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Tutorial Name: Tutorial 6 - Sampling using R
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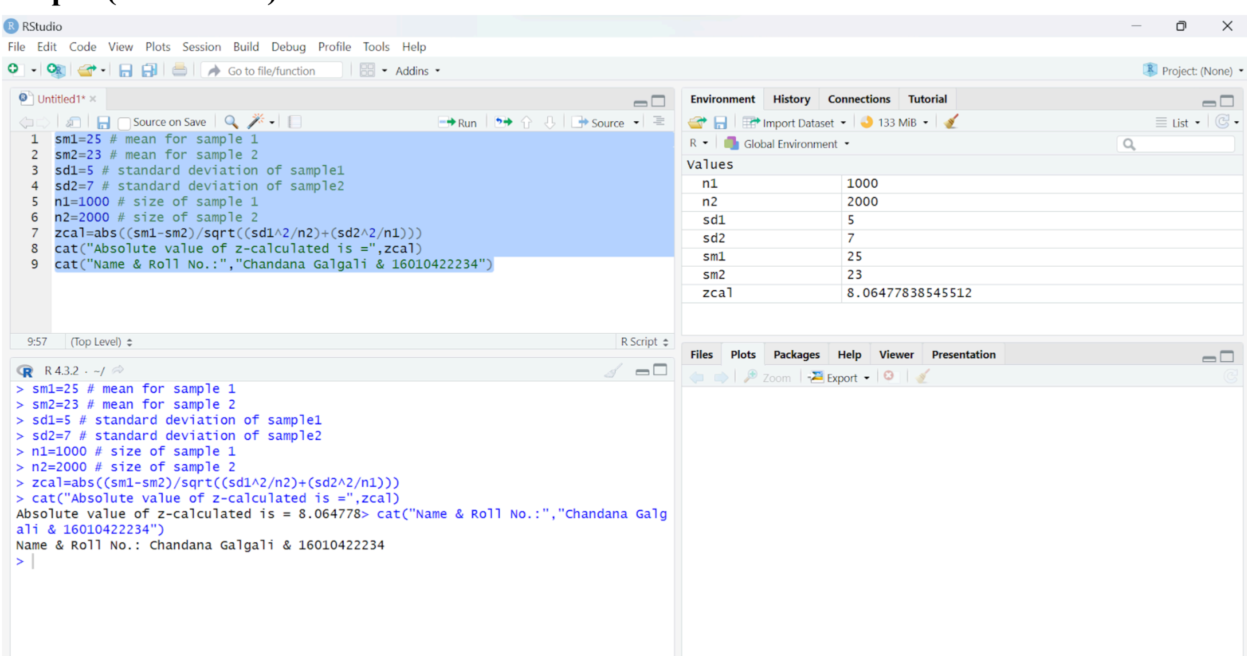
Q.1 Test the significance of the difference between the means of two normal population with the same standard deviation from the following data.

	Size	Mean	St. Dev
Sample-1	1000	25	5
Sample-2	2000	23	7

Code on Rstudio:

```
sm1=25 # mean for sample 1
sm2=23 # mean for sample 2
sd1=5 # standard deviation of sample1
sd2=7 # standard deviation of sample2
n1=1000 # size of sample 1
n2=2000 # size of sample 2
zcal=abs((sm1-sm2)/sqrt((sd1^2/n2)+(sd2^2/n1)))
cat("Absolute value of z-calculated is =",zcal)
cat("Name & Roll No.:","Chandana Galgali & 16010422234")
```

Output (screen shot):



Steps of Hypothesis Testing:

