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R version 4.0.2 (2020-06-22) -- "Taking Off Again"
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Platform: x86_64-w64-mingw32/x64 (64-bit)

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> #name-Amlan Shivam Nayak
> #Reg no.-19BCD7143
> #date-7/12/20
> #Applied statistics mat1011
> #Lab-L1
> #An outbreak of Salmonella related illness was attributed to ice produced at
>  #a certain factory. Scientists measured the level of Salmonella in 9
>  #randomly sampled batches ice cream. The levels in mpn.gm were :
>  #0.593 0.142 0.329 0.691 0.231 0.793 0.519 0.392 0.418
>  #Is there any evidence that the mean level of salmonella in the ice cream
>  #greater than 0.3 mpn/gm ?
>  #H0:mu<=0.3
>  #H1:mu0.3
>  #Right tailed test
>  x=c(0.593,0.142,0.329,0.691,0.231,0.793,0.519,0.392,0.418)
>  t.test(x,mu=0.3,alternative="greater")

        One Sample t-test

data:  x
t = 2.2051, df = 8, p-value = 0.02927
alternative hypothesis: true mean is greater than 0.3
95 percent confidence interval:
 0.3245133       Inf
sample estimates:
mean of x
0.4564444

>  One Sample t-test
Error: unexpected symbol in " One Sample"
> data: x
Error in data:x : NA/NaN argument
In addition: Warning message:
In data:x : numerical expression has 9 elements: only the first used
> t = 2.2051, df = 8, p-value = 0.02927
Error: unexpected ',' in "t = 2.2051,"
> alternative hypothesis: true mean is greater than 0.3
Error: unexpected symbol in "alternative hypothesis"
> 95 percent confidence interval:
Error: unexpected symbol in "95 percent"
>  0.3245133 Inf
Error: unexpected numeric constant in " 0.3245133 Inf"
> sample estimates:
Error: unexpected symbol in "sample estimates"
> mean of x
Error: unexpected symbol in "mean of"
> 0.4564444
[1] 0.4564444
>  #pvalue<alpha=0.5
>  #Reject H0
>  #There is sufficient evidence that the mean level of Salmonella is greater
>  #than 0.3
>  #Suppose that 10 volunteers have taken an intelligence test. Here are the
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>  #results obtained. The average score of entire population is 75 in the same
>  #test. Is there any significant difference between the sample and population
>  #means, assuming that the variance of the population is not known.
>  #Scores : 65,78,88,55,48,95,66,57,79,81
>  #H0:mu=75
>  #H1:mu is not equal to 75
>  x=c(65,78,88,55,48,95,66,57,79,81)
>  t.test(x,mu=75,alternative="two.sided")

        One Sample t-test

data:  x
t = -0.78303, df = 9, p-value = 0.4537
alternative hypothesis: true mean is not equal to 75
95 percent confidence interval:
 60.22187 82.17813
sample estimates:
mean of x
     71.2

>  One Sample t-test
Error: unexpected symbol in " One Sample"
> data: x
Error in data:x : NA/NaN argument
In addition: Warning message:
In data:x : numerical expression has 10 elements: only the first used
> t = -0.78303, df = 9, p-value = 0.4537
Error: unexpected ',' in "t = -0.78303,"
> R Console Page 2
Error: unexpected symbol in "R Console"
> alternative hypothesis: true mean is not equal to 75
Error: unexpected symbol in "alternative hypothesis"
> 95 percent confidence interval:
Error: unexpected symbol in "95 percent"
>  60.22187 82.17813
Error: unexpected numeric constant in " 60.22187 82.17813"
> sample estimates:
Error: unexpected symbol in "sample estimates"
> mean of x
Error: unexpected symbol in "mean of"
>  71.2
[1] 71.2
>  #pvaluealpha=0.05
>  #Accept H0: There is no significant difference between sample mean and
>  #population mean.
>  #HW
>  #One problem from Mayer book or some other sources
>  #try left tailed test.
>  mu=71.2
>  sd(x)
[1] 15.34637
> [1] 15.34637
Error: unexpected '[' in "["
>  x1<-rnorm(10,mean=71.2,sd=15.34637)
>  x1
 [1]  81.19945  83.04234  69.32159  52.49277  74.70743  56.13057  61.64727
 [8]  80.39532 104.94237  72.73213
>  [1] 75.96110 78.54377 85.72119 73.84867 96.69831 61.18057 75.62806
Error: unexpected '[' in " ["
>  [8] 108.39588 61.83122 84.77760
Error: unexpected '[' in " ["
>  t.test(x1,mu=75,alternative="two.sided")

