(1)

Step:1 ⇒ Calculate the mean with in each group:

$$\bar{y_1} = \frac{1}{10}\sum y_{1i} = \frac{27+43+64+62+44+56+57+49+31+69}{10} \quad 495/10 = 49.5$$

$$\bar{y_2} = \frac{1}{10}\sum y_{2i} = \frac{63+43+52+58+56+50+65+53+43+69}{10} \quad 53/10 = 53$$

$$\bar{y_3} = \frac{1}{10}\sum y_{3i} = \frac{52+60+37+40+23+39+55+52+43+39}{10} \quad 440/10 = 44$$

Step:2 ⇒ Calculate the overall mean

$$\bar{y} = \frac{\sum_i \bar{y_i}}{a} = \frac{\bar{y_1}+\bar{y_2}+\bar{y_3}}{a} = \frac{49.5+53+44}{3} = \frac{146.5}{3}$$

$$= 48.8$$

where a is no of groups.

Step:3 ⇒ Calculate the 'between group' sum of squared differences:

$$S_B = n(\bar{y_1}-\bar{y})^2 + n(\bar{y_2}-\bar{y})^2 + n(\bar{y_3}-\bar{y})^2$$

$$= 10(49.5-48.8)^2 + 10(53-48.8)^2 + 10(44-48.5)^2$$

$$= 10(0.7)^2 + 10(4.2)^2 + 10(-4.8)^2$$

$$= 10(0.49) + 10(17.64) + 10(23.04)$$

$$= 4.9 + 176.4 + 230.4$$

$$= 411.7$$

$$f_b = 3-1 = 2$$

$$M_{SB} = \frac{411.7}{2} = 205.85$$

a_1	a_2	a_3
27 - 49.5	63 - 53	52 - 44
43 - 49.5	43 - 53	60 - 44
64 - 49.5	52 - 53	37 - 44
62 - 49.5	58 - 53	40 - 44
44 - 49.5	54 - 53	23 - 44
54 - 49.5	50 - 53	39 - 44
57 - 49.5	65 - 53	55 - 44
49 - 49.5	53 - 53	52 - 44
31 - 49.5	43 - 53	63 - 44
69 - 49.5	49 - 53	39 - 44

a_1	a_2	a_3
-22.5	10	8
-6.5	-10	16
-14.5	-1	-7
-12.5	5	-4
-5.5	1	-21
-4.5	-3	-5
-7.5	12	[illegible]
-0.5	0	8
-18.5	-10	-1
-19.5	-4	-5

$$S_w = (-22.5)^2 + (-6.5)^2 + (-14.5)^2 + (-12.5)^2 + (-5.5)^2 + (-4.$$
$$(-7.5)^2 + (-0.5)^2 + (-18.5)^2 + (-19.5)^2$$
$$+ (10)^2 + (-6)^2 + (-1)^2 + (5)^2 + (1)^2 + (-3)^2 + (12^2$$
$$(-10)^2 + (-4)^2$$
$$+ (8)^2 + ((6)^2 + (-7)^2 + (-4)^2 + (-21)^2 + (-5$$
$$(11)^2 + (8)^2 + (-1)^2 + (-5)^2$$

$$= 506.25 + 42.25 + 26.25 + 156.25 + 30.25 + 20.$$
$$56.25 + 0.64 + 342.25 + 380.25$$
$$+ 100 + 100 + 1 + 25 + 1 + 9 + 144 + 0 + 100 + 1$$
$$+ 64 + 256 + 49 + 16 + 169 + 25 + 121 + 64$$
$$1 + 25.$$

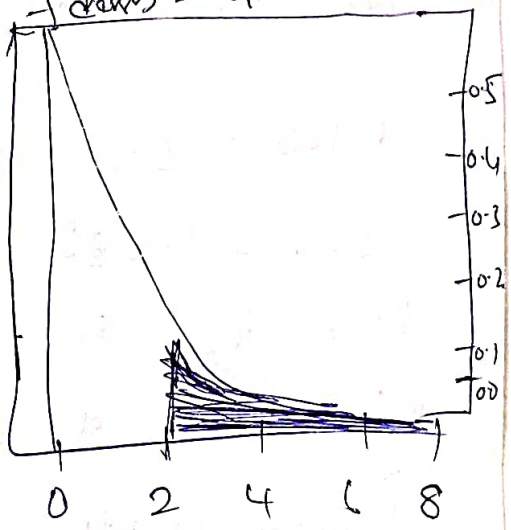
$$\approx 3301 \quad 1763.25 + 496 + 1062 = 3321$$