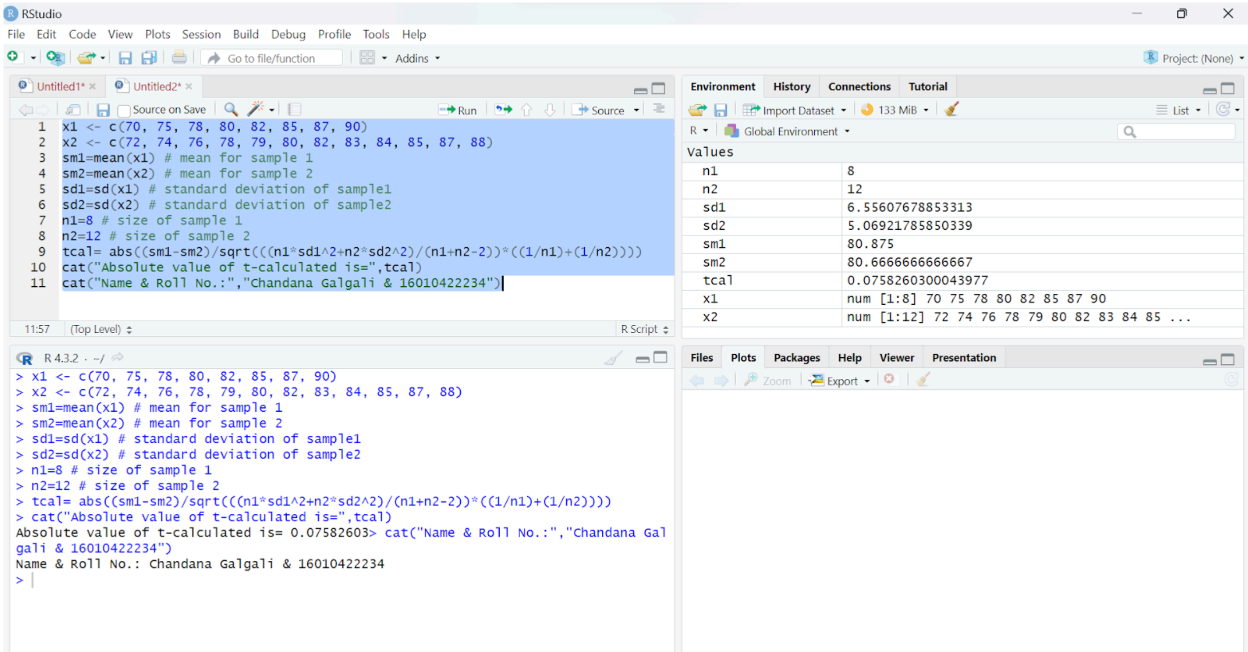
1. $H0 :\ \mu_1 = \mu_2$
2. $H1 :\ \mu_1 \neq \mu_2$ (Nature of the test is two tailed)
3. LOS is 5%
4. Table value of Z_α is 1.96
5. Calculated value of Z : $Z_{cal} = \frac{\overline{x_1} - \overline{x_2}}{\sqrt{\frac{s_1^2}{n_2} + \frac{s_2^2}{n_1}}} = 8.064778$
6. $Z_{cal} > Z_\alpha$; Therefore, $H0$ is rejected
7. We can say that the difference between the population means is significant.

Q.2. The weights of eight randomly selected athletes are recorded in kilograms: 70, 75, 78, 80, 82, 85, 87, 90. The weights of twelve randomly selected basketball players are recorded in kilograms: 72, 74, 76, 78, 79, 80, 82, 83, 84, 85, 87, 88. Can it be concluded that basketball players, on average, weigh more than athletes?

Code on Rstudio:

```
x1 <- c(70, 75, 78, 80, 82, 85, 87, 90)
x2 <- c(72, 74, 76, 78, 79, 80, 82, 83, 84, 85, 87, 88)
sm1=mean(x1) # mean for sample 1
sm2=mean(x2) # mean for sample 2
sd1=sd(x1) # standard deviation of sample1
sd2=sd(x2) # standard deviation of sample2
n1=8 # size of sample 1
n2=12 # size of sample 2
tcal= abs((sm1-sm2)/sqrt((((n1*sd1^2+n2*sd2^2)/(n1+n2-2))*((1/n1)+(1/n2))))
cat("Absolute value of t-calculated is=",tcal)
cat("Name & Roll No.:","Chandana Galgali & 16010422234")
```

Output (screen shot):



Steps of Hypothesis Testing:

1. $H0:\ \mu_1 = \mu_2$
2. $H1:\ \mu_1 < \mu_2$ (Nature of the test is one tailed)
3. LOS is 5%, $dof = 8 + 12 - 2 = 18$
4. Table value of t_α is 1.734
5. Calculated value of t: $t_{cal} = \dfrac{\overline{x}_1 - \overline{x}_2}{\sqrt{\frac{n_1 s_1^2 + n_2 s_2^2}{n_1 + n_2 - 2}} \times \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}} = 0.07582603$
6. $t_{cal} < t_\alpha$; Therefore, $H0$ is accepted (left tailed test)
7. Therefore, it can not be concluded that the basketball players, on average, weigh more than the athletes.

