Task 1

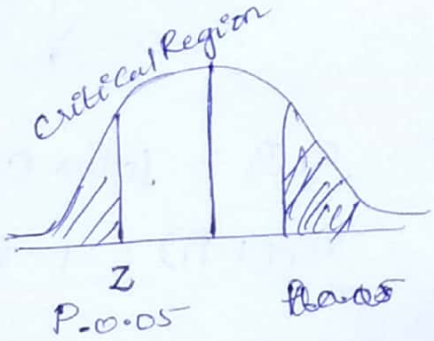
1. Blood glucose levels for obese patients have a mean of 100 with a standard deviation of 15. A researcher thinks that a diet high in raw cornstarch will have a positive effect on blood glucose levels. A sample of 36 patients who have tired the raw cornstarch diet have a mean glucose level of 108. Test the hypothesis that the raw cornstach had an effect or not.

Sol: Population Mean = 100

It is a z distribution.

null hypothesis $H_0 : \mu \leq 100$

$H_1 : \mu > 100$



$S.D = 15$

$$Z = \frac{x - \mu}{\sigma}$$

$$\frac{108 - 100}{15/\sqrt{36}} = \frac{8}{15} \times 6 = 3.20$$

By using z table P value at 3.20 is

$0.007 < 0.05$

∴ We Reject the Null hypothesis

There is a Cornstach effect.

2. In one State 52% of the voters are republicans and 48% are Democrats in a second State 47% of the voters are republicans and 53% are Democrats. Suppose a sample random sample of 100 voters are surveyed from each State what is Probabi that survey will show greater % of R.V in S.S than F.S?

$$\hat{P} \pm z\sqrt{\frac{\hat{P}(1-\hat{P})}{n}}$$

$$\sqrt{\frac{P_1 q_1}{n_1} + \frac{P_2 q_2}{n_2}}$$

$n_1 P_1 = 100 \times 0.52 = 52$

$n_1(1-P_1) = 1 - 52 = 48$

$n_2 P_2 = 100 \times 0.47 = 47$

$n_2(1-P_2) = 53.$

Mean distribution $P_1 - P_2 = 0.52 - 0.47$

$= 0.05.$

S.D

$$= \sqrt{\frac{P_1 q_1}{n_1} + \frac{P_2 q_2}{n_2}}$$

$$= \sqrt{\frac{0.52 \times 0.48}{100} + \frac{0.47 \times 0.53}{100}}$$

$$= \sqrt{0.02496 + 0.02491}$$

$$= \sqrt{0.004987} = 0.0706.$$

~~$z(p_1 - p_2)$~~

$$z_{p_1 - p_2} = (x - \mu_{p_1 - p_2}) / \sigma_d$$

$$= \frac{0 - 0.05}{0.0706}$$

$$= -0.7082$$

$$P(z \leq -0.7082) = 0.24$$

The Probability that Survey will Show greater Percentage of Rebuplican voters in Second State than first State is 0.24

3. You take the SAT and Scole 1100. The mean Scole for SAT is 1026 and the Standaud deviation is 209. How well did you Scole on the test Compared to the average test taker?

$$z = \frac{x - \mu}{\sigma}$$

$$= \frac{1100 - 1026}{209} = 74/209 = 0.354$$

$$(P_z < 0.354) = 0.6368$$

$$= 63.68\%.$$

TASK 2

1. Is gender independent of education level? A random sample of 395 people were surveyed and each person was asked to report the highest education level by obtained. The data that resulted from the survey is summarized in the table

	highschool	Bachelors	Masters	Phd	Total
Female	60	54	46	41	201
Male	40	44	53	57	194
Total	100	98	99	98	395

Are gender and education level dependent at 5% level of significance? In other words given data collected above, is there a relationship b/w the gender of an individual an the level of education that they have obtained? (r-1)(c-1) / Total $99 \times 200/(395)$ ....

	highschool	Bachelors	Masters	Phd	Total
Female	50.886	49.868	50.377	49.868	201
Male	49.114	48.132	48.623	48.132	194
Total	100	98	99	98	395

$$\chi^2 = (60-50.886)^2/50.886 + (40-49.114)^2/49.114 + \dots$$

$$\chi^2 = (O-E)^2/E$$

$$E = \frac{\text{row total} \times \text{col tol}}{\text{Sample size}}$$

$$\dots + \frac{(54-49.868)^2}{49.868} + \dots \dots \frac{(57-48.132)^2}{48.132} = 8.006.$$

The critical value of χ^2 with degree freedom is

7.815

8.006 > 7.815.

Reject the null hypothesis

Null hypothesis : The 2 categorical variables are Ondependent.

