5 0.2 setosa  
## 5 5.0 3.6 1.4 0.2 setosa  
## 6 5.4 3.9 1.7 0.4 setosa

Here we can see the first 6 observations of the iris dataset.

# LAST 6 OBSERVATIONS:

tail(iris)

## Sepal.Length Sepal.Width Petal.Length Petal.Width Species  
## 145 6.7 3.3 5.7 2.5 virginica  
## 146 6.7 3.0 5.2 2.3 virginica  
## 147 6.3 2.5 5.0 1.9 virginica  
## 148 6.5 3.0 5.2 2.0 virginica  
## 149 6.2 3.4 5.4 2.3 virginica  
## 150 5.9 3.0 5.1 1.8 virginica

Here we can see the last 6 observations of the iris dataset.

# DESCRIPTIVE STATISTICS:

## SUMMARY OF THE DATASET:

summary(iris)

## Sepal.Length Sepal.Width Petal.Length Petal.Width   
## Min. :4.300 Min. :2.000 Min. :1.000 Min. :0.100   
## 1st Qu.:5.100 1st Qu.:2.800 1st Qu.:1.600 1st Qu.:0.300   
## Median :5.800 Median :3.000 Median :4.350 Median :1.300   
## Mean :5.843 Mean :3.057 Mean :3.758 Mean :1.199   
## 3rd Qu.:6.400 3rd Qu.:3.300 3rd Qu.:5.100 3rd Qu.:1.800   
## Max. :7.900 Max. :4.400 Max. :6.900 Max. :2.500   
## Species   
## setosa :50   
## versicolor:50   
## virginica :50   
##   
##   
##

Here we can see the minimum value, the first quartile, median (second quartile), third quartile , mean and the maximum value of each of the 5 columns of the data set. Let our target variable be “sepal length”.

# IMPORTING LIBRARY:

library(BSDA)

## Loading required package: lattice

##   
## Attaching package: 'BSDA'

## The following object is masked from 'package:datasets':  
##   
## Orange

library(dplyr)

##   
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':  
##   
## filter, lag

## The following objects are masked from 'package:base':  
##   
## intersect, setdiff, setequal, union

Here we install the “dplyr” (data set plier) package for making data manipulation easier the “BSDA” (Basic Statistics and Data Analysis) package.

