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Section: O
Serial: 13

10.2

We need to test $H_0 = P_1 = P_2 = P_3 = P_4$ Vs H_1: At least one of them doesn't hold test static.

Test static,

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

$$E_i = \frac{n}{k} = \frac{206}{4} = 51.5$$

$$= \frac{\{(50)^2 + (42)^2 + (32)^2 + 82^2\}}{51.5} - 206$$

$$= 27.25$$

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

Hence, the properties proportions of road accidents in ranions highways of Bangladesh is not similar.

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10.4

We need to 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 test static.

Test static,

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

$$E_i = \frac{n}{4}$$

$$= \frac{1000}{4}$$

$$= 250$$

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

$$= 240$$

∴ Since, $\chi^2 > \chi^2(k-1) = 3 = \chi^2_{3,0.05} = 7.815$,

H_0 is not accepted. Hence, the proportions of female students in various department is not similar.

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10.5// let, $x \sim N(\mu, \sigma^2)$, σ^2 is unknown

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

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

$s^2 = \frac{1}{n-1} \left[\Sigma x^2 - \frac{(\Sigma x)^2}{n} \right]$

$= \frac{1}{36-1} \left[16125.5 - \frac{580034.56}{36} \right]$

$= 0.39$

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.

Hence, we can consider the ~~pop~~ population mean as 21.

10.7/ we need to test, $H_0 : P = P_0 = 0.40$

vs $H_1 = P \neq P$

Now, $P = \frac{q}{n} = \frac{8}{25} = 0.32$

$Q_0 = 1 - P_0 = 1 - 0.40 = 0.60$

Test Statistic : $|z| = \left| \frac{P - P_0}{\sqrt{\frac{P_0 Q_0}{n}}} \right|$

$= 0.81$

Since, $|z| < 1.96$, H_0 is accepted.

It can be considered that 0.40 is the overall proportions of female students in AIUB.