(1) H_0 There is NO significant difference in the variance of the Population and Sample

H_1 There is a significant difference in the variance of population and Sample

V_1	V_1^2
27	729
43	1849
64	4096
62	3844
44	1936
54	2916
57	3249
49	2401
31	961
69	4761
500	26742

V_2	V_2^2
63	3969
43	1849
52	2704
58	3364
54	2916
50	2580
65	4225
53	2809
43	1849
49	2401
530	28586

V_3	V_3^2
52	2704
60	3600
37	1369
40	1600
23	529
39	1521
55	3025
52	2704
43	1849
49	1521
440	20422

Correction Term $C_2 = \frac{\Sigma(2i)^2}{N} = \frac{(500+530+440)^2}{30}$

$C_2 = 72,030$

Sum of Squares of Total

$SS_T = \Sigma x^2 - C_x = 26742 + 28586 + 2042 - 72030$

$SS_T = 3720$

Sum of squares among groups

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

$$= \frac{500^2}{10} + \frac{(530)^2}{10} + \frac{(440)^2}{10} - 72030$$

$$= 25000 + 28090 + 19360 - 72030$$

$$\boxed{SS_A = 420}$$

Sum of square within groups

$$SS_w = SS_T - SS_A$$

$$= 3720 - 420$$

$$\boxed{SS_w = 3300}$$

mean sum of square among groups

$$MSS_A = \frac{SSA}{K-1} = \frac{420}{10-1} = \frac{420}{9}$$

$$\boxed{MSS_A = 46.667}$$

Mean sum of square with in group

$$MSS_w = \frac{SSw}{N-K} = \frac{3300}{30-3}$$

$$= \frac{3300}{27} = \frac{1100}{9}$$

$$\boxed{MSS_w = 122.22}$$

$$F_{cal} = \frac{MSS_w}{MSS_A} = \frac{122.2}{46.6}$$

$$\boxed{F_{table} = 2.619}$$

Source of Variation	df	SS	MSS	F table
Among groups	3-1=2	420	46.67	2.619
Within group	30-3=27	3300	122.2	

df (27, 2) = 5.49 (f_{tab})

$f_{tab} > F_{cal}$ H_0 is accepted.

2) H_0 - There is no differ in Rate of Return

H_1 - There is a Significan differ in rate of Return

Finance

x	x^2
10.76	115.7
5.05	226.50
7.01	289.34
5.07	25.7
19.5	380.25
8.16	66.58
10.38	107.74
6.75	45.56
72.62	1257.47

Energy

x	x^2
12.72	161.79
13.91	193.48
6.43	41.34
11.19	125.21
18.79	353.06
20.73	429.73
9.6	92.16
17.4	302.7
110.77	1699.56

Utilities

x	x^2
11.88	141.13
5.86	34.33
13.46	181.17
9.9	98.01
3.95	15.60
3.44	11.83
7.11	50.55
15.7	246.49
71.3	779.13

Correction Thorm

$$C_x = \frac{\xi (x)^2}{N} = \frac{(92.68 + 110.77 + 71.3)^2}{24} = 3145.31$$

Sum of Square of Total SST:

$$\xi x^2 - C_x = 1257.46 + 1699.56 + 779.13 - 3145.31$$

$$\boxed{SST = 590.85}$$

Sum of Square among Group SSA:

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

$$= \frac{92.68^2}{10} + \frac{110.77^2}{10} + \frac{71.3^2}{10} - 3145.31$$

$$\boxed{SSA = 7452.6}$$

Sum of Square with in group : SSW

$= SS_T - SS_A$

$= 7452.69 - 590.85$

$SS_W = 6861.83$

mean of Square among the group MSSA.

$MSS_A = \frac{SS_A}{N-1} = \frac{590.85}{8-1} = 84.4$

$MSS_W = \frac{SS_W}{\text{Total} - K} = \frac{7452.63}{24-3} = 354.9$

Ratio : $\frac{MSS_W}{MSS_A} = \frac{384.9}{84.4}$

Ratio $= 4.204$

Sum of Varian	df	MSS	MSS	Ratio
Among group	8-1=7	7452.7	84.40	4.204
within group	24-3=24	6861.83	354.89	Ratio

df (21, 7) $= 3.64$ (F_{tab})

H_0 is Rejected and H_1 is accepted

3) H_0 = Population variance = Sample variance

H_1 = Pop. variance $\neq$ Sample variance

$$F = \frac{S_1^2}{S_2^2}$$

$$F = \frac{0.718}{0.6198} = 1.1588$$

$df_1 = 10 - 1 = 9$

$df_2 = 10 - 1 = 9$

$F_{tab} = 5.35$ $F_{cal} = 1.1588$

$F_{tab} > F_{cal}$

So, H_0 is accepted

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4) $H_0 = \mu = 100$ $\quad H_1 : \mu \neq 100$

mean $\bar{x} = 100.83$

σ (S.D) $= 1.7573$, $n = 10$, $V = 10 - 1 = 9$

At Level 95%, $\alpha = 0.05$, $\frac{\alpha}{2} = 0.025$

$$\bar{x} - t_{n-1,\alpha/2} \frac{S}{\sqrt{n}} \leq \mu \leq \bar{x} + t_{n-1} \frac{\sigma}{2} \frac{S}{\sqrt{n}}$$

$$100.83 - 2.262 * \frac{1.7573}{\sqrt{10}} \leq \mu \leq 100.83 + 2.262 \times \frac{1.7573}{\sqrt{10}}$$

$$100.83 - 1.279 \leq \mu \leq 100.83 + 1.257$$

$$99.5 \leq \mu \leq 102.1$$

The mean is 100 and 90% of confident average speed batch of cars b/w 99.5 and 102.1 mph.

5) $H_0 = \mu = 105$

$H_1 = \mu_1 \neq 105$

$\bar{x} = 125$,

$s = 14$

$n = 25$

$d.f = 24 - 1 = 25$

$\alpha = 95\%$

$$t = \frac{\bar{x} - \mu_0}{\frac{s}{\sqrt{n}}} \Rightarrow \frac{125 - 105}{14/\sqrt{25}}$$

$$t = \frac{20}{2.8} = 7.14$$

$t_{tab} = 2.064$, $t_{cal} = 7.14$

$t_{cal} > t_{tab}$

6)

Null hypothesis H_0 $\mu = 13$

Alternate hypothesis H_1 $\mu \neq 13$

DATA'S

$\bar{x} = 15.5$

$\mu_0 = 13$

$n = 169$

$\sigma = 13$

$$Z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}}$$

$$Z = \frac{15.5 - 13}{13/\sqrt{169}} = 2.15$$

$Z > 1.96$ Null Hypothesis Rejected