Homework 6

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STAT4205

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```
library(alr4)
library(ggplot2)
```

Problem 7.6

7.6.1 - 7.6.4

stopping dataframe

heteroscedastic homosecdastic

What are theset erms?

```
dim(stopping)
```

```
## [1] 62  2
```

```
names(stopping)
```

```
## [1] "Speed"    "Distance"
```

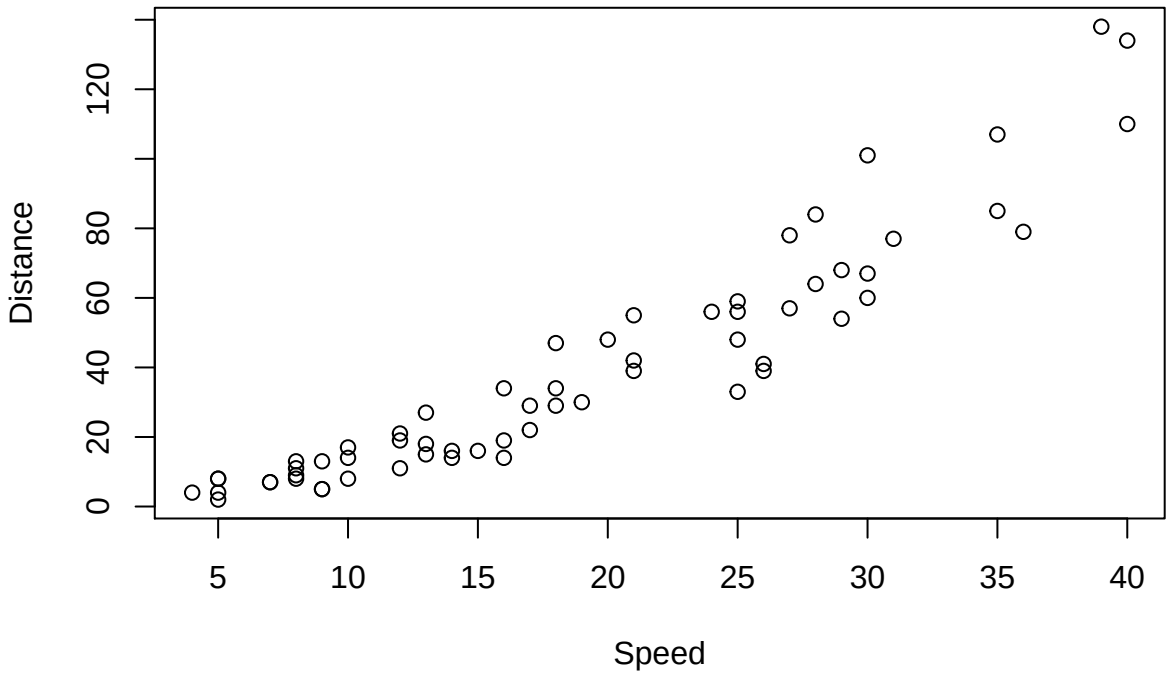
```
sapply(stopping, class)
```

