CO-3

H.A

① Given

Source	Degrees of freedom	Sum of squares	Mean sum of squares	f-calculate
Blocks	5	28.6	?	?
Treatments	4	?	?	?
Errors	?	2	3.6	
Total	?	13.5		

→ Total Degrees of freedom

$$(r \times t) - 1 = (6 \times 5) - 1 = 29$$

⇒ Error DF =

Total DF − Block DF − Treatment DF

$$= 29 - 5 - 4 = 20.$$

→ Sum of squares

$$= \frac{SSE}{\text{Error DF}} \Rightarrow MSE \times \text{Error DF}$$

$$= 3.6 \times 20 = 72$$

→ Treatment sum of squares

$SS_{Total} = SS_{Blocks} + SS_{Treatments} + SS_{Error}$.

⇒ $SS_{Treatments} =$

$163.5 - 28.6 - 72 = 62.9$

→ Mean squares :-

SS Blocks = $\frac{28.6}{5} = 5.72$

Treatments = $\frac{62.9}{4} = 15.725$.

→ calculate f - values :-

Blocks = $\frac{5.72}{3.6} = 1.589$

Treatments = $\frac{15.725}{3.6} = 4.368$

Finally :-

5	28.6	5.72	1.589	2.71
4	62.9	15.725	4.368	2.87
20	72.0	3.6	—	—
29	163.5	—	—	—

CO-3

HA

② Given

$n = 36$

$\bar{x} = 85$

$\mu = 80$

$\sigma = 10$

Step-1:- $H_0 = \mu = 80$

$H_1 : \mu > 80$

$$z = \frac{\bar{x} - \mu_0}{\sigma / \sqrt{n}}$$

$$= \frac{85 - 80}{10 / \sqrt{36}}$$

$$= \frac{5}{\frac{10}{6}} = \frac{5}{1.67} \simeq 3.00$$

5% significance level right-tailed

$z_\alpha = 1.645$

$z < z_\alpha$

= so we reject null hypothesis

(3) Given

$n = 100$

$\bar{x} = 1950$

$\mu = 2000$

$\sigma = 200$

$\alpha = 0.05$

$H_0 :- \mu = 2000$

$H_1 :- \mu < 2000$

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

$$= \frac{1950 - 2000}{\frac{200}{\sqrt{100}}} =$$

$$= \frac{-50}{\frac{200}{10}} = \frac{-50}{20} = -2.5$$

$\alpha = 0.05$ at left tail

$z_\alpha = -1.645$

$z > z_\alpha$ we accept.

(4) Given

$n_1 = 71$ $n_2 = 75$

$\bar{x} = 83.2$ $\bar{y} = \cancel{19.3}\ 90.8$

$s_1 = 19.3$ $s_2 = 21.4$

$\alpha = 0.05$

Step-1:- $H_0 = \mu_1 = \mu_2$

$H_1 = \mu_1 \neq \mu_2$

$$z = \frac{\bar{x} - \bar{y}}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

$$z = \frac{83.2 - 90.8}{\sqrt{\frac{19.3^2}{71} + \frac{21.4^2}{75}}}$$

$$z = \frac{-7.6}{3.367} \simeq \cancel{-2.26}\ -2.257$$

At $\alpha = 0.05$ for two-tailed

$$z_{0.025} = \pm 1.96$$

$|z| = 2.257 > 1.96$

= reject.

(5)

Confidence level - CI

$$CI = \bar{x} \pm Z_{\alpha/2} \cdot \frac{\sigma}{\sqrt{n}}$$

Given

$\sigma = 0.75$.

i.) 95% confidence

$n = 20$

$\bar{x} = 4.85$.

