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1) $n = 400$, $N = 100,000$, $\bar{X} = 170$, $\sigma^2 = 40$

$1-\alpha = 0,90 \Rightarrow \alpha = 0,1 \Rightarrow \frac{\alpha}{2} = 0,05$

$M \in ?$, $\because n > 30$

$$\therefore M \in \left(\bar{X} \pm Z_{\frac{\alpha}{2}} \cdot \sqrt{\frac{\sigma^2}{n}} \right)$$

$$M \in \left(170 \pm Z_{0,05} \sqrt{\frac{40}{400}} \right) \Rightarrow M \in \left(170 \pm (1,645)\left(\frac{1}{\sqrt{10}}\right) \right)$$

$$M \in (170 \pm 0,52)$$

$$\therefore M \in (169,48 , 170,52)$$

(2) $n = 150$, $x = 108$,

(2,1) $\hat{p} = ?$

$$\hat{p} = \frac{x}{n} = \frac{108}{150} = 0,72$$

(2,2) $1-\alpha = 0,99$, $p \in ?$

$$\Rightarrow \alpha = 0,01 \Rightarrow \frac{\alpha}{2} = 0,005$$

$$p \in \left(\hat{p} \pm Z_{\frac{\alpha}{2}} \sqrt{\frac{\hat{p}\hat{q}}{n}} \right)$$

$$\hat{q} = 1-\hat{p} = 1 - 0,72 = 0,28$$

$$\therefore p \in \left(0,72 \pm Z_{0,005} \cdot \sqrt{\frac{(0,72)(0,28)}{150}} \right)$$

$$p \in \left(0,72 \pm (2,575) \sqrt{0,001344} \right)$$

$$\therefore p \in (0,72 \pm 0,0944)$$

$$\therefore p \in (0,626 , 0,8144)$$

$$p \in (62,6\% , 81,44\%)$$

③ Table, $1-\alpha = 0,95$, $\mu_1 - \mu_2 \in ?$

$\alpha = 0,05$, $\frac{\alpha}{2} = 0,025$

$\mu_1 - \mu_2$ $\Leftarrow 30 < n_1 \cap 30 < n_2$ ∵

$$\mu_1 - \mu_2 \in \left((\bar{x}_1 - \bar{x}_2) \pm Z_{\frac{\alpha}{2}} \cdot \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}} \right)$$

$$\therefore \mu_1 - \mu_2 \in \left((79-73) \pm Z_{0,025} \cdot \sqrt{\frac{(11)^2}{200} + \frac{(12)^2}{150}} \right)$$

$$\mu_1 - \mu_2 \in \left(6 \pm (1,96) \cdot \sqrt{(0,605) + (0,96)} \right)$$

$$\mu_1 - \mu_2 \in (6 \pm 2,452)$$

$$\therefore \mu_1 - \mu_2 \in (3,548 \ , \ 8.452)$$

④ $\hat{p} = 0,60$, $E = 0,03$, $1-\alpha = 0,95$, n for $p = ?$

$\hat{q} = 1-\hat{p}$ $\quad\quad$ $\alpha = 0,05$

$= 1 - 0,60 = 0,40$ $\quad\quad$ $\frac{\alpha}{2} = 0,025$

$\because n$ for $p \Rightarrow$

$$\therefore n = \frac{Z_{\frac{\alpha}{2}}^2 \cdot \hat{p}\hat{q}}{E^2}$$

$$= \frac{(Z_{0,025})^2 (0,60)(0,40)}{(0,03)^2} = \frac{(1,96)^2 (0,24)}{(0,0009)}$$

$$= \frac{(3,8416)(0,24)}{\frac{9}{10000}} = \frac{(10000)(0,921984)}{9}$$

$$= \frac{9219,84}{9} = 1024,427 \approx 1025$$

$\therefore n \simeq 1025$ students.