

17BIT0028

**SIDDHI SINGH**

### Problem 1 :-

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/g) were:

0.593	0.142	0.329	0.691	0.231	0.793	0.519	0.392	0.418
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Is there evidence that the mean level of Salmonella in ice cream is greater than 0.3 MPN/g?

The screenshot shows the RGui (64-bit) application window. The menu bar includes File, Edit, View, Misc, Packages, Windows, and Help. Below the menu bar is a toolbar with icons for file operations and running code. The main workspace area is mostly blank. An "R Console" window is open in the foreground, displaying the following text:

```
>  
>  
> #SIDDHI SINGH  
> #17BIT0028  
> x=c(0.593,0.142,0.329,0.691,0.231,0.793,0.519,0.392,0.418)  
> t.test(x,alternative="greater",mu=0.3)  
  
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  
  
>  
>  
>  
>  
>
```

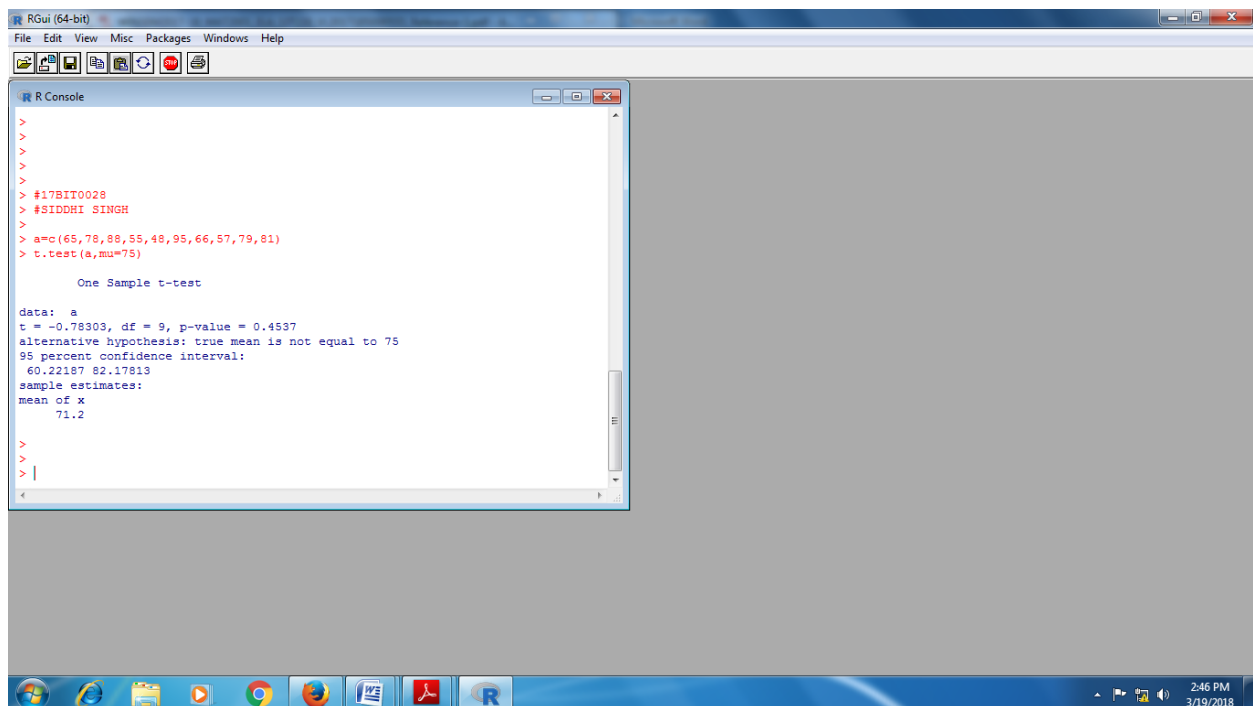
The taskbar at the bottom shows various application icons, including Chrome, Firefox, and Word, along with the system clock indicating 2:44 PM on 3/19/2018.