$z_{0.025} = 1.96$

$$CI = 4.85 \pm 1.96 \cdot \frac{0.75}{\sqrt{20}}$$

$= 4.85 \pm 1.96 \cdot 0.1677$

$= 4.85 \pm 0.3287$

$= CI \simeq (4.521, 5.179)$.

ii) 99%

$n = 16$

$\bar{x} = 4.56$

$z_{0.005} = 2.576$

$$CI = 4.56 \pm 2.576 \cdot \frac{0.75}{\sqrt{16}}$$

$= 4.56 \pm 0.483$

$CI = (4.077, 5.043)$

(6) Given $n_1 = 3$ $n_2 = 3$ $n_3 = 3$

Diet 1	Diet 2	Diet 3
2	4	2
4	5	3
3	4	3
9	13	8

$N = 9$

k = no. of groups = 3

(1) $H_0 :- \alpha_1 = \alpha_2 = \alpha_3 = 0$

(2) $H_1 :-$ Atleast $\alpha_i \neq 0$

(3) $G.T = 30$

(4) correction factor $= \frac{GT^2}{N} = \frac{30^2}{9} = 100$

(5) Sum of squares of observations

$SST = \Sigma\Sigma(x_{ij}^2) - CF$

4	16	4
16	25	9
9	16	9

$= 108 - 100$

$= 8$

⑥ Sum of squares observations by groups:-

$$S.S.A = \frac{T_1^2}{n_1} + \frac{T_2^2}{n_2} \cdots \frac{T_k^2}{n_k} - CF$$

Here $T_1 = 9$

$T_2 = 13$

$T_3 = 8$

$$= \frac{9^2}{3} + \frac{13^2}{3} + \frac{8^2}{3} - CF$$

$$\frac{81}{3} + \frac{169}{3} + \frac{64}{3} - CF$$

$= 104.6 - 100$

$= 4.6.$

⑦ Error sum of squares:-

$ESS = SST - SSA$

$= 8 - 4.6$

$= \cancel{4.6}\ 3.4$

⑧ degrees of freedom:-

for treatment $= k-1$

$= 3-1$

$= 2$

for errors $= N-k$

$= 9-3$

$= 6$

(9) Mean sum of sqaures for treatents

$$MSSA = \frac{SSA}{K-1} = \frac{4.6}{2} = 2.3$$

(10) Mean sum of saquares within groups

$$MSST = \frac{ESS}{N-k} = \frac{3.4}{6} = 0.56$$

(11) $$F_{cal} = \frac{MSSA}{MSSE} = \frac{2.3}{0.56} = 4.107$$

Ftable:-

$$F_{v_1 v_2}(0.05) = 4.76$$

$$v_1 = K-1 = 2$$

$$v_2 = N-K = 6$$

$$= 4.76$$

in table

	3
6	4.76

finally:

~~ftable > fcal~~

$$f_{cal} \not< f_{table}$$

$$4.107 \not< 4.76$$

→ Accept Ho

7. Given

Day	Mon	Tue	wed	thur	fri	sat	sun
accidents	35	40	38	42	50	55	60

$$E_i = \frac{\text{sum of accidents}}{\text{No. of days}}$$

$$= \frac{320}{7} = 45.71$$

O_i	E_i	$(O_i - E_i)^2$	$\frac{(O_i - E_i)^2}{E_i}$
35	45.71	114.70	2.509
40	45.71	32.60	0.713
38	45.71	59.44	1.300
42	45.71	13.76	0.301
50	45.71	18.40	0.402
55	45.71	86.30	1.887
60	45.71	204.20	4.467
			11.579

$\alpha = 0.01$

$\vartheta = n - 1$

$\vartheta = 7 - 1$

$= 6$

from table

$= 16.812$

= value < table value

$= 11.579 < 16.812$

= Accept H_0

∴ Uniformly distributed.

(8) Confidence Interval

$$CI = \bar{x} \pm Z_{\alpha/2} \cdot \frac{s}{\sqrt{n}}$$

Given

$\bar{x} = 12$

$s = 3.5$

$n = 40$

compute standard Error :-

$$S.E = \frac{s}{\sqrt{n}} = \frac{3.5}{\sqrt{40}} \simeq 0.5535$$

For 90% $Z_{0.05} = 1.645$

95% $Z_{0.025} \simeq 1.960$

90% :- $12 \pm 1.645 \cdot 0.5535 = 12 \pm 0.910$

$= 11.09, 12.91$

95% :- $12 \pm 1.960 \cdot 0.5535 = 12 \pm 1.085$

$= 10.92, 13.08$