Q.1

Scores	$(x-\bar{x})^2$
62	294.81
92	164.61
75	17.39
68	124.77
83	14.67
95	250.59
475	866.84

$t = \frac{\bar{x} - \mu}{\frac{s}{\sqrt{n}}}$

$n = 6$

$\bar{x} = 79.17$

$s = \sqrt{\frac{\Sigma(x-\bar{x})^2}{n-1}}$

$= \sqrt{\frac{866.84}{5}}$

$= 13.17.$

$H_0 : \mu = 70$

$H_a : \mu \neq 70$

$\alpha = 0.10.$

$df = n-1$

degrees of freedom

$t = \frac{79.17 - 70}{\frac{13.17}{\sqrt{6}}}$

$= \frac{9.17}{5.3766}$

$t_{STAT} = 1.7055.$

$t_{crit} = 2.015$

$t_{STAT} < t_{crit}$. Accept the null hypothesis which implies that the mean score is 70. Yes the professor can have a 90% confidence that the mean score for ~~Sample Mean~~ the class will be above 70.

Sample Mean

$\bar{x} = \frac{\Sigma x}{n} = \frac{475}{6} = 79.17$

The sample mean is 79.17 and this implies that on average, most students will score a value very close to the sample mean. on the test

Q. 2 Dependent t-test.

Stimulation	No stimulation	D	D^2
16	18	-2	4
7	7	0	0
3	4	-1	1
11	14	-3	9
8	6	2	4
55	7	48	2304
14	12	2	4
7	5	2	4
9	5	4	16
10	8	2	4
		54	2350

$H_0: \mu_{stim} = \mu_{no\ stim}$ $\alpha = 0.05$

$DF = n-1$

$H_a: \mu_{stim} \neq \mu_{no\ stim}$

$$t = \frac{\Sigma D}{\sqrt{\frac{n\Sigma D^2 - (\Sigma D)^2}{n-1}}}$$

D = difference between the variables

DF = Degrees of freedom.

$\Sigma D = 54$ $\Sigma D^2 = 2350$ $n = 10$

$$t = \frac{54}{\sqrt{\frac{10(2350) - (54)^2}{9}}}$$

$$= \frac{54}{\sqrt{\frac{23500 - 2916}{9}}}$$

$$= \frac{54}{\sqrt{2287.111}}$$

$$= \frac{54}{47.8238}$$

$$= 1.1291$$

$t_{critical} = 2.262.$

$t_{stat} = 1.1291$

$t_{crit} > t_{stat}$. Accept the null hypothesis. This implies that there is no difference in the two means.

Q.3. Independent T-test.

REM deprived	Drug Condition	$(x-\bar{x})^2$	$(y-\bar{y})^2$
22	20	37.33	93.51
17	14	1.23	18.47
8	9	62.25	1.77
40	6	581.29	18.75
26	20	102.21	93.51
1	3	221.71	53.73
8	5	62.25	28.41
4	10	141.37	0.11
17	6	1.23	18.75
Σ 143	93	1,210.87	322.01

let REM be represented by x.
let Drug condition be represented by y.

$\bar{x} = 15.89$ $\bar{y} = 10.33$

$S_x^2 = \frac{\Sigma(x-\bar{x})^2}{n-1}$ $S_y^2 = \frac{\Sigma(y-\bar{y})^2}{n-1}$

$= \frac{1210.87}{8}$ $= \frac{322.01}{8}$

$= 151.36.$ $= 40.25.$

$F_{STAT} = \frac{\text{Higher variance}}{\text{lower variance}}$

$= \frac{151.36}{40.25} = 3.7605.$

$F_{crit} = 5.59$ 3.01

$F_{crit} < F_{stat}$. Therefore the variances of the two variables are the same.

$H_0 : \mu_x = \mu_y$

$H_a : \mu_x \neq \mu_y$

$$t = \frac{\bar{x} - \bar{y}}{\sqrt{\left(\frac{s_p^2}{n_1} + \frac{s_p^2}{n_2}\right)}}$$

$$s_p^2 = \frac{(n_1 - 1)s_x^2 + (n_2 - 1)s_y^2}{n_1 + n_2 - 2}$$

$$= \frac{(8 \times 151.36) + (8 \times 40.25)}{16}$$

$$= 95.805.$$

$$= \frac{15.89 - 10.33}{\sqrt{\left(\frac{95.805}{9} + \frac{95.805}{9}\right)}}$$

$DF = 16$

$\alpha = 0.05$

$$= \frac{5.56}{\sqrt{21.29}}$$

$$= \frac{5.56}{4.6141}$$

$t_{STAT} = 1.205.$

$t_{crit} = 2.120$

$t_{crit} > t_{STAT}$. Accept the null hypothesis that there is no significance difference in the means of the two variables.