        One Sample t-test

data:  x1
t = -0.27789, df = 9, p-value = 0.7874
alternative hypothesis: true mean is not equal to 75
95 percent confidence interval:
 62.76190 84.56035
sample estimates:
mean of x
 73.66112
```

```
>  One Sample t-test
Error: unexpected symbol in " One Sample"
> data: x1
Error in data:x1 : NA/NaN argument
In addition: Warning message:
In data:x1 : numerical expression has 10 elements: only the first used
> t = 1.1446, df = 9, p-value = 0.2819
Error: unexpected ',' in "t = 1.1446,"
> alternative hypothesis: true mean is not equal to 75
Error: unexpected symbol in "alternative hypothesis"
> 95 percent confidence interval:
Error: unexpected symbol in "95 percent"
>  69.86554 90.65174
Error: unexpected numeric constant in " 69.86554 90.65174"
> sample estimates:
Error: unexpected symbol in "sample estimates"
> mean of x
Error: unexpected symbol in "mean of"
>  80.25864
[1] 80.25864
> #large health clinic and we are testing a new drug, Procardia,
> #whose work is to reduce hypertension. We find 13000
> #individuals with high systolic blood pressure (x¯=150 mmHg, SD=10 mmHg)
> #and we provide them Procardia for a month, and then measure their blood pressure again.
> #We find that the mean systolic blood pressure has decreased
> #to 144 mmHg with a standard deviation of 9 mmHg.
> set.seed(2820)
> pre_Treatment <- c(rnorm(2000, mean = 150, sd = 10))
> post_Treatment <- c(rnorm(2000, mean = 144, sd = 9))
> t.test(pre_Treatment, post_Treatment, paired = TRUE)

        Paired t-test

data:  pre_Treatment and post_Treatment
t = 20.789, df = 1999, p-value < 2.2e-16
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 5.593910 6.759259
sample estimates:
mean of the differences
               6.176585

>
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```
> #Experiment - 11
> #Date 8/12/2020
> #Slot Lab L1
> #Name: Amlan Nayak
> #Reg.No:19BCD7143
> #course: Applied statistics
> #Code: MAT1011
> #Problem 1
> #A school atheletics has taken a new instructor,want to test the effectiveness
> #of the new type of training proposed by hte new instructor comparing the
> #average time of 10 runners in the 100 meters.The results are given below.
> #(Time in seconds)
> #Before training
> #12.9 13.5 12.8 15.6 17.2 19.2 12.6 15.3 14.4 11.3
> #After training:
> #12.7 13.6 12.0 15.2 16.8 20.0 12.0 15.9 16.0 11.1
> # test the hypothesis that there is significant difference between before
> # and aftrt training
>
> x=c(12.9,13.5,12.8,15.6,17.2,19.2,12.6,15.3,14.4,11.3)
> y=c(12.7,13.6,12,15.2,16.8,20,12,15.9,16,11.1)
> #Null hypothesis H0:mu1=mu2
> #H1:mu1 is not equal to mu2
> t.test(x,y,mu=0,alternative="two.sided")

        Welch Two Sample t-test

data:  x and y
t = -0.043323, df = 17.653, p-value = 0.9659
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -2.478112  2.378112
sample estimates:
mean of x mean of y
    14.48     14.53

> t.test(x,y,mu=0,paired=TRUE,alternative="two.sided")

        Paired t-test

data:  x and y
t = -0.21331, df = 9, p-value = 0.8358
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -0.5802549  0.4802549
sample estimates:
mean of the differences
                  -0.05

> #pvalue>alpha=0.05 , Accept H0 there is no improvement
>
> #Problem 2
> #Suppose now that manager of the team fired the coach and take another
> #promising. We report the times of atheletes after the second training.
> #Before training:
> #12.9,13.5,12.8,15.6,17.2,19.2,12.6,15.3,14.4,11.3
> #After training:
> #12.0,12.2,11.2,13.0,15.0,15.8,12.2,13.4,12.9,11.0
> #test the hypothesis that there is an improvement in training
> #Null hypothesis H0: mu1-mu2<=0
> #Alternative hypothesis : mu1-mu2>0
> x=c(12.9,13.5,12.8,15.6,17.2,19.2,12.6,15.3,14.4,11.3)
> y=c(12.0,12.2,11.2,13.0,15.0,15.8,12.2,13.4,12.9,11.0)
> #Right tailed test
> t.test(x,y,paired=TRUE,alternative="greater")

