Statistics 140 Winter 17

Hand-In Assignment #2

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Last 4 Digits of SID: 7194

1. Studies have suggested that the percentage of undergraduate college students that prefer to study in a room with background music is 60%. A Statistics professor believes that the percentage is actually lower. To check the professor’s claim, a random sample of 25 undergraduate students was selected. It was found that 13 of the students preferred to study in a room with background music. Perform the appropriate test using α = 0.05.

**H0 = p ≥ 0.60**

**Ha = p < 0.60**

R Code:

> prop.test(x=13,n=25,p=0.60, alternative = “less”)

1-sample proportions test with continuity correction

data: 13 out of 25, null probability 0.6

X-squared = 0.375, df = 1, p-value = 0.2701

alternative hypothesis: true p is less than 0.6

95 percent confidence interval:

0.0000000 0.6918898

sample estimates:

p

0.52

**TS: n=25, T = 13, α = 0.05**

**X2 = 0.375 with p-value = 0.2701**

**Since the p-value of 0.2701 is greater than α =0.05, we do not reject H0**

**There is insufficient evidence to conclude that the percentage of students that prefer to study in a room with background music is significantly lower than 60%.**

1. A statistician (Linda1), with Icelandic heritage, was interested in determining whether the median height of eruptions of the famous *Strokkur Geyser* in Iceland is 86 feet. Linda obtained a random sample of 14 eruptions and recorded the following data: (The data has been saved in geyser1m.mtw and geyser1d.dat.)
   1. Test whether the median height is 86 feet. (8 pts)

**H0: The median height = 86**

**Ha: The median height ≠ 86**

R Code:

> z<-read.csv("C:\\Users\\Sarah\\Downloads\\geyser1d.dat")

> attach(z)

> names(z)

[1] “height”

> height

[1] 84.0 85.0 82.5 86.2 86.0 85.0 85.2 86.1 86.0 89.0 90.4 85.0 86.3 54.0

> #there are 7 obs. below 86 and 2 that are 86.

> #make the sample size two smaller because of the repeats

> binom.test(x=7,n=12,alternative ="two.sided")

Exact binomial test

data: 7 and 12

number of successes = 7, number of trials = 12, p-value = 0.7744

alternative hypothesis: true probability of success is not equal to 0.5

95 percent confidence interval:

0.2766697 0.8483478

sample estimates:

probability of success

0.5833333

**TS: n=14-2 = 12 because of the 2 86.0 values, Number of obs below 86.0 = 7**

**p-value = 0.7744**

**Since the p-value of 0.7744 is greater than α = 0.05, We do not reject H0**

**There is insufficient evidence to conclude that the median weight is significantly different from 86 feet.**

* 1. Test whether the 70th percentile (quantile) exceeds 88 feet. (7 pts)

**H0: The 70th quartile ≤ 88 feet**

**Ha: The 70th quartile > 88 feet**

R Code:

> z<-read.csv("C:\\Users\\Sarah\\Downloads\\geyser1d.dat")

> attach(z)

> height

[1] 84.0 85.0 82.5 86.2 86.0 85.0 85.2 86.1 86.0 89.0 90.4 85.0 86.3 54.0

> library(BSDA)

Loading required package: e1071

Loading required package: lattice

Attaching package: ‘BSDA’

The following object is masked from ‘package:datasets’:

Orange

> SIGN.test(height,md=88,alternative="greater")

One-sample Sign-Test

data: height

s = 2, p-value = 0.9991

alternative hypothesis: true median is greater than 88

95 percent confidence interval:

85 Inf

sample estimates:

median of x

85.6

Conf.Level L.E.pt U.E.pt

Lower Achieved CI 0.9102 85 Inf

Interpolated CI 0.9500 85 Inf

Upper Achieved CI 0.9713 85 Inf

**TS: n=14, Number of obs above 88 = 2**

**p-value = 0.9991**

**Since the p-value of 0.9991 is greater than α = 0.05, We do not reject H0**

**There is insufficient evidence to conclude that the 70th quartile is significantly different from 88 feet.**

1. The number of defective items produced by two production lines was recorded for 13 consecutive days. The following data was recorded:

Day 1 2 3 4 5 6 7 8 9 10 11 12 13

Line 1 172 201 185 206 200 192 192 177 142 190 169 161 200

Line 2 169 172 179 159 193 187 192 174 170 182 179 169 210

Perform the appropriate nonparametric test to determine whether there is a significant difference in the number of defective items produced between the two production lines. The data has been saved in a data file named defect1 w17.dat and a Minitab worksheet named defect1m.mtw. Use α = 0.05.