# POPULATION 1:

population1=filter(iris, Species=="virginica")  
population1

## Sepal.Length Sepal.Width Petal.Length Petal.Width Species  
## 1 6.3 3.3 6.0 2.5 virginica  
## 2 5.8 2.7 5.1 1.9 virginica  
## 3 7.1 3.0 5.9 2.1 virginica  
## 4 6.3 2.9 5.6 1.8 virginica  
## 5 6.5 3.0 5.8 2.2 virginica  
## 6 7.6 3.0 6.6 2.1 virginica  
## 7 4.9 2.5 4.5 1.7 virginica  
## 8 7.3 2.9 6.3 1.8 virginica  
## 9 6.7 2.5 5.8 1.8 virginica  
## 10 7.2 3.6 6.1 2.5 virginica  
## 11 6.5 3.2 5.1 2.0 virginica  
## 12 6.4 2.7 5.3 1.9 virginica  
## 13 6.8 3.0 5.5 2.1 virginica  
## 14 5.7 2.5 5.0 2.0 virginica  
## 15 5.8 2.8 5.1 2.4 virginica  
## 16 6.4 3.2 5.3 2.3 virginica  
## 17 6.5 3.0 5.5 1.8 virginica  
## 18 7.7 3.8 6.7 2.2 virginica  
## 19 7.7 2.6 6.9 2.3 virginica  
## 20 6.0 2.2 5.0 1.5 virginica  
## 21 6.9 3.2 5.7 2.3 virginica  
## 22 5.6 2.8 4.9 2.0 virginica  
## 23 7.7 2.8 6.7 2.0 virginica  
## 24 6.3 2.7 4.9 1.8 virginica  
## 25 6.7 3.3 5.7 2.1 virginica  
## 26 7.2 3.2 6.0 1.8 virginica  
## 27 6.2 2.8 4.8 1.8 virginica  
## 28 6.1 3.0 4.9 1.8 virginica  
## 29 6.4 2.8 5.6 2.1 virginica  
## 30 7.2 3.0 5.8 1.6 virginica  
## 31 7.4 2.8 6.1 1.9 virginica  
## 32 7.9 3.8 6.4 2.0 virginica  
## 33 6.4 2.8 5.6 2.2 virginica  
## 34 6.3 2.8 5.1 1.5 virginica  
## 35 6.1 2.6 5.6 1.4 virginica  
## 36 7.7 3.0 6.1 2.3 virginica  
## 37 6.3 3.4 5.6 2.4 virginica  
## 38 6.4 3.1 5.5 1.8 virginica  
## 39 6.0 3.0 4.8 1.8 virginica  
## 40 6.9 3.1 5.4 2.1 virginica  
## 41 6.7 3.1 5.6 2.4 virginica  
## 42 6.9 3.1 5.1 2.3 virginica  
## 43 5.8 2.7 5.1 1.9 virginica  
## 44 6.8 3.2 5.9 2.3 virginica  
## 45 6.7 3.3 5.7 2.5 virginica  
## 46 6.7 3.0 5.2 2.3 virginica  
## 47 6.3 2.5 5.0 1.9 virginica  
## 48 6.5 3.0 5.2 2.0 virginica  
## 49 6.2 3.4 5.4 2.3 virginica  
## 50 5.9 3.0 5.1 1.8 virginica

## POPULATION 1 DESCRIPTION:

Here we can see that we have filtered out only the “virginica” species from the iris data set.

## DIMENSION OF POPULATION 1:

dim(population1)

## [1] 50 5

Here we can see that the filtered out “virginica” species has a total of 50 observations.

# FINDING TARGET VARIABLE OF POPULATION 1:

p1 = population1$Sepal.Length  
p1

## [1] 6.3 5.8 7.1 6.3 6.5 7.6 4.9 7.3 6.7 7.2 6.5 6.4 6.8 5.7 5.8 6.4 6.5 7.7 7.7  
## [20] 6.0 6.9 5.6 7.7 6.3 6.7 7.2 6.2 6.1 6.4 7.2 7.4 7.9 6.4 6.3 6.1 7.7 6.3 6.4  
## [39] 6.0 6.9 6.7 6.9 5.8 6.8 6.7 6.7 6.3 6.5 6.2 5.9

## MEAN OF THE POPULATION 1 OF TARGET VARIABLE:

mean(p1)

## [1] 6.588

Here we have the mean of our population 1 (with “sepal length of virginica species” as target variable) is 6.588.

# SD OF THE POPULATION 1 OF TARGET VARIABLE:

sd(p1)

## [1] 0.6358796

Here we have the sd of our population 1 (with “sepal length of virginica species” as target variable) is 0.6358796.

# SAMPLE 1:

samplesize1 = 25  
s1 = sample(p1, 25, replace = FALSE)  
s1

## [1] 6.4 6.3 6.9 6.4 5.8 6.8 6.3 6.7 6.1 6.4 6.9 6.3 7.4 6.3 7.7 6.7 7.2 7.3 4.9  
## [20] 6.0 6.3 6.2 7.1 6.7 6.0

Here we can the see the 25 “sepal length” samples chosen by simple random sampling by without replacement technique from the population of 50 “virginica” observations.

