U-3

1. Given, $n = 960$

$x = 184$

$\alpha = 0.01$

$H_0 : P = \frac{1}{6}, q = \frac{5}{6}$

$H_1 : P \neq \frac{1}{6}$

$$\hat{P} = \frac{x}{n} = \frac{184}{960} = 0.1917$$

Now, $$Z = \frac{\hat{P} - P}{\sqrt{\frac{pq}{n}}}$$

$$= \frac{0.1917 - 0.1667}{\sqrt{\frac{\frac{1}{6} \times \frac{5}{6}}{960}}}$$

$Z = 2.08$

$Z_\alpha = 2.58$

$Z < Z_\alpha$

$\therefore H_0$ is accepted

(2) $n_1 = 1000$ $\quad$ $n_2 = 2000$

$\bar{x}_1 = 67.5$ $\quad$ $\bar{x}_2 = 68$

$\sigma = 2.5$

$H_0 : \mu_1 = \mu_2$ (Sample from same)

$H_1 : \mu_1 \neq \mu_2$ (" not " ")

$$Z = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}} = \frac{\bar{x}_1 - \bar{x}_2}{\sigma\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

$$= \frac{67.5 - 68}{2.5\sqrt{\frac{1}{1000} - \frac{1}{2000}}} = -5.16$$

at 5%, $Z_\alpha = 1.96$

$Z_\alpha < |Z|$

$\therefore$ we reject H_0.

(3) $n = 1000$

$x = 540 = 0.54 = \hat{P}$

$y = 460 = 0.46 = \hat{q}$

$H_0 : \mu_1 = \mu_2$, $P = 0.5$, $q = 0.5$

$H_1 : \mu_1 \neq \mu_2$, " $\neq$ ", " $\neq$ "

$$Z = \frac{\hat{P} - P}{\sqrt{\frac{pq}{n}}} = \frac{0.54 - 0.5}{\sqrt{\frac{0.5 \times 0.5}{1000}}}$$

$Z = 2.53$

at 1%

$Z_\alpha = 2.58$

$Z_\alpha > Z$

$\therefore H_0$ is accepted.

④ $n = 25$

$\bar{x} = 47.5$

$S = 8.4$

$\mu = 42.5$

$H_0 : \mu = 42.5$

$H_1 : \mu \neq 42.5$

$$t = \frac{\bar{x} - \mu}{S/\sqrt{n}} = 2.976$$

at degree of freedom,

$n - 1 = 24$

at $t_{0.05} = 2.064$

$2.064 < 2.976$

∴ we reject H_0.

⑤ $n = 10$

$$\bar{x} = \frac{41}{10} = 4.1$$

$H_0 : \mu = 4$

$H_1 : \mu \neq 4$

$$t = \frac{\bar{x} - \mu}{S/\sqrt{n}}$$

$$S = \sqrt{\frac{\Sigma (x - \bar{x})^2}{n-1}}$$

$$S^2 = \frac{12.42}{9} = 1.38$$

$S = 1.1747$

$$t = \frac{4.1 - 4}{1.17/\sqrt{10}}$$

$t = 0.269$

$dof = 9$

at $t_{5\%} = 2.262$

$t_{5\%} > t$

∴ H_0 is accepted

⑥ $\bar{x}_1 = 210$ $\quad \bar{x}_2 = 220$

$S_1 = 10$ $\quad S_2 = 12$

$n_1 = 100$ $\quad n_2 = 150$

$\sigma = 11$

$H_0 : \mu_1 = \mu_2$

$H_1 : \mu_1 \neq \mu_2$

$$Z = \frac{\bar{x}_1 - \bar{x}_2}{\sigma\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}} = \frac{-10}{11\sqrt{\frac{1}{100} + \frac{1}{150}}} = -7.04$$

at 5%,

$Z_\alpha = 1.96$

$|Z| > Z_\alpha$

∴ H_0 is rejected

⑦ $n_1 = 400$ $\quad n_2 = 600$

$x_1 = 200$ $\quad x_2 = 325$

$\hat{P}_1 = \frac{1}{2}$ $\quad \hat{P}_2 = 0.54$

$H_0 : P_1 = P_2$

$H_1 : P_1 \neq P_2$

$$P = \frac{x_1 + x_2}{n_1 + n_2} = 0.525$$

$Q = 0.475$

$$Z = \frac{\hat{P}_1 - \hat{P}_2}{\sqrt{PQ\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}} = \frac{-0.04}{\sqrt{(0.525)(0.475)\left(\frac{1}{400} + \frac{1}{600}\right)}}$$

$= -1.24$

at 5%

$Z_{5\%} = 1.96$

$Z_{5\%} > |Z|$

∴ we accept H_0

⑧ $\bar{x}_1 = 55$ $\quad \bar{x}_2 = 57$

$S_1 = 10$ $\quad S_2 = 15$

$n_1 = 400$ $\quad n_2 = 100$

$H_0 : \mu_1 = \mu_2$

$H_1 : \mu_1 \neq \mu_2$

~~$\hat{P}_1 = 0.1375$ $\quad \hat{P}_2 = 0.57$~~

$$P = \frac{\bar{x}_1 + \bar{x}_2}{n_1 + n_2} = 0.224$$

$Q = 0.776$

$$Z = \frac{\hat{P}_1 - \hat{P}_2}{\sqrt{PQ\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}} = -9.27$$

at 5%

$Z_{5\%} = 1.96$

$Z_{5\%} < |Z|$

∴ we reject H_0

$$Z = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}} = -1.26$$

at 5%,

$Z_{5\%} = 1.96$

$Z_{5\%} > |Z|$

∴ we accept H_0