**H0: The number of defective items is the same (p = 0.50)**

**Ha: The number of defective items is not the same (p ≠ 0.50)**

R Code:

> line1<-c(172,201,185,206,200,192,192,177,142,190,169,161,200)

> line2<-c(169,172,179,159,193,187,192,174,170,182,179,169,210)

> diff=line1-line2

> diff

[1] 3 29 6 47 7 5 0 3 -28 8 -10 -8 -10

> library(BSDA)

Loading required package: e1071

Loading required package: lattice

Attaching package: ‘BSDA’

The following object is masked from ‘package:datasets’:

Orange

> SIGN.test(diff,md=0,alternative = "two.sided")

One-sample Sign-Test

data: diff1

s = 8, p-value = 0.3877

alternative hypothesis: true median is not equal to 0

95 percent confidence interval:

-9.211189 7.605594

sample estimates:

median of x

3

Conf.Level L.E.pt U.E.pt

Lower Achieved CI 0.9077 -8.0000 7.0000

Interpolated CI 0.9500 -9.2112 7.6056

Upper Achieved CI 0.9775 -10.0000 8.0000

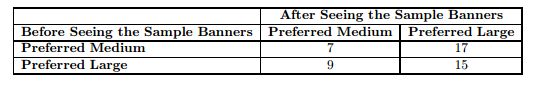
**TS: T = number of positive numbers = 8**

**p-value = 0.3877**

**Since the p-value = 0.3877 is greater than α = 0.05, we do not reject H0**

**There is insufficient evidence to conclude that one line has more defective items than the other.**

1. Brandon is the current President of the UCR chapter of Mu Sigma Rho (µσρ), the national statistics honor society. The organization is in the process of creating a new banner to be displayed at future Mu Sigma Rho (µσρ) events. The organization has a choice of a medium or a large banner size. Brandon was interested in determining whether members would change their mind once they saw the actual sizes of banners. Brandon obtained samples of each size of banner. He recorded banner size preference of the members before he showed the sample banners and then again after he showed the sample banners. The followed summary data was recorded:



Perform the appropriate nonparametric test using α = 0.05.

**H0: Seeing the sample banner did not change banner size preference**

**Ha: Seeing the sample banner did change banner size preference**

R Code:

> z<-matrix(c(7,17,9,15),nrow=2,ncol=2,byrow=TRUE)

> z

[,1] [,2]

[1,] 7 17

[2,] 9 15

> mcnemar.test(z)

McNemar's Chi-squared test with continuity correction

data: z

McNemar's chi-squared = 1.8846, df = 1, p-value = 0.1698

**TS: X2 = 1.8846 with p-value = 0.1698**

**Since the p-value of 0.1698 is greater than α = 0.05, we do not reject H0**

**There is insufficient evidence to indicate that seeing the sample banners altered banner size preference.**

1. Brandon was hired by a local corporation to determine whether there is a significant correlation between employee sales and the number of years the employee has been with the corporation. He selected a random sample of 12 employees and recorded the following information:



Perform the appropriate nonparametric test to determine whether the data supports significant correlation between employee sales and number of years the employee has been with the company. Use α = 0.05. (The data has been saved in employee2 w17.dat)

**H0: Employee sales and number of years the employee has worked are not correlated**

**Ha: Employee sales and number of years the employee has worked are correlated**

R Code:

> em<-read.table("C:\\Users\\Sarah\\Downloads\\EMPLOYEE2\_w17.dat", header=TRUE)

> em #Read table

> attach(em)

> names(em)

[1] "Emp" "Sales" "Years"

> sorted=em[order(Years),]

> sorted #Read sorted

> attach(sorted)

The following objects are masked from em:

Emp, Sales, Years

> names(sorted)

[1] "Emp" "Sales" "Years"

> library(randtests)

> cox.stuart.test(Sales)

Cox Stuart test

data: Sales

statistic = 5, n = 6, p-value = 0.2188

alternative hypothesis: non randomness

**TS: T=5 with p-value = 0.2188**

**Since the p-value of 0.2188 is greater than α = 0.05, we do not reject H0**

**There is insufficient evidence to indicate a correlation between employee sales and the number of years the employee has been with the company.**