        Paired t-test

data:  x and y
t = 5.2671, df = 9, p-value = 0.0002579
```

```
alternative hypothesis: true difference in means is greater than 0
95 percent confidence interval:
 1.049675      Inf
sample estimates:
mean of the differences
                   1.61

> #pvalue=0.0002579<alpha=0.05=Area of rejection region
> #reject H0: ther is an improvement in training
> #Left tailed test problem
> #Consider the paired data below that represents cholestrol levels in 10 men
> #before and after a certain medication.
> #Before (x)
> #237,289,257,228,303,275,262,304,244,233
> #After (y)
> #194,240,230,186,265,222,242,281,240,212
> # Test the claim that on average , the drug may not lower the cholestrol
> #in all men.
> #Test this at 5% level of significance
> #Null hypothesis H0:mu1>=mu2
> #Alternative hypothesis H1:mu1<=mu2
> #Left tailed test
> x=c(237,289,257,228,303,275,262,304,244,233)
> y=c(194,240,230,186,265,222,242,281,240,212)
> t.test(x,y,paired=TRUE,alternative="less")

        Paired t-test

data:  x and y
t = 6.5594, df = 9, p-value = 0.9999
alternative hypothesis: true difference in means is less than 0
95 percent confidence interval:
     -Inf 40.94289
sample estimates:
mean of the differences
                     32

> #pvalue>alpha=0.05 Accept H0 Medication lower the cholestrol
> #Experiment - 11  F-test
> #Try on problem paired t-test from mayer book
> #rnorm(n,mean=,sd=) generate n random samples
> #values for each sample
> #x=rnorm(n,mean=,sd=)
> #y=rnorm(n,mean=,sd=)
> #Five measurements of output of two units have gien the following
> #results(in kilpgrams per one hour) of operation.Assume that both the samples
> #have been obtained from nomral operations,test at 10% significance level if two
> #populations have same variance
> #UNIT A: 14.1 10.1 14.7 13.7 14.0
> #UNIT B: 14.0 14.5 13.7 12.7 14.1
> #H0:var1=var2
> #H1:var1 != var2
> x=c(14.1,10.1,14.7,13.7,14)
> y=c(14,14.5,13.7,12.7,14.1)
> var.test(x,y,alternative="two.sided")

        F test to compare two variances

data:  x and y
F = 7.3304, num df = 4, denom df = 4, p-value = 0.07954
alternative hypothesis: true ratio of variances is not equal to 1
95 percent confidence interval:
  0.7632268 70.4053799
sample estimates:
ratio of variances
          7.330435

> #Alpha=0.1
> #pvalue<alpha
> #Reject H0 population variances are not equal
```

```
> #At 5% level pvalue=0.07954>0.05=alpha Accept H0
> #Take on application problem from Mayer book on f-test
> #Related to right tailed test
>
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> # Taking two random samples
> A = c(16, 17, 25, 26, 32,
+           34, 38, 40, 42)
> B = c(600, 590, 590, 630, 610, 630)
> # var test in R
> var.test(A, B, alternative = "two.sided")

        F test to compare two variances

data:  A and B
F = 0.27252, num df = 8, denom df = 5, p-value = 0.1012
alternative hypothesis: true ratio of variances is not equal to 1
95 percent confidence interval:
 0.04033118 1.31282683
sample estimates:
ratio of variances
         0.2725248

>
```

```
R version 4.0.3 (2020-10-10) -- "Bunny-Wunnies Freak Out"
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> #experiment 12
> #slot LAb L1
> #Date 12 th Dec 2020
> #name Amlan Nayak
> #REGD NO:19BCD7143
> #The below table gives the distribution of students
> #according to the family type and anxiety level
> #Family type Anxiety level
> #  Low Normal HIgh
> #                   Low      Normal    HIgh
> #Joint Family       35      42        61
> #Nuclear family     48       51       68
> #test the null hypothesis that the family type
> #and the anxiety level are independent
> data<-matrix(c(35,42,61,48,51,68),ncol=3,byrow=T)
> data
     [,1] [,2] [,3]
[1,]   35   42   61
[2,]   48   51   68
> data<-matrix(c(35,42,61,48,51,68),ncol=3,nrow=2,byrow=T)
> data
     [,1] [,2] [,3]
[1,]   35   42   61
[2,]   48   51   68
> chisq.test(data)