# POPULATION 2:

population2=filter(iris,Species=="setosa")  
population2

## Sepal.Length Sepal.Width Petal.Length Petal.Width Species  
## 1 5.1 3.5 1.4 0.2 setosa  
## 2 4.9 3.0 1.4 0.2 setosa  
## 3 4.7 3.2 1.3 0.2 setosa  
## 4 4.6 3.1 1.5 0.2 setosa  
## 5 5.0 3.6 1.4 0.2 setosa  
## 6 5.4 3.9 1.7 0.4 setosa  
## 7 4.6 3.4 1.4 0.3 setosa  
## 8 5.0 3.4 1.5 0.2 setosa  
## 9 4.4 2.9 1.4 0.2 setosa  
## 10 4.9 3.1 1.5 0.1 setosa  
## 11 5.4 3.7 1.5 0.2 setosa  
## 12 4.8 3.4 1.6 0.2 setosa  
## 13 4.8 3.0 1.4 0.1 setosa  
## 14 4.3 3.0 1.1 0.1 setosa  
## 15 5.8 4.0 1.2 0.2 setosa  
## 16 5.7 4.4 1.5 0.4 setosa  
## 17 5.4 3.9 1.3 0.4 setosa  
## 18 5.1 3.5 1.4 0.3 setosa  
## 19 5.7 3.8 1.7 0.3 setosa  
## 20 5.1 3.8 1.5 0.3 setosa  
## 21 5.4 3.4 1.7 0.2 setosa  
## 22 5.1 3.7 1.5 0.4 setosa  
## 23 4.6 3.6 1.0 0.2 setosa  
## 24 5.1 3.3 1.7 0.5 setosa  
## 25 4.8 3.4 1.9 0.2 setosa  
## 26 5.0 3.0 1.6 0.2 setosa  
## 27 5.0 3.4 1.6 0.4 setosa  
## 28 5.2 3.5 1.5 0.2 setosa  
## 29 5.2 3.4 1.4 0.2 setosa  
## 30 4.7 3.2 1.6 0.2 setosa  
## 31 4.8 3.1 1.6 0.2 setosa  
## 32 5.4 3.4 1.5 0.4 setosa  
## 33 5.2 4.1 1.5 0.1 setosa  
## 34 5.5 4.2 1.4 0.2 setosa  
## 35 4.9 3.1 1.5 0.2 setosa  
## 36 5.0 3.2 1.2 0.2 setosa  
## 37 5.5 3.5 1.3 0.2 setosa  
## 38 4.9 3.6 1.4 0.1 setosa  
## 39 4.4 3.0 1.3 0.2 setosa  
## 40 5.1 3.4 1.5 0.2 setosa  
## 41 5.0 3.5 1.3 0.3 setosa  
## 42 4.5 2.3 1.3 0.3 setosa  
## 43 4.4 3.2 1.3 0.2 setosa  
## 44 5.0 3.5 1.6 0.6 setosa  
## 45 5.1 3.8 1.9 0.4 setosa  
## 46 4.8 3.0 1.4 0.3 setosa  
## 47 5.1 3.8 1.6 0.2 setosa  
## 48 4.6 3.2 1.4 0.2 setosa  
## 49 5.3 3.7 1.5 0.2 setosa  
## 50 5.0 3.3 1.4 0.2 setosa

## POPULATION 2 DESCRIPTION:

Here we can see that we have filtered out only the “setosa” species from the iris dataset.

## DIMENSION OF POPULATION 1:

dim(population2)

## [1] 50 5

Here we can see that the filtered out “setosa” species has a total of 50 observations.

# FINDING TARGET VARIABLE FROM POPULATION 2:

p2 = population2$Sepal.Length  
p2

## [1] 5.1 4.9 4.7 4.6 5.0 5.4 4.6 5.0 4.4 4.9 5.4 4.8 4.8 4.3 5.8 5.7 5.4 5.1 5.7  
## [20] 5.1 5.4 5.1 4.6 5.1 4.8 5.0 5.0 5.2 5.2 4.7 4.8 5.4 5.2 5.5 4.9 5.0 5.5 4.9  
## [39] 4.4 5.1 5.0 4.5 4.4 5.0 5.1 4.8 5.1 4.6 5.3 5.0

## MEAN OF THE POPULATION 2 OF TARGET VARIABLE:

mean(p2)

## [1] 5.006

Here we have the mean of our population 2 (with “sepal length of setosa species” as target variable) is 5.006.

