

Q1

Null Hypothesis $\rightarrow H_0$: The course feedback averages given by the professors are equal
($\mu_A = \mu_B = \mu_C = \mu_D$)

Alternate Hypothesis $\rightarrow H_1$: Atleast one mean is different from the rest

	A	B	C	D
X	4.5	4.2	3.3	3.6
Y	3.8	4.1	2.7	4
Z	4	3.4	3.4	3
Σ	12.3	11.7	9.4	10.6

$$n = 12$$

$$n_i = k = 4$$

$$n_j = 3$$

$$= T = 44$$

$$\text{Correction Factor } CF = \frac{T^2}{n} = \frac{44^2}{12} = 161.333$$

$$SST = \sum_{i=0}^3 \sum_{j=0}^2 x_{ij}^2 - CF = (4.5^2 + 3.8^2 + \dots + 4^2 + 3^2) - 161.333$$

$$= 3.0667$$

$$SSTR = \sum_{i=0}^3 \left(\frac{\sum_{j=0}^2 x_{ij}}{n_j} \right)^2 - CF = \frac{12.3^2 + 11.7^2 + 9.4^2 + 10.6^2}{3} - 161.333$$

$$= 1.6334$$

$$SSE = SST - SSTR = 3.0667 - 1.6334$$

$$= 1.4333$$

$$MSTR = \frac{SSTR}{k-1} = \frac{1.6334}{3} = 0.5445$$

$$MSE = \frac{SSE}{n-k} = \frac{1.4333}{8} = 0.1792$$

$$F = \frac{MSTR}{MSE} = \frac{0.5445}{0.1792} = 3.0385$$

Q1
CONT..

ANOVA SUMMARY

SOURCE OF VARIATION	SUM OF SQUARES	d.o.f	MEAN SQUARES	F-VALUE
Between Sample (COURSE)	SSTR = 1.6334	$n-1 = 3$	MSTR = 0.5445	3.0385
Within Sample (ERROR)	SSE = 1.4333	$n-r = 8$	MSE = 0.1792	
TOTAL	SST = 3.0667	$n-1 = 11$		

Table Value $F(0.01_{\text{CONFIDENCE}}, \text{d.o.f } 3, 8) = \underline{7.591}$ [From F Table for $\alpha = 0.01$]

$3.0385 < 7.591 \Rightarrow$ Null hypothesis is accepted at 1% level of Significance since calculated F value is less than F value from table. We can conclude that course feedback of professors is statistically similar for all courses

Q2

PROCESS	SAMPLE SIZE	MEAN LIFE	STD DEVIATION	dof = $20+25-2$ <u>$= 43$</u>
A	20	20400	100	
B	25	21800	100	

We are given two means and the samples dof > 30 , hence To test the hypothesis we will employ the Z-test. We will use two tailed since we are checking if the samples are statistically different

Null hypothesis H_0 : The two sample mean lives are similar

Alternate hypothesis H_1 : The two sample means are significantly statistically different.

$$\bar{X}_A = 20400 \quad \bar{X}_B = 21800 \quad n_A = 20 \quad n_B = 25 \quad S_A = S_B = 100$$

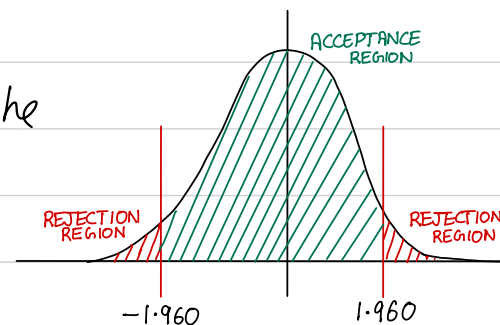
$$Z = \frac{\bar{X}_A - \bar{X}_B}{\sqrt{\frac{S_A^2}{n_A} + \frac{S_B^2}{n_B}}} = \frac{20400 - 21800}{100 \sqrt{\frac{9}{100}}} = \frac{-14}{3/10} = \underline{-46.667}$$

AKHIL.S

2021MT12054

Q2
CONT..

