

### TASK 11

Q1:-  $H_0: \mu = 100$  (corn starch add an effect)

$H_1: \mu \neq 100$  (corn starch did not add an effect)

$$\text{Alpha} = \frac{0.05}{2} = 0.025 \text{ (2 tail test)}$$

from ~~table~~ table  $1 - 0.025 = 0.975$  is 1.96.

$$\text{from } Z = \frac{\bar{x} - \mu_0}{\sigma / \sqrt{n}} = \frac{(108 - 100)}{15 / \sqrt{36}} = \frac{8}{5} = 1.6$$

hence the 'Z' value is falls in Rejection Region.

we can reject the null hypothesis  $H_0$ .

hence, the corn starch did not work.

Q2:-  $R_1 = 0.52$       $D_1 = 0.48$

$R_2 = 0.47$       $D_2 = 0.53$

$$\text{Difference in mean} = E(R_1 - R_2) = 0.52 - 0.47 = 0.05$$

$$SD = \sigma = \sqrt{\frac{R_1(1-R_1)}{N} + \frac{R_2(1-R_2)}{n_2}}$$

$$\sigma = \sqrt{\frac{(0.52)(0.48)}{100} + \frac{(0.47)(0.53)}{100}}$$

$$\sigma = \underline{\underline{0.0706}}$$

$$\text{now, } Z = \frac{X - \mu_{p1-p2}}{\sigma_d} = \frac{(0 - 0.05)}{0.0700} = -0.7082,$$

$$Z(-0.7082)$$

$$\Rightarrow \underline{0.24}$$

Q3:

$$\mu = 1026$$

$$\sigma = 209$$

$$X = 1100$$

$$Z = \frac{X - \mu}{\sigma} = \frac{1100 - 1026}{209} = \frac{74}{209}$$

$$= \underline{0.354}$$

So, the marks (score) is 0.354 ASD above the normal population.

hence Z score of 354 is .1368

So  $0.5 + .1368 = .6368 \approx 63.68\%$  Above other students

Task 2

Q1:  $n = 395$

Expected values:-

$H_0$  = Education level does not depend on gender  
 $H_1$  = Education level depend on gender

row total & col total

|       | HS     | B      | M      | Phd    | Total |
|-------|--------|--------|--------|--------|-------|
| F     | 50.886 | 49.868 | 50.377 | 49.868 | 201   |
| M     | 49.114 | 48.132 | 48.623 | 48.132 | 194   |
| Total | 100    | 98     | 99     | 98     | 395   |

$$\chi^2 = \sum \frac{(\text{Actual} - \text{expected})^2}{\text{expected}}$$

$$\chi^2 = 8.006$$

$$\chi^2 \text{ value of 3 degree freedom} = 7.815$$

$$8.006 > 7.815$$

Hence, we can reject the null hypothesis, Education level depends on gender

Q2:-  $\alpha = 0.5$

$$\bar{x}_1 = 48.2 \quad \bar{x}_2 = 55.4 \quad \bar{x}_3 = 69.8$$

Squared deviation

$$g_1 = \text{deviation } [2.8, -3.2, -15.2, 18.8] [7.84, 10.24, 231.04, 353.44]$$

$$g_2 = \text{deviation } [-12.4, 7.6, -12.4, 7.6, 9.6] [153.76, 57.76, 153.76, 57.76, 92.16]$$

$$g_3 = \text{deviation } [-13.8, 6.2, 4.2, 17.2, -13.8] [190.44, 38.44, 17.64, 295.84, 190.44]$$

$$\text{Sum of squared} = g_1: 612.8$$

$$g_2: 515.2$$

$$g_3: 732.8$$

$$\text{Var}_1 = \frac{612.8}{5-1} = 153.2$$

$$\text{Var}_2 = \frac{515.2}{5-1} = 128.8$$

$$\text{Var}_3 = \frac{732.8}{5-1} = 183.2$$

$$\text{Total Error} = \frac{153.2 + 128.8 + 183.2}{3} = 155.07$$

ANOVA Table Error calculation.

$$df_{\text{Error}} = 15 - 3 = 12$$

$$SS_{\text{Error}} = (155.07)12 = 1860.84$$

$$\bar{x}_{\text{grand}} = \frac{48.2 + 35.4 + 69.8}{3} = 51.13$$

group level deviation  $d_i$

$$g_1 \quad 48.2 \quad 51.13 \quad 8.58$$

$$g_2 \quad 35.4 \quad 51.13 \quad 247.43$$

$$g_3 \quad 69.8 \quad 51.13 \quad 348.57$$

$$SS_{\text{mean}} = 604.58$$

$$Var_{\text{mean}} = \frac{604.58}{3-1} = 302.29$$

$$MS_{\text{between}} = (302.29)(3) = 906.87$$

$$df_{\text{group}} = 3 - 1 = 2$$

$$SS_{\text{group}} = (906.87)(2) = 1813.74$$

$$F = \frac{SS_{\text{group}}}{SS_{\text{Error}}} = \frac{1813.74}{1860.84} = 9.75$$

$$F_{\text{critical}}(2, 12) = 3.89$$

So, hence  $9.75 > 3.89$  Reject  $H_0$ .

$$\eta^2 = \frac{SS_{\text{group}}}{\text{tot SS}} = \frac{1813.74}{4883.7} = 0.62$$

$$\eta^2 = 0.62$$

$$\text{APA} = F(2, 12) = 9.75, p < 0.05, \eta^2 = 0.62$$

Q31 A : 10, 20, 30, 40, 50

B : 5, 10, 15, 20, 25

$$N = 5$$

$$\bar{X}_1 = \frac{150}{5} = 30$$

$$\sigma_1 = 15.8114$$

$$\mu_1 = 250$$

$$\bar{X}_2 = 15$$

$$\sigma_2 = 7.9057$$

$$\mu_2 = 62.5$$

F test

$$= v_1 / v_2$$

$$= 250 / 62.5$$

$$= 4$$