Q2

Exercise 34 a, b on page 652.

a)

```
x <- c( 50,   71, 55, 50, 33, 58, 79, 26,  69, 44,  37, 70, 20,  45, 49)
y <- c(152, 1992, 48, 22,  2,  5, 35,  7, 269, 38, 171, 13, 43, 185, 25)
n <- length(x)

S_xy <- sum(x*y) - (sum(x)*sum(y)) / n
S_xx <- sum(x^2) - (sum(x))^2 / n
```

$S_{xy} = \sum x_i y_i - \frac{(\sum x_i)(\sum y_i)}{n} = 42402$

$S_{xx} = \sum x_i^2 - \frac{(\sum x_i)^2}{n} = 4125.6$

```
x_bar <- mean(x)
y_bar <- mean(y)
Beta_1 <- S_xy/S_xx
Beta_0 <- y_bar - Beta_1 * x_bar
```

$\hat{\beta}_1 = \frac{S_{xy}}{S_{xx}} = \mathbf{-317.54}$

$\hat{\beta}_0 = \bar{y} - \hat{\beta}_1 \bar{x} = \mathbf{10.278}$

```
SSE <- sum(y^2) - Beta_0*sum(y) - Beta_1*sum(x*y)
SST <- sum((y - y_bar)^2)
r_2 <- 1 - SSE / SST
```

$\text{SSE} = \sum y_i^2 - \hat{\beta}_0 \sum y_i = \hat{\beta}_1 \sum x_i y_i = 3,096,567.3$

$\text{SST} = \sum (y_i - \bar{y})^2 = 3,532,368.7$

$r^2 = 1 - \frac{SSE}{SST} = \mathbf{0.1233}$

b)

```
s <- SSE / (n - 2)
s_Beta1 <- s / sqrt(S_xx)

Beta_1_0 <- 0
t <- (Beta_1 - Beta_1_0) / s

alpba <- 0.05
t_val = qt(alpba/2, n-2, lower.tail = FALSE)
reject <- t >= t_val || t <= -1 * t_val
```

$s = \frac{\text{SSE}}{n-2} = 237,187.4$

$s_{\hat{\beta_1}} = \frac{s}{\sqrt{S_{xx}}} = 3,708.46$

$t = \frac{\hat{\beta_1}}{s_{\hat{\beta_1}}} = 4.314 \cdot 10^{-5}$

$t_{0.05/2,n-2} = 2.16$

Do not reject null hypothsis because $t_{0.05/2,n-2} > t > -t_{0.05/2,n-2}$

d)

sorry

e)

90% Confidence interval

$(\hat{\beta_1} \mp t_{0.1/2,n-2})$

$(8.507, 12.05)$