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ROLL NO.: K068

Practical 9:

Q1. A machine is set to produce metal plates of thickness 1.5 cms with standard deviation of 0.2 cm. A sample of 100 plates produced by the machine gave an average thickness of 1.52 cms. Is the machine fulfilling the purpose?Write a R program for above problem.

```
library(distributions3)

x = 1.52 n =
100 s = 0.2
mu = 1.5
 z_stat=(x-mu)/(s/sqrt(n)) z = Normal (0,
1) p_value=2*cdf(z,z_stat) alpha=0.05
if(p_value<alpha){ print("Reject Null
Hypothesis")
}else { print("Accept Null Hypothesis")
}
```

```
package 'distributions3' was built under R version 4.2.3
> x = 1.52
> n = 100
> s = 0.2
> mu = 1.5
>
> z_stat=(x-mu)/(s/sqrt(n))
> z = Normal (0, 1)
> p_value=2*cdf(z,z_stat)
> alpha=0.05
> if(p_value<alpha){
+ print("Reject Null Hypothesis")
+ }else {
+ print("Accept Null Hypothesis")
+ }
[1] "Accept Null Hypothesis"
```

Q2. The average marks scored by 32 boys are 72 with SD of 8, while that for 36 girls is 70 with SD of 6. Test at 1% LOS whether the boys perform equal as girls.Write a R program for above problem.

```
#Q2 library(distributions3) n1=32 x1 = 72 s1=8 n2 = 36 x2 = 70
s2 = 6 z_stats=(x1-x2)/sqrt(((s1*s1)/n1)+((s2*s2)/n2))
print(z_stats) z=Normal(0, 1) p_value =2 * cdf(z,z_stats)
alpha=0.01 if(p_value<alpha) {     print("Reject Null
Hypothesis")
}else{     print("Accept Null Hypothesis")
}
```

```
> #Q2
> library(distributions3)
> n1=32
> x1 = 72
> s1=8
> n2 = 36
> x2 = 70
> s2 = 6
> z_stats=(x1-x2)/sqrt(((s1*s1)/n1)+((s2*s2)/n2))
> print(z_stats)
[1] 1.154701
> z=Normal(0, 1)
> p_value =2 * cdf(z,z_stats)
> alpha=0.01
> if(p_value<alpha) {
+     print("Reject Null Hypothesis")
+ }else{
+     print("Accept Null Hypothesis")
+ }
[1] "Accept Null Hypothesis"
```

Q3. The fatality rate of typhoid patients is believed to be 17.26%. In a certain year 640 patients suffering from typhoid were treated in a metropolitan hospital and only 63 patients died. Can you consider the hospital efficient? [1% LOS]. Write a R program for above problem.

```r
#Q3 library(distributions3) p=0.1723 n=640 x=63 p_value = prop.test(x, n, p = NULL,alternative =
"less",correct=FALSE)$p.value alpha=0.01 if(p_value<alpha){     print("Reject Null Hypothesis")
}else{     print("Accept Null Hypothesis")
}
```

```r
> #Q3
> library(distributions3)
> p=0.1723
> n=640
> x=63
> p_value = prop.test(x, n, p = NULL,alternative = "less",correct=FALSE)$p.val$
> alpha=0.01
> if(p_value<alpha){
+     print("Reject Null Hypothesis")
+ }else{
+     print("Accept Null Hypothesis")
+ }
[1] "Reject Null Hypothesis"
```

Q4. 15.5% of a random sample of 1600 undergraduates were smokers, where as 20% of a random sample of 900 postgraduates were smokers in a states. Can we conclude that less number of undergraduates are smokers than the postgraduates? Write a R program for above problem.

```r
#Q4 library(distributions3)
p_value= prop.test(x=c(248,189),n=c(1600,900),alternative = "less",correct =
"FALSE")$p.value alpha=0.05
if(p_value<alpha){     print("Reject Null
Hypothesis")
}else{     print("Accept Null Hypothesis")
}
```

```
> #Q4
> library(distributions3)
> p_value= prop.test(x=c(248,189),n=c(1600,900),alternative = "less",correct =$
> alpha=0.05
> if(p_value<alpha){
+     print("Reject Null Hypothesis")
+ }else{
+     print("Accept Null Hypothesis")
+ }
[1] "Reject Null Hypothesis"
```

Q5. A random sample of 400 members is found to have a mean of 4.45 cm. Can it be reasonably regarded as a sample from a large population whose mean is 5 cm and whose variance is 4 cms? Write a R program for above problem.

```
#Q5 library(distributions3) s=2 x=4.45 n=400
mu=5 z_stat=(x-mu)/(s/sqrt(n)) print(z_stat)
z=Normal(0,1) p_value=2*cdf(z,z_stat)
print(p_value) alpha=0.05 if(p_value<alpha){
print("Reject Null Hypothesis")
}else{     print("Accept Null Hypothesis")
}
```

```
> #Q5
> library(distributions3)
> s=2
> x=4.45
> n=400
> mu=5
> z_stat=(x-mu)/(s/sqrt(n))
> print(z_stat)
[1] -5.5
> z=Normal(0,1)
> p_value=2*cdf(z,z_stat)
> print(p_value)
[1] 3.797912e-08
> alpha=0.05
> if(p_value<alpha){
+     print("Reject Null Hypothesis")
+ }else{
+     print("Accept Null Hypothesis")
+ }
[1] "Reject Null Hypothesis"
>
```

Practical 10:

