Yash Nilesh Kasare
TE (AI/DS) - 26

Statistics : Assignment No. 03

Q.1

		Son			
		Dark	Not Dark	Total	
	Dark	48	90	138	
Father	Not dark	80	782	862	
Total		128	872	1000	

Ho : there is no association between the darkness
    of eye color of father and son.

H₁ : there is an association between them.

Expected frequencies .

$$E_{ij} = \frac{(\text{total row})(\text{total column})}{(\text{grand total})}$$

$$E_{11} = \frac{138 \times 128}{1000} = 17.664$$

$$E_{12} = \frac{138 \times 872}{1000} = 120.336$$

$$E_{21} = \frac{862 \times 128}{1000} = 110.336$$

$$E_{22} = \frac{862 \times 872}{1000} = 751.664$$

Chi - Square Test :, $\quad x^2 = \Sigma \dfrac{(0-E)^2}{E}$

$$x^2 = \dfrac{(48-17.664)^2}{17.664} + \dfrac{(90-120.336)^2}{120.336} + \dfrac{(80-110.336)^2}{110.336} +$$

$$\dfrac{(782-751.664)^2}{751.664}$$

$$= 52.15 + 7.65 + 8.34 + 1.23$$
$$= 69.37$$

$$dof = (rows - 1)(columns - 1)$$
$$= (2-1)(2-1)$$
$$= 1$$

At 5% significance level & $dof = 1$
∴ critical value = 3.841 "
... from the table

Since, $x^2_{cal} = 69.37 > 3.841$
∴ we reject Ho .
∴ There is a strong association between father's and son's eye color.

Q.2

Without Display,

mean $(\mu) = 320$

$\sigma = 50$

With Display,

Sample mean $(\bar{x}) = 335$

$n = 100$

Significance level $= 5\%$.

H_0 : Display does not help. i.e., $\mu = 320$

H_1 : Display helps. i.e., $\mu > 320$

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

$$= \frac{335 - 320}{50 / \sqrt{100}}$$

$$= 3.$$

Critical value at significance $5\% = 0.05$

$Z_{0.05} = 1.645$. (one tailed)

Since, $Z = 3 > 1.645$

we reject H_0, the attractive display significantly increased usage, hence it did help.