### Inference:-

From the output we see that the p-value = 0.029. Hence, there is moderately strong evidence that the mean Salmonella level in the ice cream is above 0.3 MPN/g.

Problem 2: Suppose that 10 volunteers have taken an intelligence test; here are the results obtained. The average score of the entire population is 75 in the same test. Is there any significant difference (with a significance level of 95%) 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



```
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> 
> #17BIT0028
> #SIDDIHI SINGH
> a=c(65,78,88,55,48,95,66,57,79,81)
> t.test(a,mu=75)

One Sample t-test

data:  a
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
```

### *Inference:-*

- ➔ *The t-computed value is smaller than t-tabulated, we accept the null hypothesis of equality of the averages.*
- ➔ *Alternatively we could consider the p-value with a significance level of 95%. If p-value is greater than 0.05 then we accept the null hypothesis  $H_0$ , otherwise we reject the null .*

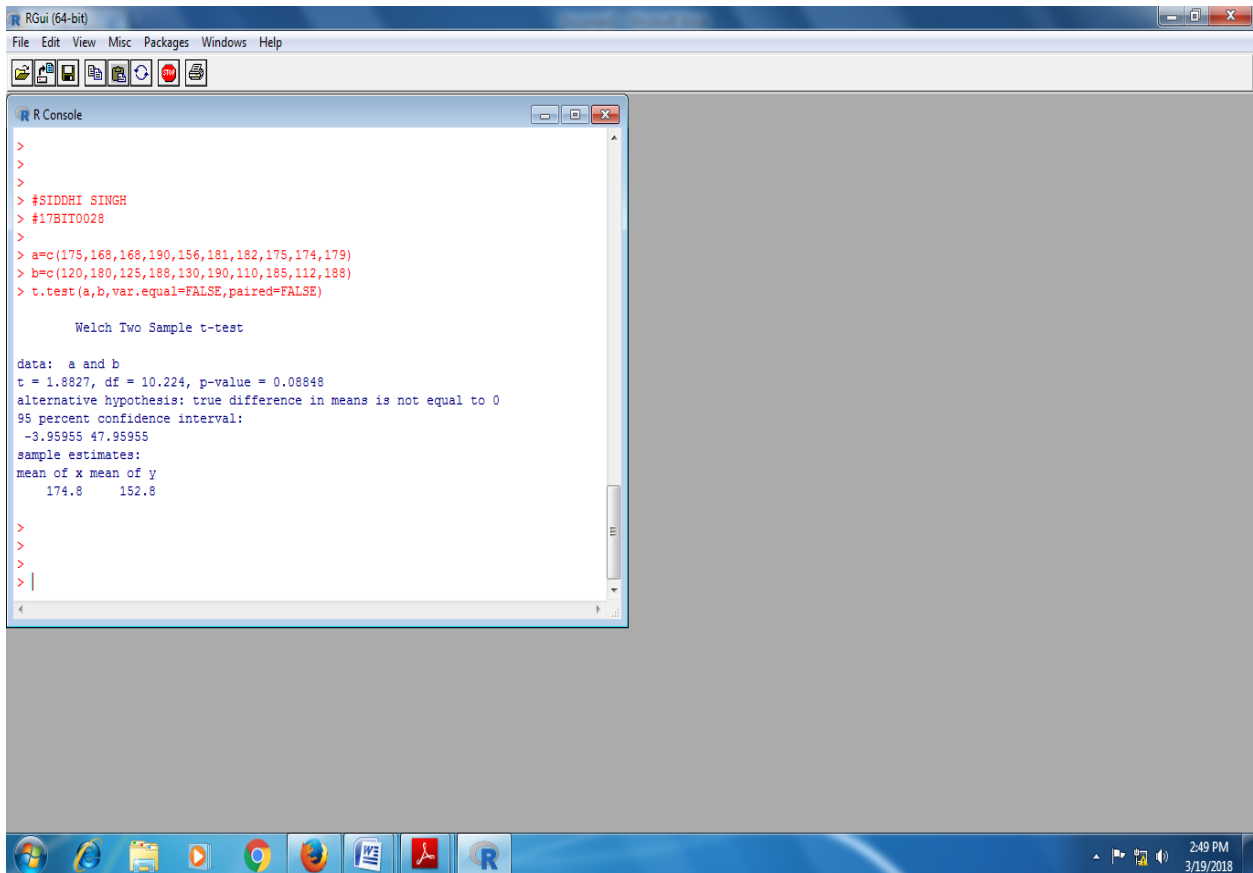
t.test usage:

Test a claim about  $\mu_1 - \mu_2$  Below, mu is the value of  $\mu_1 - \mu_2$  in the null hypothesis.

- Two-Tailed Test: `t.test(x, y, mu = ,)`
- Right-Tailed Test: `t.test(x, y, mu = , alternative="greater")`
- Left-Tailed Test: `t.test(x, y, mu = , alternative="less")`

Problem 3: Comparing two independent sample means, taken from two populations with unknown variance. The following data shows the heights of individuals of two different countries with unknown population variances. Is there any significant difference b/n the average heights of two groups.

A:	175	168	168	190	156	181	182	175	174	179
B:	185	169	173	173	188	186	175	174	179	180



```
>
>
> #SIDDIHI SINGH
> #17BIT0028
>
> a=c(175,168,168,190,156,181,182,175,174,179)
> b=c(185,180,175,188,130,190,110,185,112,188)
> t.test(a,b,var.equal=FALSE,paired=FALSE)

Welch Two Sample t-test

data: a and b
t = 1.8827, df = 10.224, p-value = 0.08848
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
-3.95955 47.95955
sample estimates:
mean of x mean of y
 174.8    152.8

>
>
> |
```

**Problem 4:** Suppose the recovery time for patients taking a new drug is measured (in days). A placebo group is also used to avoid the placebo effect. The data are as follows

with drug	: 15 10 13 7 9 8 21 9 14 8
placebo	: 15 14 12 8 14 7 16 10 15 2

Is there any significant difference between the average effect of these two drugs?

```

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> #17BIT0028
> #SIDDIHI SINGH
> x=c(15,10,13,7,9,8,21,9,14,8)
> y=c(15,14,12,8,14,7,16,10,15,2)
> t.test(x,y,alt="less",var.equal=TRUE)

Two Sample t-test

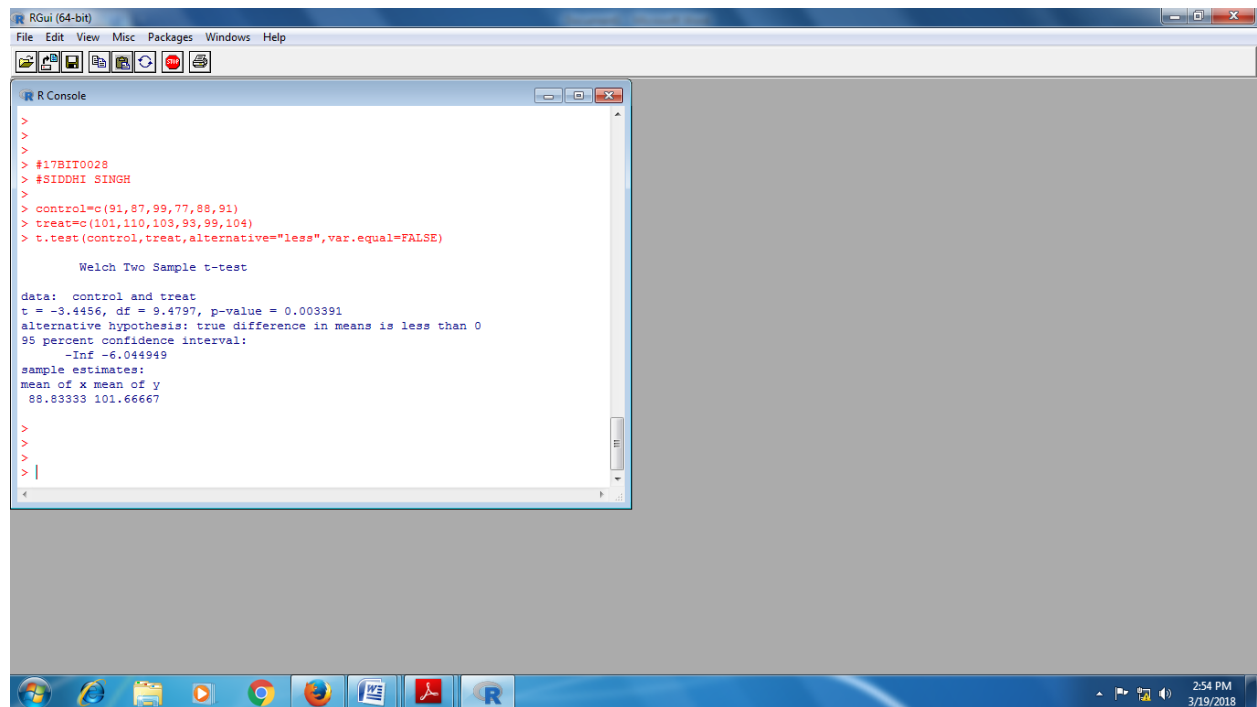
data: x and y
t = 0.050529, df = 18, p-value = 0.5199
alternative hypothesis: true difference in means is less than 0
95 percent confidence interval:
 -Inf 3.531811
sample estimates:
mean of x mean of y
 11.4      11.3
  
