Q5

Exercise 18 on page 571.

a)

code:

```
m1 <- c(13, 17,  7, 14);    h1 <- rep("1", length(m1));
m2 <- c(21, 13, 20, 17);    h2 <- rep("2", length(m2));
m3 <- c(18, 15, 20, 17);    h3 <- rep("3", length(m3));
m4 <- c( 7, 11, 18, 10);    h4 <- rep("4", length(m4));
m5 <- c( 6, 11, 15,  8);    h5 <- rep("5", length(m5));

measure <- c(d1, d2, d3, d4, d5)
hormone <- c(h1, h2, h3, h4, h5)

vals <- data.frame(measure, hormone)

anova_result <- anova(lm(measure~ hormone, data=vals))
print(anova_result)
```

output:

```
Response: measure
          Df Sum Sq Mean Sq F value  Pr(>F)
hormone    4  200.3  50.075  3.4855 0.03336
Residuals 15  215.5  14.367
```

The F value is 3.4855 which which gives a P value of 0.03336, so the null hypothesis can be rejected.

b)

$\bar{x}_1 = 12.75$

$\bar{x}_2 = 17.75$

$\bar{x}_3 = 17.5$

$\bar{x}_4 = 11.5$

$\bar{x}_5 = 10$

$$w = Q_{\alpha,I,I(J-1)} = Q_{0.05,5,5\cdot(4-1)}\sqrt{14.367/4} = 8.276$$

$\bar{X}_5$	$\bar{X}_4$ X_4	$\bar{X}_1$	$\bar{X}_3$	$\bar{X}_2$
10	11.5	12.75	17.5	17.75

$\Delta \bar{x}_5, \bar{x}_4 = 1.5 < w$

$\Delta \bar{x}_5, \bar{x}_1 = 2.75 < w$

$\Delta \bar{x}_5, \bar{x}_3 = 7.5 < w$

$\Delta \bar{x}_5, \bar{x}_2 = 7.75 < w$

using tukey procedure, none of the sample means differ significantly.