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7. (1) $\hat{p} = \frac{45}{80} = 0.56$ (2) $Z_{\frac{\alpha}{2}}\sqrt{\frac{\hat{p}(1-\hat{p})}{n}} = Z_{0.025}\sqrt{\frac{0.56 \times 0.44}{0}} = 1.96 \times 0.06$

$= 0.12$

(3) $\hat{p} \pm Z_{\frac{\alpha}{2}}\sqrt{\frac{\hat{p}(1-\hat{p})}{n}} = 0.56 \pm Z_{0.05}\sqrt{\frac{0.56 \times 0.44}{80}} = 0.56 \pm 0.1 \rightarrow (0.46, 0.66)$

8. $\hat{p} = \frac{55}{100} = 0.55$, $\hat{p}_2 = \frac{60}{100} = 0.6$ $(\hat{p}_1 - \hat{p}_2) \pm Z_{\frac{\alpha}{2}}\sqrt{\frac{\hat{p}(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_1}}$

$= (0.55 - 0.6) \pm Z_{0.025}\sqrt{\frac{0.55 \times 0.45}{100} + \frac{0.6 \times 0.4}{100}}$

$= -0.05 \pm 0.14 \rightarrow (-0.19, 0.09)$

21. (1) $\hat{p} = \frac{105}{250} = 0.42$, $1-\alpha = 0.9$ $Z_{\frac{\alpha}{2}} = Z_{0.05} = 1.645$

$0.42 \pm Z_{0.05}\sqrt{\frac{0.42 \times 0.58}{250}} = 0.45 \pm 0.05 \rightarrow (0.37, 0.47)$

(2) $e = 0.03$, $1-\alpha = 0.95$ $Z_{\frac{\alpha}{2}} = Z_{0.025} = 1.96$

a. $p = 0.3$, $n = \left(\frac{1.96}{0.03}\right)^2 (0.3)(0.7) = 896.37$ $\therefore n = 897$

b. $\hat{p} = \frac{105}{250} = 0.42$ $n = \left(\frac{1.96}{0.03}\right)^2 (0.42)(0.58) = 1039.79 \doteq 1040$

$\therefore n = 1040$

c. $p = 0.5$

$n = \left(\frac{1.96}{0.03}\right)^2 (0.5)(0.5) = 1067.11 \doteq 1068$ $\therefore n = 1068$