        Pearson's Chi-squared test

data:  data
X-squared = 0.53441, df = 2, p-value = 0.7655

> #pvalue> alpha =0.05 Accept HO:Family type and anxiety
> #Level are independent
> #problem 2
> #test he null hpothesis that the type of drug and age grown
> #are independent for the following data from the excel
> data<-read.csv("C:\\Users\\HP\\Downloads\\chidata.csv")
> data
    PatientID   Drug Age.Group
1          P1 Drug A  Under 21
2          P2 Drug A  Under 21
3          P3 Drug A  Under 21
4          P4 Drug A  Under 21
5          P5 Drug A  21 to 55
6          P6 Drug A  21 to 55
7          P7 Drug A  21 to 55
8          P8 Drug A  21 to 55
9          P9 Drug A   Over 55
10        P10 Drug A   Over 55
```

```
11        P11 Drug A   Over 55
12        P12 Drug A   Over 55
13        P13 Drug B  Under 21
14        P14 Drug B  Under 21
15        P15 Drug B  Under 21
16        P16 Drug B  Under 21
17        P17 Drug B  21 to 55
18        P18 Drug B  21 to 55
19        P19 Drug B  21 to 55
20        P20 Drug B  21 to 55
21        P21 Drug B   Over 55
22        P22 Drug B   Over 55
23        P23 Drug B   Over 55
24        P24 Drug B   Over 55
25        P25 Drug C  Under 21
26        P26 Drug C  Under 21
27        P27 Drug C  Under 21
28        P28 Drug C  Under 21
29        P29 Drug C  21 to 55
30        P30 Drug C  21 to 55
31        P31 Drug C  21 to 55
32        P32 Drug C  21 to 55
33        P33 Drug C   Over 55
34        P34 Drug C   Over 55
35        P35 Drug C   Over 55
36        P36 Drug C   Over 55
37            Drug A  21 to 55
38            Drug A  21 to 55
39            Drug A  21 to 55
40            Drug A  21 to 55
41            Drug A   Over 55
42            Drug A   Over 55
43            Drug A   Over 55
44            Drug A   Over 55
45            Drug A   Over 55
46            Drug A   Over 55
47            Drug A   Over 55
48            Drug A   Over 55
49            Drug B  Under 21
50            Drug B  Under 21
51            Drug B  Under 21
52            Drug B  Under 21
53            Drug B   Over 55
54            Drug B   Over 55
55            Drug B   Over 55
56            Drug B   Over 55
57            Drug B   Over 55
58            Drug B   Over 55
59            Drug B   Over 55
60            Drug B   Over 55
61            Drug B   Over 55
62            Drug B   Over 55
63            Drug B   Over 55
64            Drug B   Over 55
65            Drug B   Over 55
66            Drug B   Over 55
67            Drug C   Over 55
68            Drug C   Over 55
69            Drug C   Over 55
70            Drug C   Over 55
71            Drug C   Over 55
72            Drug C   Over 55
73            Drug C  Under 21
74            Drug C  Under 21
75            Drug C  Under 21
76            Drug C  Under 21
77            Drug C  Under 21
78            Drug C  Under 21
79            Drug C  Under 21
80            Drug C  Under 21
```

```
81             Drug C  Under 21
82             Drug C  Under 21
83             Drug C  Under 21
84             Drug C  Under 21
85             Drug C  Under 21
86             Drug C  Under 21
87             Drug C  Under 21
88             Drug C  Under 21
89             Drug C  Under 21
90             Drug C  Under 21
91             Drug C  Under 21
92             Drug C  Under 21
93             Drug C   Over 55
94             Drug A  Under 21
95             Drug A  Under 21
96             Drug A  Under 21
97             Drug A  Under 21
98             Drug A  Under 21
99             Drug A  Under 21
100            Drug A  Under 21
101            Drug A  Under 21
102            Drug A  Under 21
103            Drug A  Under 21
104            Drug A  Under 21
105            Drug A  Under 21
106            Drug A  Under 21
107            Drug A  Under 21
108            Drug A  Under 21
109            Drug A  Under 21
110            Drug A  Under 21
111            Drug A  Under 21
112            Drug B  21 to 55
113            Drug B  21 to 55
114            Drug B  21 to 55
115            Drug B  21 to 55
116            Drug B  21 to 55
117            Drug B  21 to 55
118            Drug B  21 to 55
119            Drug B  21 to 55
120            Drug B  21 to 55
121            Drug B  21 to 55
122            Drug B  21 to 55
123            Drug B  21 to 55
124            Drug B  21 to 55
125            Drug B  21 to 55
126            Drug B  21 to 55
127            Drug B  21 to 55
128            Drug B  21 to 55
129            Drug B  21 to 55
130            Drug B  21 to 55
131            Drug B  21 to 55
132            Drug B  21 to 55
133            Drug B  21 to 55
134            Drug B  21 to 55
135            Drug B  21 to 55
136            Drug B  21 to 55
137            Drug B  21 to 55
138            Drug B  21 to 55
139            Drug B  21 to 55
140            Drug B  21 to 55
141            Drug B  21 to 55
142            Drug C  21 to 55
143            Drug C  21 to 55
144            Drug C  21 to 55
145            Drug C  21 to 55
146            Drug C  21 to 55
147            Drug C  21 to 55
148            Drug C  21 to 55
149            Drug C  21 to 55
150            Drug C  21 to 55
```

