Q1.(a) C.I.: $\hat{\mu} \pm C\sqrt{1-\frac{n}{N}}\frac{\hat{\sigma}}{\sqrt{n}}$, $C \sim N(0,1)$

$\hat{\mu} = \frac{1}{15}[179+160+136+227+217+168+108+124+143+140+309+229+111+141+260] = 181.4667$

$\hat{\sigma}^2 = \frac{\sum_{i=1}^{15}(y_i-\hat{\mu})^2}{15-1} = 3162.838$

A 95% C.I. is: $181.4667 \pm 1.96\sqrt{1-\frac{15}{362}}\frac{\sqrt{3162.838}}{\sqrt{15}}$

$= (153.6, 209.33)$

We are 95% confident that the mean weight is in (153.6, 209.33)

(b) $E = \frac{20}{2} = 10$, $C = 1.96$ since we want 95% C.I., $C \sim N(0,1)$

$n = (\frac{E^2}{C^2\hat{\sigma}^2} + \frac{1}{N})^{-1} = 91.03$

So we need at least 92 chicks.

proportion $= \frac{92}{362} = 25.34\%$

(c)(i) C.I.: $\hat{\mu} \pm C\frac{\hat{\sigma}}{\sqrt{n}}$, $C \sim N(0,1)$

A 95% C.I. is: $181.4667 \pm 1.96\sqrt{\frac{3162.838}{15}}$

$= (153.0055, 209.9273)$

We are 95% confident that the mean weight is in (150.322, 212.611)

(ii) $E = 10$, $\frac{19}{20} = 0.95 \Rightarrow$ we want 95% C.I., $C = 1.96$, $C \sim N(0,1)$

$n = \frac{C^2\hat{\sigma}^2}{E^2} = \frac{1.96^2 \cdot 3162.838}{10^2} \approx 121.5036$

So we need at least 122 chicks.

2. $\frac{19}{20} = 0.95 \Rightarrow$ want want a 95% C.I.

$E = 0.05$

Since N is not ∞

$\hat{\sigma}^2 = \hat{\pi}(1-\hat{\pi}) \leq \frac{1}{4}$

$n = (\frac{E^2}{C^2\hat{\sigma}^2} + \frac{1}{N})^{-1}$, $C \sim N(0,1)$, $C = 1.96$

$\geq (\frac{0.05}{1.96^2 \cdot \frac{1}{4}} + \frac{1}{7000})^{-1}$ $\quad 0.0025$

$= 364.1741$

So we need at least 365 students.