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Serial: 2 Section: 0

Final Assignment 03

10.2 We need to test $H_0: P_1 = P_2 = P_3 = P_4$ Vs

H_1: At least one of the

doesn't hold test statistic

test statistic,

$$X^2 = \sum \frac{O_i^2}{E_i} - n$$

$$E_i = \frac{n}{k}$$

$$= \frac{206}{4}$$

$$= 51.5$$

$$= \frac{\{(50)^2 + (42)^2 + (32)^2 + (82)^2\}}{51.5} -$$

$$= 27.25$$

Since, $X^2 > \chi^2_{(k-1)=3}$, So H_0 is not accep-

Hence, the proportions of road accidents various highways of Bangladesh is not similar

(10.4) test $H_0 : P_1 = P_2 = P_3 = P_4$ vs H_1 : at least one of the female student doesn't hold the ~~least~~ static

test static,

$$\chi^2 = \sum \frac{O_i^2}{E_i} - n$$

$E_i = \frac{n}{k}$

$= \frac{1000}{4}$

$= 250$

$= \frac{\{(250)^2 + (450)^2 + (190)^2 + (150)^2\}}{250} - 1000$

$= 240$

Since, $\chi^2 > \chi^2_{(k-1)=3} = \chi^2_3 = 7.81$, H_0 is not accepted. Hence, the proportions of female students in various department is not similar.

(10.5) Let, $x \sim N(\mu, 5^2)$, 6^2 is unknown

We need to test $H_0 : \mu = \mu_0 = 21$ vs $H_1 : \mu \neq \mu_0$

$\therefore \bar{x} = \frac{1}{n} \sum x = \frac{1}{36} \times 761.6 = 21.15$

$S^2 = \frac{1}{n-1} \left[\sum x^2 - \frac{(\sum x)^2}{n} \right] = \frac{1}{36-1} \left[16125.5 - \frac{5800345}{36} \right]$

$= 0.39$

Test statistic : $Z = \frac{\bar{x} - \mu_0}{S/\sqrt{n}} = \frac{21.15 - 21}{0.63/\sqrt{36}} = 1.42$

Since $Z < Z_{(0.1)}$, so H_0 is accepted.

(10.7) We need to test, $H_0 : P = P_0 = 0.40$ vs $H_1 : P \neq P_0$

Now, $p = \frac{a}{n} = \frac{8}{25} = 0.32$

$q_0 = 1 - P_0 = 1 - 0.40 = 0.60$

Test Statistic : $|Z| = \left| \frac{p - P_0}{\sqrt{\frac{P_0 q_0}{n}}} \right|$

$= \left| \frac{0.32 - 0.40}{\sqrt{\frac{0.40 \times 0.60}{25}}} \right|$

$= |-0.81| = 0.81$

Since, $|Z| < 1.96$, H_0 is accepted, So it can be considered that 0.40 is the overall proportions of female students in AIUB.

(10.9) We need to test $H_0: P_1 = P_2$ vs $H_1: P_1 \neq P_2$

test Statistic, $z = \dfrac{P_1 - P_2}{\sqrt{Pq\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}} \sim N(0,1)$

$P = \dfrac{25+18}{100+125} = 0.19$

$q = 1 - P = 1 - 0.19 = 0.81$

$P_1 = \dfrac{25}{100}$; $P_2 = \dfrac{18}{125}$

$= 0.25$ $= 0.14$

$\therefore |z| = \left| \dfrac{0.25 - 0.14}{\sqrt{(0.19)(0.81)\left(\frac{1}{100} + \frac{1}{125}\right)}} \right|$

$= |2.09|$

Since, $|z| > 1.96$, H_0 is rejected. We can consider that probation problem is not same for boys and girls at AIUB.

10.11 H_0: High blood pressure associated with heart problem

H_1: High blood pressure is not associated with heart problem.

Test statistic: $\chi^2 = \frac{n(ad-bc)^2}{(a+b)(a+c)(b+d)(c+d)}$

$$= \frac{150\{\{(150\times158)-(120\times122)\}^2}{270\times272\times278\times280}$$

$$= 2.16$$

$\therefore \chi^2 < \chi^2_{(k-1)=1} = 3.84$, H_0 is accepted. So, it can be considered as high blood pressure associated with heart problem.

10.12 H_0: Association does exist between origin and full attention.

H_1: Association doesn't exist between origin and full attention.

test Statistic : $\chi^2 = \frac{n(ad-bc)^2}{(a+b)(a+c)(b+d)(c+d)}$

$a+c = 202$

$b+d = 148$

$a+b = 202$

$c+d = 148$

$n = 350$

$ad = 138 \times 84 = 11592$

$bc = 64 \times 64 = 4096$

$$= \frac{350(11592-4096)^2}{202 \times 202 \times 148 \times 148}$$

$$= 22.00$$

Since $\chi^2 > \chi^2_{(k-1)=1} = 3.84$, H_0 is not accepted

Hence, association doesn't exist between origin and full attention.