Take Home Final Exam

Pep Canyadell

1. Build a model that can be used to predict volume (V) using age group and weight (W) from the data presented in Problem 11.20, page 509 – 510 (from the 11th ed. of our text) or Problem 11.23, page 589 (if you are using the 10th ed. of our text). Then use this model to predict the volume (in liters) for an infant weighing 9 kg, a child weighing 18 kg, and an adult weighing 78 kg.

```
infant <- read.table("infants.csv", header = TRUE, sep=",")

dim (infant)
```

```
## [1] 20  2
```

```
head(infant)
```

```
##    x1     y
## 1 6.2 2.936
## 2 7.5 3.616
## 3 7.0 1.735
## 4 7.1 2.557
## 5 7.8 2.883
## 6 8.2 2.318
```

```
model.1 <- lm(y ~ x1, data = infant)
summary(model.1)
```

```
##
## Call:
## lm(formula = y ~ x1, data = infant)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -1.6248 -0.5858 -0.0658  0.3362  4.1565
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   0.5040     1.4490   0.348   0.7320
## x1            0.3431     0.1520   2.257   0.0367 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.226 on 18 degrees of freedom
## Multiple R-squared:  0.2206, Adjusted R-squared:  0.1773
## F-statistic: 5.094 on 1 and 18 DF,  p-value: 0.03667
```

Infant Group

Equation of the least squares line:

$\hat{y} = 0.5040 + 0.3431$ x

Predicted volume for a children weighing 9kg =

y^ = 0.5040 + 0.3431 * 9 = 3.5919

Predicted volume for a children weighing 9kg is equal to 3.5919 liters

```
children <- read.table("children.csv", header = TRUE, sep=",")
dim (children)
```

```
## [1] 18  2
```

```
head(children)
```

```
##   x1    y
## 1 13 4.72
## 2 14 5.23
## 3 14 5.85
## 4 15 4.17
## 5 16 5.01
## 6 17 5.81
```

```
model.2 <- lm(y ~ x1, data = children)
summary(model.2)
```

```
##
## Call:
## lm(formula = y ~ x1, data = children)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -1.5712 -0.6378  0.1408  0.7822  1.0358
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.01807    0.53153   0.034    0.973
## x1           0.36071    0.02185  16.505 1.81e-11 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.8687 on 16 degrees of freedom
## Multiple R-squared:  0.9445, Adjusted R-squared:  0.9411
## F-statistic: 272.4 on 1 and 16 DF,  p-value: 1.807e-11
```

Children Group

Equation of the least squares line:

y^ = 0.01807 + 0.36071 x

Predicted volume for infant weighing 18kg =

y^ = 0.01807 + 0.36071 * 18 = 6.51085

Predicted volume for an infant weighing 18kg is equal to 6.51085 liters

```
adult <- read.table("adults.csv", header = TRUE, sep=",")
dim (adult)
```

```
## [1] 9 2
```

```
head(adult)
```

```
##   x1    y
## 1 61 19.7
## 2 80 23.7
## 3 96 20.0
## 4 75 19.5
## 5 60 19.6
## 6 68 21.5
```

```
model.3 <- lm(y ~ x1, data = adult)
summary(model.3)
```

```
##
## Call:
## lm(formula = y ~ x1, data = adult)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -4.9381 -0.4853 -0.3924  0.4086  7.1984
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  11.7495     7.6617   1.534    0.169
## x1            0.1374     0.1024   1.342    0.222
##
## Residual standard error: 3.473 on 7 degrees of freedom
## Multiple R-squared:  0.2046, Adjusted R-squared:  0.09092
## F-statistic:   1.8 on 1 and 7 DF,  p-value: 0.2216
```

Adult Group

Equation of the least squares line:

y^ = 11.7495 + 0.1374 x

Predicted volume for an adult weighing 78kg =

y^ = 11.7495 + 0.1374 * 78 = 22.4667

Predicted volume for an adult weighing 78kg is equal to 22.4667 liters

2. Examine whether a relationship exists between blood type and whether one is a carrier from the data presented in Problem 12.17, page 572 (from the 11th ed. of our text) or Problem 12.17, page 659 (if you are using the 10th ed. of our text).

```
bloty <- matrix(c(72,230,54,192,16,63,8,15), ncol = 4, byrow = TRUE)

colnames(bloty) <- c("O","A","B","AB")
rownames(bloty) <- c("Carriers", "Noncarriers")

bloty <- as.table(bloty)

bloty
```

```
##              O   A   B  AB
## Carriers    72 230  54 192
## Noncarriers 16  63   8  15
```

