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Activity Sheet - 9 - LARGE SAMPLE TEST

AIM: To find whether the hypothesis is accepted or rejected

1)

SYNTAX:

Null hypothesis H_0 : $\mu = 12.0$

Alternative Hypothesis: H_1 : $\mu \neq 12.0$

$\bar{x} = \text{mean}(x)$

$sd = \sqrt{\text{var}(x)}$

$n = \text{length}(x)$

$t = (\bar{x} - \mu) / (sd / \sqrt{n})$

t

$t_v = qt(1 - \alpha/2, df = n - 1)$ #two tailed

t_v

if ($t < t_v$)

printf("We accept the null hypothesis H_0 ")else

{

printf("We reject the null hypothesis H_0 ")

}

CODE:

```
1 # Null hypothesis H0: mu =12.0
2 # Alternative Hypothesis: H1:mu ≠ 12.0
3 x=c(14.3,12.6,13.7,10.9,13.7,12.0,11.4,12.0,12.6,13.1)
4 mu=12
5 a =.05
6 xbar=mean(x)
7 sd=sqrt(var(x))
8 n=length(x)
9 t=(xbar-mu)/(sd/sqrt(n))
10 t
11 tv=qt(1-a/2,df=n-1) #two tailed
12 tv
13 if (t<tv)
14   sprintf("We accept the null hypothesis H0")else
15 {
16   sprintf("We reject the null hypothesis H0")
17 }
```

OUTPUT:

```
> # Null hypothesis H0: mu =12.0
> # Alternative Hypothesis: H1:mu ≠ 12.0
> x=c(14.3,12.6,13.7,10.9,13.7,12.0,11.4,12.0,12.6,13.1)
> mu=12
> a =.05
> xbar=mean(x)
> sd=sqrt(var(x))
> n=length(x)
> t=(xbar-mu)/(sd/sqrt(n))
> t
[1] 1.835644
> tv=qt(1-a/2,df=n-1) #two tailed
> tv
[1] 2.262157
> if (t<tv)
+ sprintf("We accept the null hypothesis H0")else
+ {
+   sprintf("We reject the null hypothesis H0")
+ }
[1] "We accept the null hypothesis H0"
```

2)

H0: $\mu_1 = \mu_2$ there is no significant difference between the medicines A and B as regards on increase in weight.

H1: $\mu_1 \neq \mu_2$ there is a significant difference between the medicines A and B

SYNTAX:

```
n1=length(a); n2=length(b)
```

```
al=0.01
```

```
tv=qf(1-al/2,n1-1,n2-1)
```

```
f=var(a)/var(b)
```

```
#alternative way
```

```
ft=var.test(a,b,alternative="two.sided")
```

CODE:

```
1  a=c(42,39,38,60,41)
2  b=c(38, 42,56, 64, 68, 69, 62)
3  n1=length(a)
4  n2=length(b)
5  al=0.01
6  tv=qf(1-al/2,n1-1,n2-1)
7  f=var(a)/var(b)
8  f
9  #alternative way
10 ft=var.test(a,b,alternative="two.sided")
11 ft
```

OUTPUT:

```
> f
[1] 0.5345572
>
> #alternative way
> ft=var.test(a,b,alternative="two.sided")
> ft

      F test to compare two variances

data:  a and b
F = 0.53456, num df = 4, denom df = 6, p-value = 0.5668
alternative hypothesis: true ratio of variances is not equal to 1
95 percent confidence interval:
 0.08584285 4.91648918
sample estimates:
ratio of variances
 0.5345572
```

3) SYNTAX:

Null hypothesis $H_0: \text{var1} = \text{var2}$

Alternative Hypothesis: $H_1: \text{var1} \neq \text{var2}$

$n_1 = \text{length}(a)$; $n_2 = \text{length}(b)$

$\alpha = 0.05$

$tv = qf(1 - \alpha/2, n_1 - 1, n_2 - 1)$

$f = \text{var}(b) / \text{var}(a)$

#alternative way

$ft = \text{var.test}(a, b, \text{alternative} = "two.sided")$

CODE:

```
1 # Null hypothesis H0:var1=var2
2 # Alternative Hypothesis: H1:var1 ≠ var2
3 a=c(6.21, 5.70, 6.04, 4.47, 5.22, 4.45, 4.84, 5.84, 5.88, 5.82, 6.09, 5.59,6.06, 5.59, 6.74, 5.55)
4 b=c(4.28 ,7.71 ,6.48 ,7.71, 7.37 ,7.20 ,7.06 ,6.40 ,8.93, 5.91, 5.51, 6.36)
5 n1=length(a)
6 n2=length(b)
7 α=0.05
8 tv=qf(1-α/2,n1-1,n2-1)
9 f=var(b)/var(a)
10 f
11 #alternative way
12 ft=var.test(a,b,alternative="two.sided")
13 ft
```