For the two tail test at 5% significance the Z value is 1.960. The region of acceptance for the null hypothesis is between -1.96 to 1.96. The calculated Z (-46.667) is lesser than -1.96. hence we can reject the null hypothesis



Q3

x (QUIZ)	y (ASSIGNMENT)	$X = x - \bar{x}$	x^2	$Y = y - \bar{y}$	y^2	XY
5	8.5	0.425	0.1806	-0.525	0.2756	-0.2231
4.5	9	-0.075	0.0056	-0.025	0.0006	0.0019
3	5.5	-1.575	2.4806	-3.525	12.4256	5.5519
5	9.5	0.425	0.1806	0.475	0.2256	0.2019
4.5	9	-0.075	0.0056	-0.025	0.0006	0.0019
4.5	9.5	-0.075	0.0056	0.475	0.2256	-0.0356
4.5	10	-0.075	0.0056	0.975	0.9506	-0.0731
5	9.5	0.425	0.1806	0.475	0.2256	0.2019
5	9	0.425	0.1806	-0.025	0.0006	-0.0106
4.5	9	-0.075	0.0056	-0.025	0.0006	0.0019
4.5	10	-0.075	0.0056	0.975	0.9506	-0.0731
4.5	10	-0.075	0.0056	0.975	0.9506	-0.0731
5	8.5	0.425	0.1806	-0.525	0.2756	-0.2231
3.5	9	-1.075	1.1556	-0.025	0.0006	0.0269
4.5	7.5	-0.075	0.0056	-1.525	2.3256	0.1144
5	9.5	0.425	0.1806	0.475	0.2256	0.2019
5	9.5	0.425	0.1806	0.475	0.2256	0.2019
4.5	9.5	-0.075	0.0056	0.475	0.2256	-0.0356
5	9	0.425	0.1806	-0.025	0.0006	-0.0106
4.5	9.5	-0.075	0.0056	0.475	0.2256	-0.0356
91.5	180.5		5.1375		19.7375	5.7125

$$\bar{x} = 4.575 \quad \bar{y} = 9.025$$

AKHIL.S

2021MT12054

Q3
CONT...

$$r = \frac{\sum XY}{\sqrt{\sum X^2 \sum Y^2}} = \frac{5.7125}{\sqrt{5.1375 \times 19.7375}} = \underline{0.5673} \quad (0 < r < 1)$$

The r value lies between 0 and 1, so this means that the two variables show a positive partial correlation.

Q4

Null Hypothesis $\rightarrow H_0$: The selling abilities of the three salesmen (X, Y, Z) are same

Alternate Hypothesis $\rightarrow H_1$: At least one salesman's selling ability is different from the rest

X	Y	Z	X^2	Y^2	Z^2
5	3	5	25	9	25
4	7	3	16	49	9
7	4	5	49	16	25
8	6	4	64	36	16
6	-	3	36	-	9
Σ 30	20	20	190	110	84

$$T = 30 + 20 + 20 = 70$$

$$T^2 = 4900$$

$$k = 3$$

$$n = 14$$

$$CF = \frac{T^2}{n} = \frac{4900}{14} = 350$$

$$SST = (\sum X^2 + \sum Y^2 + \sum Z^2) - CF = 190 + 110 + 84 - 350 = \underline{34}$$

$$SSTR = \frac{(\sum X)^2}{n_x} + \frac{(\sum Y)^2}{n_y} + \frac{(\sum Z)^2}{n_z} - CF = \frac{900}{5} + \frac{400}{4} + \frac{400}{5} - 350 = \underline{10}$$

$$SSE = SST - SSTR = 34 - 10 = \underline{24}$$

$$MSTR = \frac{SSTR}{k-1} = \frac{10}{2} = \underline{5}$$

$$MSE = \frac{SSE}{n-k} = \frac{24}{11} = \underline{2.1818}$$

$$F = \frac{MSTR}{MSE} = \frac{5}{2.1818} = \underline{2.2917}$$

AKHIL.S

2021MT12054

Q4
CONT..

Table Value $F(0.01 \text{ CONFIDENCE, dof } 2, 11) = 7.206$

Table Value $F(0.05 \text{ CONFIDENCE, dof } 2, 11) = 3.9823$

Table Value $F(0.1 \text{ CONFIDENCE, dof } 2, 11) = 2.8595$

Since the F value (2.2917) is less than the table values for 1%, 5% & 10% level of significance we can accept H_0 and say that all 3 salesmen have similar selling abilities at these levels of significance