```
151           Drug C  21 to 55
152           Drug C  21 to 55
153           Drug C  21 to 55
154           Drug C  21 to 55
155           Drug C  21 to 55
156           Drug C  21 to 55
157           Drug C  21 to 55
158           Drug C  21 to 55
159           Drug C  21 to 55
160           Drug C  21 to 55
161           Drug C  21 to 55
162           Drug C  21 to 55
163           Drug C  21 to 55
164           Drug C  21 to 55
165           Drug C  21 to 55
166           Drug C  21 to 55
167           Drug C  21 to 55
> tab2<-table(data$Drug,data$Age.Group)
> tab2

         21 to 55 Over 55 Under 21
  Drug A        8      12       22
  Drug B       34      18        8
  Drug C       30      11       24
> chisq.test(tab2)

        Pearson's Chi-squared test

data:  tab2
X-squared = 23.223, df = 4, p-value = 0.0001143

> #pvalue=0.0001143<alpha=0.05 Reject HO
> #type of drug and age group are dependent
> #fitting of binomial distribution
> #A surve of 320 families with 5 children each
> #revealed the following distribution
> #no of boys :5    4    3    2    1      0
> #no of girls:0   1    2     3    4      5
> #is this result consistent with the hypothesis
> #the male and female births are equally possible.
> n=5
> N=320
> x=0:5
> obsf<-c(14,56,110,88,40,12)
> p=0.5
> x=0:5
> exf<-dbinom(x,n,p)*320
> exf
[1]  10  50 100 100  50  10
> chisq<-sum((obsf-exf)^2/exf)
> chisq
[1] 7.16
> qchisq(0.95,5)
[1] 11.0705
> #caluculated value<tabulated value
> #Accept HO male and female births are equal
> #Fitting of Poisson distribution
> #Fit the Poission distribution and test the godness of fit
> #x:0 1 2 3 4 5 6
> #f:275 72 30 7 5 2 1
> x<-c(275,72,30,7,5,2,1)
> lambda<-sum(f*x)/sum(f)
Error: object 'f' not found
> f<-c(275 72 30 7 5 2 10
Error: unexpected numeric constant in "f<-c(275 72"
> f<-c(275 72 30 7 5 2 10 )
Error: unexpected numeric constant in "f<-c(275 72"
> f<-c(275 ,72, 30, 7, 5, 2, 10 )
> lambda<-sum(f*x)/sum(f)
> lambda
```

```
[1] 203.9825
> exf<-dpois(x,lambda)*sum(f)
> exf
[1] 1.407119e-04 3.298767e-24 7.564518e-50 3.015586e-74 3.043933e-77
[6] 2.151827e-82 2.109814e-84
> exf=round(exf)
> exf1=round(exf)
> obsf<-c(275,72,30,15)
> exf2<-c(242,117,28,6)
> chisq<-sum((obsf-exf2)^2/exf)
Warning message:
In (obsf - exf2)^2/exf :
  longer object length is not a multiple of shorter object length
> exf2
[1] 242 117  28   6
> obsf1
Error: object 'obsf1' not found
>
> chisq<-sum((obsf-exf2)^2/exf2)
> chisq
[1] 35.45055
> qchisq(0.95,2)
[1] 5.991465
> #caluculated value >tabulated value
> #caluculated value >tabulated value   Reject HO
> #poission distribution is not a good fit
> #Fit the normal distribution.
```