OUTPUT:

```
> f
[1] 3.741404
> #alternative way
> ft=var.test(a,b,alternative="two.sided")
> ft

      F test to compare two variances

data:  a and b
F = 0.26728, num df = 15, denom df = 11, p-value = 0.01972
alternative hypothesis: true ratio of variances is not equal to 1
95 percent confidence interval:
 0.08026564 0.80393023
sample estimates:
ratio of variances
 0.2672793
```

INFERENCE : Hypothesis H0 is rejected

4)

SYNTAX:

```
x=c(49, 53 ,51, 52, 47, 50 ,52 ,53)
```

```
y=c(52, 55 ,52, 53, 50 ,54 ,54, 53)
```

```
t.test(x, y, paired = TRUE, alternative = "two.sided")
```

```
#alternate
```

```
n=length(x)
```

```
d=(x-y)
```

```
a=0.05
```

```
mean=mean(d)
```

```
sd=sd(d)
```

```
tc=abs(mean/(sd/sqrt(n)))
```

```
tv=qt(1-a/2,df=n-1) #two tailed
```

```
if (tc<tv)
```

```
    sprintf("We accept the null hypothesis H0")else
```

```
{
```

```
    sprintf("We reject the null hypothesis H0")
```

```
}
```

CODE:

```
1 x=c(49, 53 ,51, 52, 47, 50 ,52 ,53)
2 y=c(52, 55 ,52, 53, 50 ,54 ,54, 53)
3 t.test(x, y, paired = TRUE, alternative = "two.sided")
4 #alternate
5 n=length(x)
6 d=(x-y)
7 a=0.05
8 mean=mean(d)
9 sd=sd(d)
10 tc=abs(mean/(sd/sqrt(n)))
11 n
12 mean
13 sd
14 tc
15 tv=qt(1-a/2,df=n-1) #two tailed
16 tv
17 if (tc<tv)
18     sprintf("We accept the null hypothesis H0")else
19 {
20     sprintf("We reject the null hypothesis H0")
21 }
```

OUTPUT:

```
> x=c(49, 53 ,51, 52, 47, 50 ,52 ,53)
> y=c(52, 55 ,52, 53, 50 ,54 ,54, 53)
> t.test(x, y, paired = TRUE, alternative = "two.sided")

      Paired t-test

data:  x and y
t = -4.3205, df = 7, p-value = 0.003478
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -3.0946083 -0.9053917
sample estimates:
mean of the differences
                -2
```

```
> #alternate
> n=length(x)
> d=(x-y)
> a=0.05
> mean=mean(d)
> sd=sd(d)
> tc=abs(mean/(sd/sqrt(n)))
> n
[1] 8
> mean
[1] -2
> sd
[1] 1.309307
```

```

> tc
[1] 4.320494
> tv=qt(1-a/2,df=n-1) #two tailed
> tv
[1] 2.364624
> if (tc<tv)
+   sprintf("We accept the null hypothesis H0")else
+   {
+     sprintf("We reject the null hypothesis H0")
+   }
[1] "We reject the null hypothesis H0"

```

5)

AIM: To test if there is any association between the attribute independence of attribute and goodness of fit using chi Square distribution

SYNTAX:

```
o=c(404,420,400,376)
```

```
e=c(400,400,400,400)
```

```
xsq=sum((o-e)^2/e)
```

```
xsq
```

```
cv=qchisq(p=0.05,df=3,lower.tail=FALSE)
```

```
cv
```

```
if(cv>xsq){
```

```
  print("H0 IS ACCEPTED")
```

```
}else{
```

```
  print(" H1 IS ACCEPTED")
```

```
}
```

```
data=matrix(c(404,420,400,376),ncol=4,byrow=T)
```

```
data
```

```
chisq.test(data)
```

CODE:

```
1 o=c(404,420,400,376)
2 e=c(400,400,400,400)
3 xsq=sum((o-e)^2/e)
4 xsq
5 cv=qchisq(p=0.05,df=3,lower.tail=FALSE)
6 cv
7 if(cv>xsq){
8   print("H0 IS ACCEPTED")
9 }else{
10  print(" H1 IS ACCEPTED")
11 }
12 data=matrix(c(404,420,400,376),ncol=4,byrow=T)
13 data
14 chisq.test(data)
```

OUTPUT:

```
> o=c(404,420,400,376)
> e=c(400,400,400,400)
> xsq=sum((o-e)^2/e)
> xsq
[1] 2.48
> cv=qchisq(p=0.05,df=3,lower.tail=FALSE)
> cv
[1] 7.814728
> if(cv>xsq){
+   print("H0 IS ACCEPTED")
+ }else{
+   print(" H1 IS ACCEPTED")
+ }
[1] "H0 IS ACCEPTED"
> data=matrix(c(404,420,400,376),ncol=4,byrow=T)
> data
      [,1] [,2] [,3] [,4]
[1,]  404  420  400  376
> chisq.test(data)

      Chi-squared test for given probabilities

data:  data
X-squared = 2.48, df = 3, p-value = 0.4789
```