03/10/23

Answer to the Q#1

(a) Normal distribution with a large sample:

Here, $n = 20$, $X = 12$

So, $P = \frac{X}{n} = \frac{12}{20} = 0.6$

for 95% CI, $z = 1.96$

For large sample,

$$CI = P \pm 1.96 \times \{ P(1-P)/n \}^{\frac{1}{2}}$$

$$= 0.6 \pm 1.96 \times \left\{ \frac{0.6 \times (1-0.6)}{20} \right\}^{\frac{1}{2}}$$

$$= 0.6 \pm 0.2147$$

$\therefore$ 95% CI is $= (0.3853, 0.8147)$ (Ans.)

(7)

(b) Now, $n = 200$, $x = 120$

$p = 0.6$

For 95% $z = 1.96$

For large sample

$$CI = p \pm 1.96 \times \left\{ \frac{p \times (1-p)}{n} \right\}^{\frac{1}{2}}$$

$$= 0.6 \pm 1.96 \times \left\{ \frac{0.6 \times (1-0.6)}{200} \right\}^{\frac{1}{2}}$$

$$= 0.6 \pm 0.068$$

$\therefore$ 95% CI = (0.532 , 0.668)

(Ans.)

(iii)

Answer# 2

(a)

For Gehan's design:

n_1 = Sample = ?

β = Type-II error = 0.2

P_1 = True response rate = 0.15

We know,

$$\log(\beta) = n_1 \times \log(1-P_1)$$

$$\therefore n_1 = \frac{\log(\beta)}{\log(1-P_1)} = \frac{\log(0.2)}{\log(1-0.15)}$$

$$= 9.903$$

$$\approx 10.$$

(Ans)

Here, Type-I error is $\alpha = 0.05$

(Ans).

Answer #2

(b)

Total Sample, $n = 2 \times 10 = 20$

Response rate, $p = 0.15$

For 95% $z = 1.96$

So,

$$CI = p \pm 1.96 \times \left\{ \frac{p \times (1-p)}{n} \right\}^{1/2}$$

$$= 0.15 \pm 1.96 \times \left\{ \frac{0.15 \times (1-0.15)}{20} \right\}^{\frac{1}{2}}$$

$$= 0.15 \pm 0.156$$

Lower is negative. So, I set it to zero

Upper is $= 0.15 + 0.156 = 0.306$

$\therefore$ 95% CI $= (0, 0.3)$ (Ans).