① Anova analysis

G1 Variable 1		G2 Variable 2		G3 Variable 3	
x	x^2	x	x^2	x	x^2
27	729	63	3969	52	2704
43	1849	43	1849	60	3600
64	4096	52	2704	37	1369
62	3844	58	3364	40	1600
44	1936	54	2916	23	529
54	2916	50	2500	39	1521
57	3249	65	4225	55	3025
49	2401	53	2809	52	2704
31	961	43	1849	43	1849
69	4761	49	2401	39	1521
500	26,742	530	28586	440	20422

1) Correction term:

$$C_x = \frac{\Sigma(x)^2}{N} = \frac{(500+530+440)^2}{30} = \frac{2160900}{30}$$

$$= 72030$$

2) Sum of square total:

$$S_{ST} = \Sigma x^2 - C_x$$

$$= (26742 + 28586 + 20422) - 72030$$

$$= 3,720$$

3) Sum of square among group:

$$SS_A = \frac{(\Sigma x^2)}{N} - C_x$$

$$= \left[\frac{500^2}{10} + \frac{530^2}{10} + \frac{440^2}{10}\right] - 72030$$

$$SS_A = (25000 + 28090 + 19360) - 72030$$

$$SS_A = 420$$

4) Sum of Square with in group:

$$SS_W = SS_T - SS_A$$

$$= 3720 - 420$$

$$= 3,300$$

5) Mean of sumof Square Among groups:

$$M_{SSA} = \frac{SSA}{K-1}$$ Where K-1 Variable category

$$= \frac{420}{3-1}$$

$$M_{SSA} = 210$$

6) Mean of sum of Square with in groups

$$M_{SSW} = \frac{SSW}{N-K} \cdot = \frac{3,300}{30-3}$$

$$= \frac{3300}{27}$$

$$f\ ratio = \frac{M_{SSA}}{M_{SSW}}$$

Significance level = 0.0

$$= \frac{210}{122.22}$$

$$f_{ratio} = 1.72$$

Comparing f ratio with the f table → Df (27, 2)

from f table = 3.3541

F ratio < f table ⇒ 1.72 < 3.3541

Result: there is no significance difference and accept null hypothesis and reject Ha

Question :2

G1		5 year Return			
		G2		G3	
F		E		U	
x	x^2	x	x^2	x	x^2
10.76	21.52	12.72	161.80	11.88	141.13
15.05	226.50	13.91	193.49	5.86	34.34
17.01	289.34	6.43	41.34	13.46	181.17
5.07	25.70	11.19	125.22	9.9	98.01
19.5	380.25	18.79	353.06	3.95	15.60
8.16	66.58	20.73	429.73	3.44	11.83
10.38	107.74	9.6	92.16	7.11	50.55
6.75	45.56	17.4	302.76	15.7	246.49
92.68	1163.19	110.77	1699.56	71.3	779.12

1) Correction term:

$$C_x = \frac{\Sigma(x)^2}{N} = \frac{(92.68 + 110.77 + 71.3)^2}{24}$$

$$C_x = 3145.32$$

2) Sum of Square Total:

$$S_{ST} = \Sigma x^2 - C_x$$

$$= (1163.19 + 1699.56 + 779.12) - 3145.32$$

$$S_{ST} = 496.55$$

3) Sum of square among group

$$S_{SA} = \frac{(\Sigma x^2)}{N} - Cx$$

$$= \left[\frac{92.68^2}{8} + \frac{110.77^2}{8} + \frac{71.3^2}{8} \right] - 3145.32$$

$$= (1073.89 + 1533.75 + 635.46) - 3145.3$$

$$S_{SA} = 97.58$$

4) Sum of square with in group

$$S_{SW} = S_{ST} - S_{SA}$$

$$= 496.55 - 97.58$$

$$S_{SW} = 398.97$$

5) Mean of sum of squares among group

$$M_{SSA} = \frac{SSA}{K-1} = \frac{97.58}{2} = 48.79$$

6) Mean of sum of square with in group

$$M_{SSW} = \frac{S_{SW}}{N-K} = \frac{398.97}{24-3}$$

$$M_{SSW} = 18.99$$

$$f\ ratio = \frac{M_{SSA}}{M_{SSW}} = \frac{48.79}{18.99} = 2.57$$

0.05

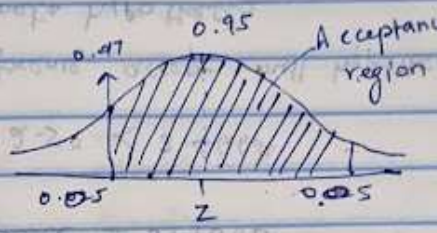
$\Rightarrow$

Df = (21, 2) f table = 3.4668

f ratio < f table $\Rightarrow$ 2.57 < 3.4668

Result: No significance difference, accept null hypothesis and reject alternate hypothesis

Q6 : Z test



$n = 169$

$\mu = 15$, $\bar{x} = 16$

$\sigma = 14$

$$z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}} = \frac{16 - 15}{14/\sqrt{169}} = \frac{1}{14/13} = \frac{1}{1.077}$$

$z = 0.9285 \simeq 0.93$

Pvalue from Z lookup = $0.1762 > 0.10$

Since Pvalue is higher than significant level Accept Ho and Reject Ha

Q5 : T distribution (test)

$$\left(\bar{x} + t \times \frac{s}{\sqrt{n}}\right) \leq \mu \leq \left(\bar{x} - t \times \frac{s}{\sqrt{n}}\right)$$

$n = 25$

$\bar{x} = 125$, $s = 14$

$df = 24$ $\mu = 105$

$\alpha = 0.05$

125

$\Rightarrow \left[125 + (2.064) \times \frac{14}{\sqrt{25}}\right] \leq \mu \leq \left[\quad \frac{\quad}{\sqrt{25}}\right]$

↓ t lookup

$$\Rightarrow \quad 125 + \left[(2.064) \times \frac{14}{\sqrt{25}}\right] \leq \mu \leq 125 - \left[2.064 \times \frac{14}{\sqrt{25}}\right]$$

$$= \quad 125 + 5.779 \leq \mu \leq 125 - 5.779$$

$$= \quad 130.78 \quad 119.22 \quad 119.22 \leq \mu \leq 130.78$$

$$\leq \mu \leq$$

→ This shows 95% Confident that enhancement worked, because mean of sale is expected in the range of 130.78 and 119.22 which is more than $105

Q4: T distribution for Car speed

$\bar{x} = 100.83$

$s = 3.43$

$n = 10$

$df = 9$

$\alpha = 0.05$, $\frac{\alpha}{2} = 0.025$

$$\bar{x} + t \times \frac{s}{\sqrt{n}} \leq \mu \leq \bar{x} - t \times \frac{s}{\sqrt{n}}$$

$$100.83 + \left(2.262 \times \frac{3.43}{\sqrt{10}}\right) \leq \mu \leq 100.83 - \left(\frac{2.262 \times 3.43}{\sqrt{10}}\right)$$

$$\Rightarrow \quad 100.83 + 2.456 \leq \mu \leq 100.83 - 2.456$$

$$\Rightarrow \quad 103.29 \leq \mu \leq \quad 98.37 \leq \mu \leq 103.29$$

95% Confident that mean of batch of cars speed is between 98.37 and 103.29 mph

Question#3 is little confused for the formula, so unable to complete it