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Name: ADARSH KUMAR TEMANI

Registration Number: 18BCE2441

Course Code: MAT2001

Course: Statistics for Engineers

Prof.: Palanivel K

Slot: L15 + L16

Digital Assignment 4

Z - Test for Single Proportion, Difference of Proportions, Single Mean and Difference of Means

1. Experience has shown that 20% of a manufactured product is of top quality. In one day's production of 400 articles, only 50 are of top quality. Write down the R programming code to test whether the production of the day chosen is a representative sample at 95% confidence level.

```
> # let the null hypothesis is H0:- p0=0.2

> pbar = 50/400

> p0 = 0.20 # hypothesized value

> n = 400  # sample size

> z = (pbar-p0)/sqrt(p0*(1-p0)/n)

> z# test statistic

[1] -3.75

> # We then compute the critical value at .05 significance level

> alpha = .05

> z.alpha = qnorm(1-alpha)

> -z.alpha  # critical value

[1] -1.644854
```

># Hence, the test statistic 3.75 is not less than the critical value of 1.6449. Thus, at .05 significance level, we reject null hypothesis.

2. Before an increase in excise duty on tea, 800 people out of a sample of 1000 were consumers of tea. After the increase in duty, 800 people were consumers of tea in a sample of 1200 persons. Write down the R programming code to test whether the significant decrease in the consumption of tea after the increase in duty at 1 % level of significance.

```
> # Let p1 be the propotion of the tea consumers before the increase in duty and p2 be the proportion of the tea consumers after the increase in duty.

> # H0 = p1=p2 and H1 = p1>p2

> prop.test(c(800,800),c(1000,1200),alternative=c("less"),correct=FALSE)

        2-sample test for equality of proportions without continuity correction
```

```
data: c(800, 800) out of c(1000, 1200)

X-squared = 48.889, df = 1, p-value = 1

alternative hypothesis: less

95 percent confidence interval:

 -1.0000000 0.1638933

sample estimates:

   prop 1    prop 2

0.8000000 0.6666667
```

> # Hence, the p-value= 1<2.33, so calculated value is less than the critical value. Thus, we accept the null hypothesis and we will reject the alternative hypothesis.

3. A sample of 900 items is found to have a mean of 3.47 cm. write down the R programming code to test whether it can be reasonably regarded as a simple sample from a population with mean 3.23 cm and SD 2.31 cm at 99% level of confidence.

```
#The null hypothesis is that mu0=3.23

> xbar=3.47  #sample mean

> mu0=3.23  #hypothesized value

> sigma=2.31 #population standard deviation

> n=900   #sample size

> z=(xbar-mu0)/(sigma/sqrt(n))

> z#test statistic

[1] 3.116883

> #Computing the critical values at 0.01 significance level

> alpha=0.01

> z.half.alpha=qnorm(1-alpha/2)

> c(-z.half.alpha,z.half.alpha)

[1] -2.575829 2.575829
```

> #**The test statistic 3.116883 does not lies between the critical values -2.575829 and**

2.575829.Hence, at 0.01 significance level, we reject the null hypothesis that it can be reasonably regarded as a simple sample from the population.

4. The average mark scored by 32 boys is 72 with a standard deviation of 8, while that for 36 girls is 70 with a standard deviation of 6. Write down the R programming code to test whether the boys are performing better than girls on the basis of average mark at 5 % level of significance.

```
> z.test2sam=function(var.a,var.b)
+ {
+ n.a=32 +
n.b=36 +
mu.a=72 +
mu.b=70 +
var.a=64 +
var.b=36
+ zeta=(mu.a-mu.b)/(sqrt(var.a/n.a+var.b/n.b)) +
return(zeta)
+ }
> zeta(64,36)
> zeta(var.a,var.b)
>[1] 1.1574
```

> # The test statistic calculated value is 1.1574 and the critical table value at 5% level of significance is 2.33

> # Hence, the calculated value < table value.

> # Thus, we can accept null hypothesis H0.

> # **Conclusion:- Boys do not perform better than girls.**