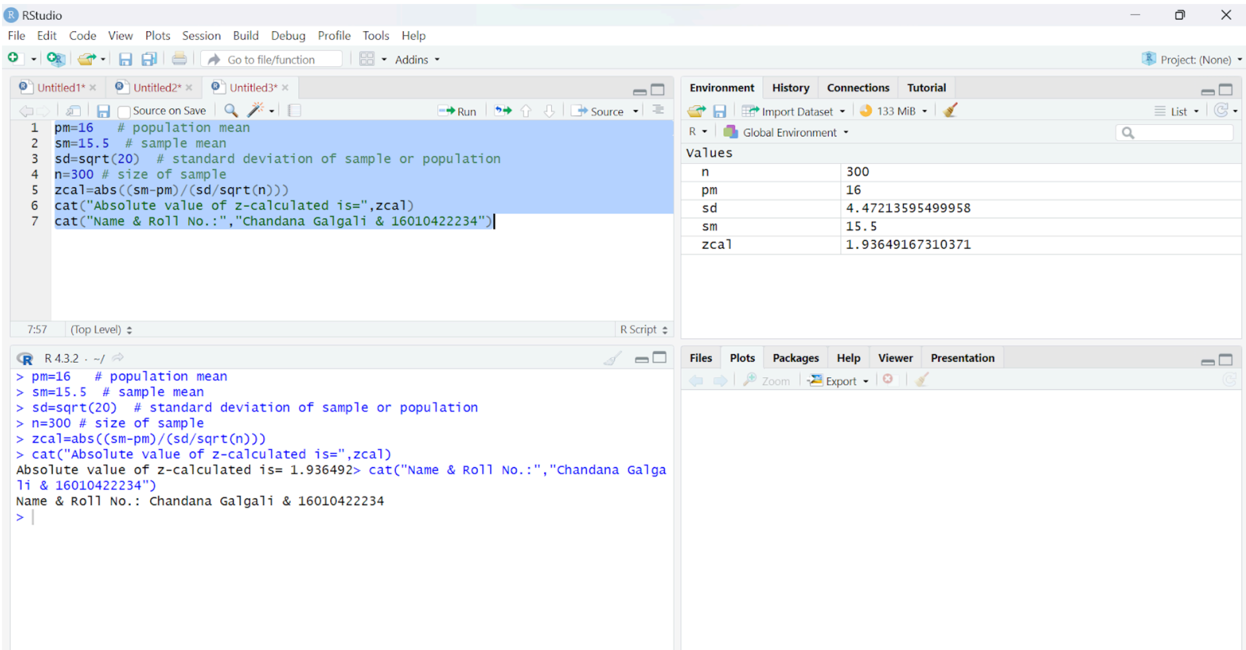
Q.3. A random sample of 300 observations has a mean of 15.5 kg. Can it be a random sample from a population whose mean is 16 kg and variance is 20 kg?

Code on Rstudio:

```
pm=16   # population mean
sm=15.5  # sample mean
sd=sqrt(20)  # standard deviation of sample or population
n=300 # size of sample
zcal=abs((sm-pm)/(sd/sqrt(n)))
```

cat("Absolute value of z-calculated is=",zcal)
cat("Name & Roll No.:","Chandana Galgali & 16010422234")

Output (screen shot):



Steps of Hypothesis Testing:

1. $H0 : \mu = 16$

2. $H1 : \mu \neq 16$ (Nature of the test is two tailed)

3. LOS is 5%

4. Table value of Z_{α} is 1.96

5. Calculated value of Z : $Z_{cal} = \frac{\overline{x} - \mu}{\frac{\alpha}{\sqrt{n}}} = 1.936492$

6. $Z_{cal} < Z_{\alpha}$; Therefore, $H0$ is accepted

7. Therefore, we can say that the sample is drawn from a population with mean 16 kg and variance 20 kg.