# SD OF THE POPULATION 2 OF TARGET VARIABLE:

sd(p2)

## [1] 0.3524897

Here we have the sd of our population 2 (with “sepal length of virginica species” as target variable) is 0.3524897.

# SAMPLE 2:

samplesize2 = 25  
s2 = sample(p2, 25, replace = FALSE)  
s2

## [1] 5.4 5.7 5.4 4.7 5.2 5.1 5.0 4.8 5.2 4.8 4.9 5.7 4.6 5.5 4.3 5.1 4.8 4.8 4.6  
## [20] 5.1 5.0 5.1 4.9 4.9 5.3

Here we can the see the 25 “sepal length” samples chosen by simple random sampling by without replacement technique from the population of 50 “setosa” observations.

# Z TEST

# TWO TAILED:

## TO TEST WHETHER THE TWO MEANS ARE EQUAL OR NOT:

H0: mean1 = mean2 H1: mean1 != mean2

z.test (x=s1, y=s2, alternative = "two.sided", mu=0, sigma.x = sd(p1), sigma.y = sd(p2), conf.level = 0.95)

##   
## Two-sample z-Test  
##   
## data: s1 and s2  
## z = 10.233, p-value < 2.2e-16  
## alternative hypothesis: true difference in means is not equal to 0  
## 95 percent confidence interval:  
## 1.203004 1.772996  
## sample estimates:  
## mean of x mean of y   
## 6.524 5.036

Here we tried to do a two tailed Z-test where our null hypothesis is both mean are equal and our alternative hypothesis is both means are not equal. After proceeding with the test, we can see that our p value is less than 0.05, thus, we reject the null hypothesis as there is enough evidence to suggest a significant difference.

# ONE TAILED:

## TO TEST WHETHER MEAN 1 IS LESS THAN MEAN 2 OR NOT:

H0: mean1 = mean2 H1: mean1 < mean2

z.test (x=s1, y=s2, alternative = "less", mu=0, sigma.x = sd(p1), sigma.y = sd(p2), conf.level = 0.95)

##   
## Two-sample z-Test  
##   
## data: s1 and s2  
## z = 10.233, p-value = 1  
## alternative hypothesis: true difference in means is less than 0  
## 95 percent confidence interval:  
## NA 1.727176  
## sample estimates:  
## mean of x mean of y   
## 6.524 5.036

Here we tried to do a one tailed Z-test where our null hypothesis is both means are equal and our alternative hypothesis is mean 1 is less than mean 2. After proceeding with the test, we can see that our p value is greater than 0.05, thus, we accept the null hypothesis as there is not enough evidence to suggest a significant difference.

## TO TEST WHETHER MEAN 1 IS GREATER THAN MEAN 2 OR NOT:

H0: mean1 = mean2 H1: mean1 > mean2

z.test (x=s1, y=s2, alternative = "greater", mu=0, sigma.x = sd(p1), sigma.y = sd(p2), conf.level = 0.95)

##   
## Two-sample z-Test  
##   
## data: s1 and s2  
## z = 10.233, p-value < 2.2e-16  
## alternative hypothesis: true difference in means is greater than 0  
## 95 percent confidence interval:  
## 1.248824 NA  
## sample estimates:  
## mean of x mean of y   
## 6.524 5.036

Here we tried to do a one tailed Z-test where our null hypothesis is both mean are equal and our alternative hypothesis is where mean 1 is greater than mean 2. After proceeding with the test, we can see that our p value is less than 0.05, thus, we reject the null hypothesis as there is enough evidence to suggest a significant difference.