2.7 Problems

2.1 $SE = \frac{s.d.}{\sqrt{n}} = \frac{3.12}{3} = 1.04$

Variance $= (s.d.)^2 = 9.7344$

2.2 $Mean = \frac{Sum}{N} = \frac{399.851}{16} = 24.99$

Std. Dev. $= \sqrt{n}\,(SE\ Mean) = 4(0.159) = 0.636$

2.3

Chapter 3

3.55 a) $F_0 = 5.535 \Rightarrow P(F > F_0) = 0.0036$

H_0: $\mu_i = \mu_j$ for all

H_a: $\mu_i \neq \mu_j$ for at least one

$\alpha = 0.05 < P(F > F_0) = 0.0036$, so we can reject the null hypothesis

b) $E(MS_E) = \sigma^2$

$MS_E = \frac{SS_E}{N-a} = \frac{0.0876}{20} = 0.00438$

$E(MS_{trt}) = \sigma^2 + n\sigma_\tau^2$

$= 0.024244$

$\sigma_\tau^2 = \frac{MS_{trt} - MS_E}{n}$

$= 0.0839728$

c) $L = \frac{1}{n}\left(\frac{MS_{trt}}{MS_E} \cdot \frac{1}{F_{\alpha/2, a-1, N-a}} - 1\right)$

$= \frac{1}{5}\left(\frac{5.535}{3.51} - 1\right)$

$= 0.1154$

$U = \frac{1}{n}\left(\frac{MS_{trt}}{MS_E} \cdot \frac{1}{F_{1-\alpha/2, a-1, N-a}} - 1\right)$

$= \frac{1}{5}\left(\frac{5.535}{5.8} - 1\right)$

$= -0.0091$

95% confidence interval for $\frac{\sigma_\tau^2}{\sigma_\tau^2 + \sigma^2}$: $\frac{L}{1+L} \leq \frac{\sigma_\tau^2}{\sigma_\tau^2 + \sigma^2} \leq \frac{U}{1+U}$

$0.1566 \leq$

3.54 a)

This is a random effects experiment because we are randomly pooling looms, which is assumed to be the source of variation.

$SS_{trt} = 0.0576$, $df_{trt} = 4$

$\Rightarrow MS_{trt} = \frac{0.0576}{4} = 0.0144$

$SS_E = 0.58$, $df_E = 20$

$\Rightarrow MS_E = \frac{0.58}{20} = 0.029$

$F_0 = \frac{MS_{trt}}{MS_E} = 0.497$

$P(F > F_0) = 0.738$

$\therefore$ no rejection

b) $\sigma_\tau^2 = \frac{MS_{trt} - MS_E}{n}$

Method of moment procedure give a negative σ_τ^2, so the estimated σ_τ^2 is 0

c) $MS_E = \sigma^2 = 0.029$

3.1 $F_{0.025,3,5} = 7.76$

$F_{0.975,3,5} = \frac{1}{F_{0.025,5,3}} = \frac{1}{14.88} = 0.0672$

$F_0 = 3.26$ is within the 95% CI, so we cannot reject the null hypothesis

3.2 $a = 6$

$n = 3$

3.3 $MS_{trt} = \frac{SS_{trt}}{df_{trt}} = \frac{36.15}{3} = 12.05$

$SS_E = SS_T - SS_{trt} = 159.89$

$df_E = 19 - 3 = 16$

$MS_E = \frac{159.89}{16} = 9.993125$

$F_0 = \frac{12.05}{9.99} = 1.21$