```

**Inference :-**

P value(0.3002) > 0.05 then there is no evidence to reject our Null hypothesis.

**Problem 5:** Six subjects were given a drug (treatment group) and an additional 6 subjects a placebo(control group).Their reaction time to stimulus was measured(in ms).We want to perform a two sample t-test for comparing the means of the treatment and control groups.

Control	91	87	99	77	88	91
Treatment	101	110	103	93	99	104



```
>
>
> #17BIT0028
> #SIDDDHI SINGH
>
> control=c(91,87,99,77,88,91)
> treat=c(101,110,103,93,99,104)
> t.test(control,treat,alternative="less",var.equal=FALSE)

Welch Two Sample t-test

data: control and treat
t = -3.4456, df = 9.4797, p-value = 0.003391
alternative hypothesis: true difference in means is less than 0
95 percent confidence interval:
 -Inf -6.044949
sample estimates:
mean of x mean of y
 88.83333 101.66667

>
>
> |
```

**From both the output we see that the p-value = 0.003136(equal) and 0.003391(Unequal). Therefore, it infers that there is different between treatment and control group.**

LAB-10

lab 10 28 - A  
19/3/18

17BIT0028

> x = c(0.593, 0.142, 0.329, 0.691, 0.231, 0.793,  
0.519, 0.392, 0.418)  
> t.test(x, alternative = "greater", mu = 0.3)

> a = c(65, 78, 88, 55, 48, 75, 66, 57, 77, 81)  
> t.test(a, mu = 75)

> a = c(175, 168, 168, 190, 156, 181, 182, 175, 174,  
179)

> b = c(120, 180, 125, 188, 130, 190, 110, 185, 112,  
188)

> t.test(a, b, var.equal = FALSE, paired = FALSE)

> x = c(15, 10, 13, 7, 9, 8, 21, 9, 14, 8)

> y = c(15, 14, 12, 8, 14, 7, 16, 10, 13, 2)

> t.test(x, y, alt = "less", var.equal = TRUE)

> control = c(91, 87, 99, 77, 88, 91)

> treat = c(101, 110, 103, 93, 99, 104)

> t.test(control, treat, alternative = "less", var.equal = FALSE)