JVTS Education Now

$H_0 : p = 0.7$

$H_1 : p \neq 0.7$

$\alpha = 0.10$

$n = 15$

$X = 8$

$np_0 = 15 \times 0.7 = 10.5$

$\therefore p = 2P(X \leq 8 \text{ for } p = 0.7)$

$= 2\sum_{x=0}^{8} b(x, 15, 0.7)$

$= 0.2625$

$p > 0.10$

$p > \alpha$

H_0 not enough evidence

Q2

$H_0 : \quad p = 0.6$

$H_1 : \quad p > 0.6$

$\alpha = 0.05$

$x = 70, \quad n = 100, \quad p = 0.6$

$$z = \frac{x - np_0}{\sqrt{np_0 q_0}}$$

$$= \frac{70 - 100 \times 0.6}{\sqrt{100 \times 0.6 \times 0.4}}$$

$$= 2.04$$

for $z > 2.04$

$p = 0.0207$

$p < \alpha$

new drug superior

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Q3 $\hat{P}_1 = \frac{120}{200} = 0.6$

$\hat{P}_2 = \frac{240}{500} = 0.48$

$\hat{P}_p = \frac{120+240}{200+500} = 0.514$

$\alpha = 0.05$

$H_0 : P_1 \leq P_2$

$H_1 : P_1 > P_2$

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

$$Z = \frac{0.6 - 0.48}{\sqrt{0.514(1-0.514)\left(\frac{1}{200}+\frac{1}{500}\right)}}$$

$\therefore Z = 2.869$

for $Z > 2.869$, $P = 0.0044$

$P < \alpha$, $\therefore$ reject H_0

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Q4)

a) $H_0 \Rightarrow p = 0.20$

$H_1 \Rightarrow p > 0.20$

right tail critical region

b) $H_0 \Rightarrow \mu = 3$

$H_1 \Rightarrow \mu \neq 3$

both tails critical region

c) $H_0 \Rightarrow \cancel{P_0}\ p = 0.15$

$H_1 \Rightarrow p < 0.15$

left tail critical region

d) $H_0 : \mu = 500$

$H_1 : \mu > 500$

right tail critical region

e) $H_0 \Rightarrow \mu = 15$

$H_1 \Rightarrow \mu \neq 15$

Both tail test critical region

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Q5 $H_0 : \mu_1 = \mu_2$

$H_1 : \mu_1 \neq \mu_2$

$\alpha = 0.05$

$$\bar{x}_1 = \frac{9.3 + 8.8 + 6.8 + 8.7 + 8.5 + 6.7 + 8.0 + 6.5 + 9.2 + 7.0}{10}$$

$= 7.95$

$$\bar{X}_2 = \frac{11 + 9.8 + 9.9 + 10.2 + 10.1 + 9.7 + 11.0 + 11.1 + 10.2 + 9.6}{10}$$

$= 10.26$

$$S_1^2 = \frac{1}{n_1 - 1}\left[\sum_{i=1}^{n_1} x_{1i}^2 - n_1 \bar{x}_1^2\right]$$

$= 1.207$

$$S_2^2 = \frac{1}{n_2 - 1}\left[\sum_{i=1}^{n_2} x_{2i}^2 - n_1 \bar{x}_2^2\right]$$

$= 0.325$

population variances probably differs
hence t-test

$$v = \frac{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)^2}{\frac{1}{n_1-1}\left(\frac{s_1}{n_1}\right)^2 + \frac{1}{n_2-1}\left(\frac{s_2}{n_2}\right)^2}$$

$= 10.30$
≈ 10

$$T = \frac{\bar{x}_1 - \bar{x}_2 - (\mu_1 - \mu_2)}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

∴ T for null, where $\mu_1 - \mu_2 = 0$

$$T = \frac{7.95 - 10.26}{\sqrt{\frac{1.202}{10} + \frac{0.325}{10}}} = -5.9$$

$|t| = 5.90$

pval $= 2 \times P(T \geq |t|)$

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$\therefore$ p val < 0.001

as $p < \alpha$ null hypothesis rejected