$f_w = q(n-1) = 3(10-1) = 27$

$M_{SW} = S_W / f_w = \frac{3301}{27} \approx 122.2$

$f = \frac{M_{SB}}{M_{SW}} = \frac{205.85}{122.2} \approx 1.68$

$f_{decay} = V_1 = 2v_2 = 27.$



(3) H_0 = Population Variance = Sample Variance

H_1 = Population variance $\neq$ Sample Variance

$$f = \frac{s_1^2}{s_2^2} = \frac{0.718}{0.6196}$$

$$= 1.1588$$

$df_1 = 10 - 1 = 9$

$df_2 = 10 - 1 = 9$

$f_{tab} = 5.35$

$f_{cal} = 1.1588$

$f_{tab} > f_{cal}$ so, Null hypothesis is accepted i.e the thickness of sheet is not changed due to Machine operator, manufacturing environment, raw material etc.

(4). $H_0 : \mu = 100$

$H_1 : \mu \neq 100$

Mean, $\bar{x} = 100.83$

Standard deviation, $S = 1.7573$.

$n = 10$

$\nu = 10 - 1 = 9$

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

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

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

$$100.83 - 2.262 \times \frac{1.7573}{3.1623} \leq \mu \leq$$

$$100.83 - 2.262 \times \frac{1.7573}{3.1623}$$

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

$$99.573 \leq \mu \leq 102.087$$

The batch mean is 100. The reasonable is 95% confident that the average speed of the batch of cars is between 99.573 and 102.087 mph.

3) $H_0 = \mu = 105$

$H_1 = \mu \neq 105$

$\bar{x} = 125$

$s = 14$

$n = 25$ d.f $= 25 - 1 = 24$

$\alpha = 95\%$

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

$$= \frac{20}{2.8} \Rightarrow 7.1429$$

$t_{tab} = 2.064$

$t_{cal} = 7.1429$

$t_{cal} > t_{tab}$ hence, the Null hypothesis is rejected and alternate hypothesis is accepted.

Hence, the enhancement of the book is not a success.

6) Null hypothesis. H_0 $\mu = 13$

Alternate hypothesis H_1 $\mu \neq 13$

Where μ is the average commuting distance for all chicago workers.

given =

$\bar{x} = 15.5$

$\mu_0 = 13$

$n = 167$

$\sigma = 13$

$$Z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}} \Rightarrow \frac{15.5 - 13}{13/\sqrt{169}}$$

$$= 2.5 > 1.96$$

∴ the Calculated value of Z is greater than the table value we reject H_0 hypothesis and accept H_1 hypothesis

∴ the National Average commuting distance does not describe the Mean commuting distance for all workers in the chicago area.

(2) H_0: There is no difference in the sale

H_1 = There is a significance difference.

ference		Energy		ailabilities	
X	X^2	X	X^2	X	X^2
10.76	115.7	12.72	161.7	11.88	141.1
15.05	226.5	13.91	93.4	5.86	34.3
13.01	189.3	6.43	41.34	13.4	181.1
5.07	25.70	11.19	25.2	9.9	98.01
19.5	380.2	18.79	353.0	3.9	15.6
8.16	66.5	28.73	629.7	3.4	11.8
10.38	107.7	4.6	92.16	7.11	58.5
6.75	45.5	17.4	302.7	15.7	246.4
92.68	1257.4	110.77	1699.	71.3	789.1

Sum of squares among groups

$$SS_A = \left(\frac{\Sigma x^2}{n}\right) - C_x$$

$$= \frac{92.68^2}{10} + \frac{110.77^2}{10} + \frac{91.32}{10} = 3165.30$$

$$= 1072.678 + 635.46$$

$$- 3165.3$$

$$\Rightarrow 765 2.6.$$

Sum of Squares within groups

$$SS_W = SS_T - SS_A$$

$$= 7452.6 - 590.3$$

$$= 6861.33$$

Mean Sum of Squares among groups

$$MSS_A = \frac{SS_A}{N-1} \Rightarrow \frac{590.8}{5-1} \Rightarrow$$

$$84.60$$

$$MSS_W = \frac{SS_W}{T.H-K} \Rightarrow \frac{7452.6}{24-3}$$

$$\Rightarrow 354.8$$

ratio :

$$\frac{MSS_W}{MSS_A} = \frac{354.8}{84.6}$$

$$= 4.2065$$

Source of Variance	df	SS	MSS	ratio
Among groups	8-1=7	7452.6	34.4	4.2065
within groups	24-3=21	6618	354.8	f-q

H_0 is rejected and H_1 is accepted.

∴ There is a significant difference in the salt of sources of industries.