Statistics hw 4

① ⓐ $n = 5$

$\sigma = 3$

Mean $= 30$

$1-\alpha = .90$

$\alpha = 0.1$

$1-\alpha/2 = 0.95$

$Z_{0.95} = 1.645$

Confidence interval : $\bar{x} \pm Z_{0.95} \frac{s}{\sqrt{n}}$

$30 \pm 1.645 \frac{3}{\sqrt{5}}$

$(27.79, 32.21)$

ⓑ $1.645 \frac{3}{\sqrt{n}} = 1$

$n = 24.3542$

sample size must be 25 devices.

③ $n = 4$

$\sigma = 5$

Mean $= \cancel{2}257$

$1-\alpha = .90$

$\alpha = 0.1$

$1-\alpha/2 = 0.95$

$Z_{0.95} = 1.645$

Confidence interval : $\bar{x} \pm Z_{0.95} \frac{s}{\sqrt{n}}$

$\cancel{250}\ 257 \pm 1.645 \frac{5}{\sqrt{4}}$

$(252.89, 261.11)$

④ $n = 9$

$\sigma = 10g$

Mean $= 192g$

$1-\alpha = .90$ $\alpha = 0.1$ $1-\alpha/2 = \cancel{0.95}\ 0.95$ $Z_{0.95} = 1.645$

confidence interval: $\bar{x} \pm z_{0.95} \frac{s}{\sqrt{n}}$

$$192 \pm 1.645 \frac{10}{\sqrt{9}}$$

$(186.52, 197.48)$

(5) $1.645 \frac{10}{\sqrt{n}} = 2 \qquad n = 67.6506$

sample size must be 68+ bags.

(8) $1-\alpha/2 = 1-(1-.95)/2 = 1-0.05/2 = 0.975$

$z_{0.975} = 1.960$

Confidence interval: $n\hat{p} \geq 5, n(1-\hat{p}) \geq 5$

$n \geq 5/0.55 \rightarrow n \geq 9.09$

$n \geq 5/0.45 \rightarrow n \geq 11.11$

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

$0.55 \pm 1.960 \sqrt{\frac{(0.55)(0.45)}{n}}$

$0.55 - 1.960 \sqrt{\frac{(0.55)(0.45)}{n}} = -1.960$

$n \geq 0.15$

$0.55 + 1.960 \sqrt{\frac{(0.55)(0.45)}{n}} = 1.960$

$n \geq 48$

given the constraints on n, we can conclude that the minimal sample size is 12.

(9) $n = 200$, 10% defective $(20/200)$

$1-\alpha/2 = 1-(1-.95)/2 = 1-0.05/2 = 0.975$

$z_{0.975} = 1.960$

confidence interval: $0.1 \pm 1.960 \sqrt{\frac{(0.1)(0.9)}{200}}$

$(0.0584, 0.1416)$

(13) ~~sdan~~ standard deviation of sample:

$S \approx 7.14$

Mean: 192g

$\alpha/2 = (1-.90)/2 = 0.1/2 = 0.05$

$n-1=8$

$t_{0.05}(8) = 1.860$

confidence interval: $\bar{x} \pm t_{0.05}(8)\,\frac{7.14}{3}$

$192 \pm 1.860\,\frac{7.14}{3}$

$(187.57, 196.43)$