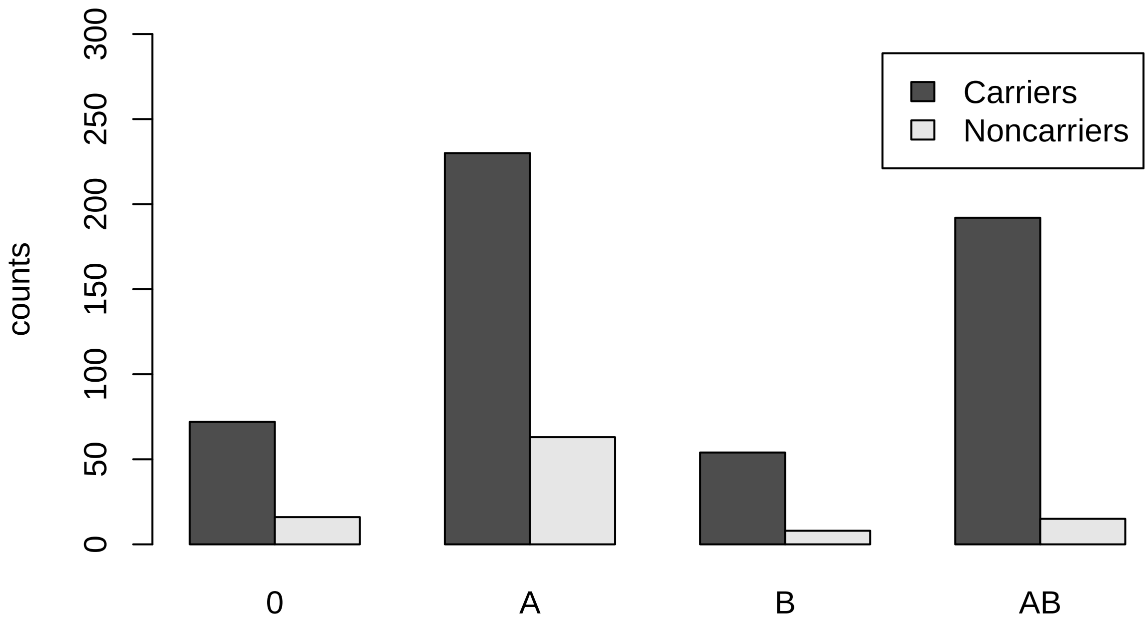
```
results <- chisq.test(bloty)
results$expected
```

```
##                     0         A         B        AB
## Carriers    74.19077 247.02154 52.270769 174.51692
## Noncarriers 13.80923  45.97846  9.729231  32.48308
```

```r
results
```

```
##
##  Pearson's Chi-squared test
##
## data:  bloty
## X-squared = 19.412, df = 3, p-value = 0.0002246
```

```r
barplot(bloty, ylim = c(0,300), ylab = "counts", beside = TRUE, legend = TRUE)
```



Chi-Square Test:

Ho: No relationship exist between blood type and whether one is a carrier or a non-carrier

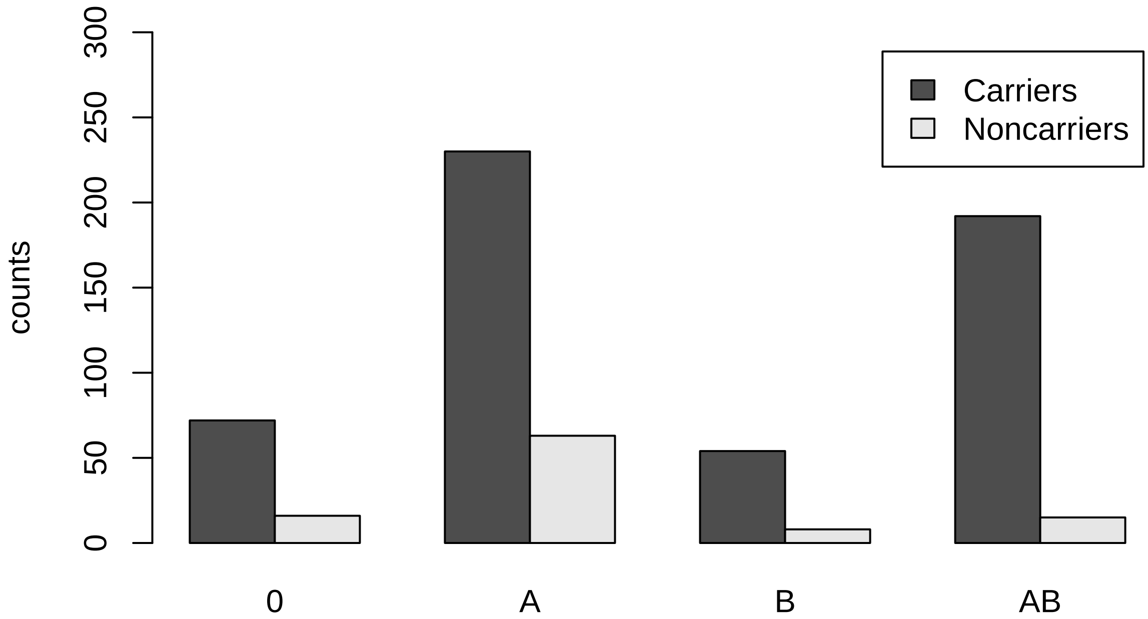
Ha: There is a relationship between blood type and whether one is a carrier or a non-carrier

Test Statistic: $X2^* = 19.412$ with $df = 3$

P-value: 0.0002246

Conclusion: Reject Ho in favor of Ha. There is sufficient evidence to conclude that a relationship exist between blood type and whether one is a carrier or a non-carrier.

```r
barplot(bloty, ylim = c(0,300), ylab = "counts", beside = TRUE, legend = TRUE)
```



Post-Hoc Analysis:

Since it was concluded that there is a relationship between the blood group and if one is a carrier or a non-carrier, we can conduct the Post-Hoc analysis to investigate this relationship.

```
rowsum <- rowSums (bloty, na.rm = FALSE, dims = 1)
barplot(bloty/rowsum, ylim = c(0,0.8), ylab = "Percents", beside = TRUE, legend = TRUE)
```