Alternativehypothesis: The 2 Categorical variables are dependent

Education level depends on gender at a 5% level of Significance.

3. Calculate FTest for given 10,20, 30,40,50 and 5,10,15,20,25 For 10,20,30,40,50

10,20,30,40,50.

$N = 5$

$$\text{Mean} = (x_1 + x_2 + x_3 + x_4 + x_5 \cdots x_n) / N$$

$$N = 150/50 = 30$$

$$S.D = \text{Sqrt}\left(1/(N-1) * (x_1 - x_m)^2 + (x_2 - x_m)^2 \cdots (x_n - x_m)^2\right).$$

$$\text{Sqrt}\left[1/(5-1)\left((10-30)^2+(20-30)^2+(30-30)^2+(40-30)^2+(50-30)^2\right)\right]$$

$$\text{Sqrt}\left[1/4\,(400+100+0+100+400)\right]$$

$$\text{Sqrt}(250)$$

$$= 15.8114$$

Varience = SD^2

Varience = 15.8114^2

$$= 250$$

→ 5, 10, 15, 20, 25

$N = 5$

Mean $\frac{\Sigma x}{N} = 75/5 = 15$

$$S.D = \text{Sqrt}\left[1/(5-1)\times(5-15)^2+(10-15)^2+(15-15)^2+(20-15)^2+(25-15)^2\right)$$

$$= \text{Sqrt}\left[1/4(100)+25+25+0+100)\right)$$

$$\text{Sqrt}(62.5)$$

Varience = SD^2

$$= 7.9057^2$$

Varience = 62.5

F Test Varience(First Set) / Varience(Sec 5)

$$= 250/62.5$$

$$= 4.$$

2. Using the following data Perform a one way analysis of Varience using a 0.5 write up the results in APA formate

Group 1 51, 45, 33, 45, 67

2: 23, 43, 23, 43, 45

56, 76, 74, 87, 56

Mean of group1 $= \frac{\Sigma x}{N} = \frac{51+45+33+45+67}{5}$

$= 48.2$

Mean of group2 $= \frac{\Sigma x}{N} = \frac{23+43+23+43+45}{5}$

$= 35.2$

Mean of group3 $= \frac{\Sigma x}{N} = \frac{56+76+74+87+56}{5}$

$= 69.8.$

deviations in group1		Sq of deviation	
(51 - 48.2)	2.8	$(2.8)^2$	7.84
(45 - 48.2)	-3.2	$(-3.2)^2$	10.24
(33 - 48.2)	-15.2	$(15.2)^2$	231.04
(45 - 48.2)	-3.2	$(-3.2)^2$	10.24
(67 - 48.2)	18.8	$(18.8)^2$	353.44
		Total =	612.8

Group2:

		Sq deviations
(23 - 35.4)	-12.4	153.76
(43 - 35.4)	7.6	57.76
(23 - 35.4)	-12.4	153.76
(43 - 35.4)	7.6	57.76
(45 - 35.4)	9.6	92.16
	Total.	515.2

Group3:

		Sq deviations
(56 - 69.8)	- 13.8	190.44
(76 - 69.8)	6.2	38.44
(74 - 69.8)	4.2	17.64
(87 - 69.8)	17.2	295.84
(56 - 69.8)	-13.8	190.44
	Total.	732.8

$$Var_1 = \frac{612.8}{(5-1)} = 153.2$$

$$Var_2 = \frac{515.2}{5-1} = 128.8$$

$$Var_3 = \frac{732.8}{5-1} = 183.2$$

$$MS_{error} = \frac{153.2 + 128.8 + 183.2}{3}$$

$$= 155.07$$

dferror = 15-3 = 12

SSerror = (155.07)(15-3)

= 1860.8.

Sample Mean

$$\frac{48.2 + 35.4 + 69.8}{3} = 51.13.$$

		devi	Sqdevi
48.2	51.13	-2.93	8.58
35.4	51.13	-15.73	247.43
69.8	51.13	-18.67	348.57

Sum of Squares = 604.58

$$\text{Varmeans} = \frac{604.58}{(3-1)} = 302.29$$

MSbet = (302.29)5 = 1511.45.

SS = (1511.45)(3-1) = 3022.9

$$F = \frac{1511.45}{155.7} = \frac{MS}{SSer} = 9.75$$

$F_{Critical}(2, 12) = 3.89.$

Reject Null hypothesis.

Source	SS	df	MS	F
G	3022.9	2	1511.45	9.75
E	1860.8	12	155.07	
Total	4883.7			

$$\eta^2 = \frac{3022.9}{488.7} = 0.62.$$

APA

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