習題7. (1) $\hat{p} = \frac{45}{80} = \frac{x}{n} = 0.56$

(2) e誤差界限 $= z_{\frac{\alpha}{2}} \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$

$= z_{0.025} \sqrt{\frac{0.56 \times 0.44}{80}}$

$= 1.96 \times 0.06 = 0.12$

(3) 信賴區間

$\hat{p} \pm z_{\frac{\alpha}{2}} \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$

$= 0.56 \pm z_{0.05} \sqrt{\frac{0.56 \times 0.44}{80}}$

$= 0.56 \pm 1.645 \times 0.06$

$= 0.56 \pm 0.1 \Rightarrow (0.46, 0.66)$

習8. $\hat{p}_1 = \frac{x}{n} = \frac{55}{100} = 0.55$

$\hat{p}_2 = \frac{x}{n} = \frac{60}{100} = 0.6$

$(\hat{p}_1 - \hat{p}_2) \pm z_{\frac{\alpha}{2}} \sqrt{\frac{p_1(1-p_1)}{n_1} + \frac{p_2(1-p_2)}{n_2}}$

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

$= -0.05 \pm 1.96 \times 0.07 = -0.05 \pm 0.14$

$\Rightarrow (-0.19, 0.09)$

習11 (1) $\hat{p} = \frac{x}{n} = \frac{105}{250} = 0.42$

$0.42 \pm z_{0.05} \sqrt{\frac{0.42 \times 0.58}{250}}$

$= 0.42 \pm 1.645 \times 0.03$

$= 0.42 \pm 0.05$

$\Rightarrow (0.37, 0.47)$

(2) a $\hat{p} = 0.3$, $e = 0.03$, $1-\alpha = 0.95$

$e = \frac{\sigma}{\sqrt{n}} \times z$, $n = \left(\frac{z_{\frac{\alpha}{2}}}{e}\right)^2 \times \hat{p}(1-\hat{p}) = \left(\frac{1.96}{0.03}\right)^2 (0.3)(0.7) = 896.37 \fallingdotseq 897$

b $\hat{p} = \frac{105}{250} = 0.42$

$n = \left(\frac{z_{\frac{\alpha}{2}}}{e}\right)^2 \times \hat{p}(1-\hat{p}) = \left(\frac{1.96}{0.03}\right)^2 (0.42)(0.58) = 1039.79 \fallingdotseq 1040$

$n = 1040$

c $\hat{p} = 0.5$ $n = \left(\frac{1.96}{0.03}\right)^2 \times 0.5 \times 0.5 = 1067.11 \fallingdotseq 1068$, $n = 1068$

習2 誤界限 $e = z_{\frac{\alpha}{2}} \frac{\sigma}{\sqrt{n}}$ $n = \left(\frac{z_{\frac{\alpha}{2}} \sigma}{e}\right)^2$

(1) $n = \left(\frac{1.96 \times 3}{0.5}\right)^2 = 138.3 \fallingdotseq 139 = n$

(2) $1-\alpha = 0.9$ $\alpha = 0.1$ $\frac{\alpha}{2} = 0.05$ $z_{\frac{\alpha}{2}} = z_{0.05} = 1.645$ $e = 0.03$

$n = \frac{1.645 \times 0.2}{0.03} = 120.27 \fallingdotseq 121 = n$

(3) $1-\alpha = 0.98$ $e = 0.02$ $\sigma = 0.05$

$\left(\frac{2.326 \times 0.05}{0.02}\right)^2 = 33.8 \fallingdotseq 34$