Q1. The annual rainfall at a certain place is normally distributed with mean 30. If the rainfall during the past 8 years are 31.1, 30.7, 24.3, 28.1, 27.9, 32.2, 25.4 and 29.1, can we conclude that average rainfall during the past 8 years is less than the normal rainfall?Write R program for above problem.

```r
#1 library(distributions3)
#Ho=not less than normal #H1=less than normal
p_value=t.test(x=c(31.1,307,24.3,28.1,27.9,32.2,25.4,29.1),y=NULL,alternative = "less",
paired=FALSE, mu=30, var.equal = FALSE,conf.level = 0.95)$p.value print(p_value) alpha=0.05
if(p_value<alpha)
{   print("reject null hypotheses")
}else {   print("accept null hypotheses")
}
#conclusion:avg rainfall not less then normal rainfall
```

```
> #1
> library(distributions3)
> #Ho=not less than normal
> #H1=less than normal
> p_value=t.test(x=c(31.1,307,24.3,28.1,27.9,32.2,25.4,29.1),y=NULL,alternativ$
> print(p_value)
[1] 0.8133295
> alpha=0.05
> if(p_value<alpha)
+ {
+   print("reject null hypotheses")
+ }else
+ {
+   print("accept null hypotheses")
+ }
[1] "accept null hypotheses"
> #conclusion:avg rainfall not less then normal rainfall
```

Q2. Two random samples gave the following data:

Sample	Size	Mean	Variance
1	16	440	40
2	25	460	42

Can we conclude that the means of the two samples differ significantly?Write R program for above problem.

```r
#Q2 library(distributions3)
#Ho: u1=u2 #H1:u1!=u2 n1=16 x1=440 var1=40 n2=25 x2=460 var2=42
p_value =t.test(x = c(x1, x2), var.equal = TRUE)$p.value print(p_value)
alpha=0.05 if(p_value<alpha)
{   print("reject null hypotheses")
}else {   print("accept null hypotheses")
}
#conclusion:  the means of the two samples does not differ significantly.
```

```
> #Q2
> library(distributions3)
> #Ho: u1=u2
> #H1:u1!=u2
> n1=16
> x1=440
> var1=40
> n2=25
> x2=460
> var2=42
> p_value =t.test(x = c(x1, x2), var.equal = TRUE)$p.value
> print(p_value)
[1] 0.01414478
> alpha=0.05
> if(p_value<alpha)
+ {
+   print("reject null hypotheses")
+ }else
+ {
+   print("accept null hypotheses")
+ }
[1] "reject null hypotheses"
> #conclusion:  the means of the two samples does not differ significantly.
```

Q3. The following data relate to the marks obtained by 11 students in 2 tests, one held at the beginning of a year and the other at the end of the year after intensive coaching.

Test 1:55 60	**65**	**75**	**49**	**25**	**18**	**30**	**35**	**54**	**61**	**72**
Test 2:63 70	**70**	**81**	**54**	**29**	**21**	**38**	**32**	**50**	**70**	**80**

Do the data indicate that the students have benefited by coaching?

Write R program for above problem.

```
#Q3 library(distributions3)
#Ho:not benefitted #H1:benefitted x=c(55,60,65,75,49,25,18,30,35,54,61,72)
y=c(63,70,70,81,54,29,21,38,32,50,70,80) p=t.test(x,y,alternative = "less", paired=TRUE, var.equal =
FALSE,conf.level = 0.95)$p.value
#when x1 bar< x2 bar then students benefitted from coaching print(p_value)
alpha=0.05 if(p_value<alpha)
{   print("reject null hypotheses")
}else {   print("accept null hypotheses")
}
#conclusion:students have benefitted from the coaching
```

```
#Q3
library(distributions3)
#Ho:not benefitted
#H1:benefitted
x=c(55,60,65,75,49,25,18,30,35,54,61,72)
y=c(63,70,70,81,54,29,21,38,32,50,70,80)
p=t.test(x,y,alternative = "less", paired=TRUE, var.equal = FALSE,conf.level$
#when x1 bar< x2 bar then students benefitted from coaching
print(p_value)
1] 0.8133295
alpha=0.05
if(p_value<alpha)
{
  print("reject null hypotheses")
}else
{
  print("accept null hypotheses")
}
1] "accept null hypotheses"
#conclusion:students have benefitted from the coaching
```

Q4. In a test given to two groups of students the marks obtained were as follows. First Group

18 20 36 50 49 36 34 49 41

Second Group

29 28 26 35 30 44 46

Examine the significant difference between the means of marks secured by students of the above two groups.

Write R program for above problem.

```
#Q4
library(distributions3)
#H0: there is no significant difference in mean #h1: there is significant
difference in mean x=c(18,20,36,50,49,36,34,49,41)
y=c(29,28,26,35,30,44,46)
p=t.test(x,y,alternative = "two.sided", paired=FALSE, var.equal = FALSE,conf.level =
0.95) p_value=p$p.value print(p_value) alpha=0.05 if(p_value<alpha)
{   print("reject null hypotheses")
}else{   print("accept null hypotheses")
}
#conclusion:THERE IS NO SIGNIFICANT DIFFERENCE IN THE MEAN
```

```
> #Q4
> library(distributions3)
> #H0: there is no significant difference in mean
> #h1: there is significant difference in mean
> x=c(18,20,36,50,49,36,34,49,41)
> y=c(29,28,26,35,30,44,46)
> p=t.test(x,y,alternative = "two.sided", paired=FALSE, var.equal = FALSE,conf$
> p_value=p$p.value
> print(p_value)
[1] 0.5577696
> alpha=0.05
> if(p_value<alpha)
+ {
+   print("reject null hypotheses")
+ }else{
+   print("accept null hypotheses")
+ }
[1] "accept null hypotheses"
> #conclusion:THERE IS NO SIGNIFICANT DIFFERENCE IN THE MEAN
```