```
##     Speed  Distance
## "integer" "integer"
```

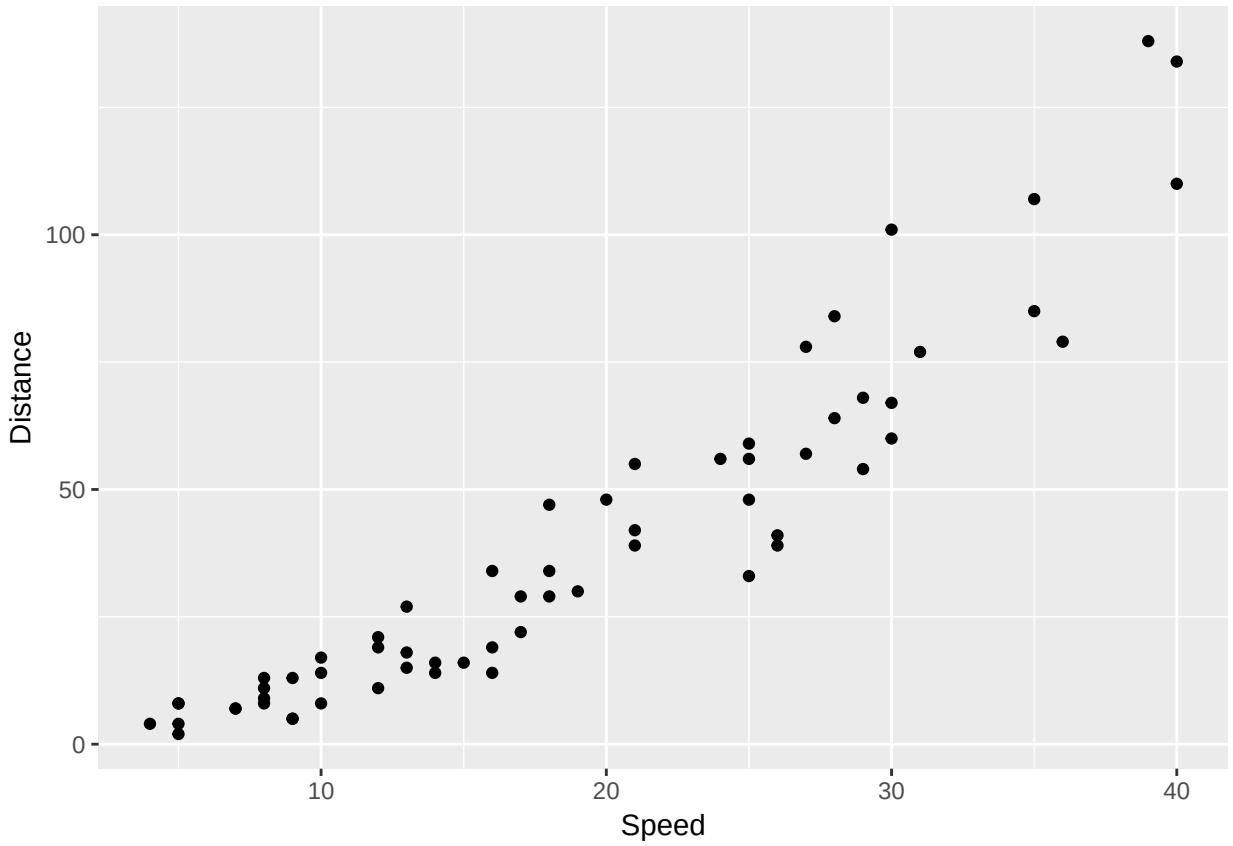
```
head(stopping)
```

```
##   Speed Distance
## 1     4        4
## 2     5        2
## 3     5        4
## 4     5        8
## 5     5        8
## 6     7        7
```

```
plot(stopping)
```




```
ggplot(stopping, aes(Speed, Distance)) +
  geom_point()
```



7.6.1

This graph supports a quadratic regression model because the graph has a curve and less linear.

7.6.2

7.6.3

7.6.4

```
head(stopping)
```

```
##   Speed Distance
## 1     4        4
## 2     5        2
## 3     5        4
## 4     5        8
## 5     5        8
## 6     7        7
```

```
summary(stopping)
```

```
##      Speed          Distance
##  Min.   : 4.00   Min.   :  2.00
##  1st Qu.:10.00   1st Qu.: 13.25
##  Median :17.50   Median : 29.50
##  Mean   :18.92   Mean   : 39.31
##  3rd Qu.:26.75   3rd Qu.: 56.75
##  Max.   :40.00   Max.   :138.00
```

Problem 7.8

jevons dataframe

```
dim(jevons)
```

```
## [1] 5 6
```

```
names(jevons)
```

```
## [1] "Age"    "n"      "Weight" "SD"     "Min"    "Max"
```

```
sapply(jevons, class)
```

```
##       Age         n    Weight        SD       Min       Max
## "integer" "integer" "numeric" "numeric" "numeric" "numeric"
```

```
head(jevons)
```

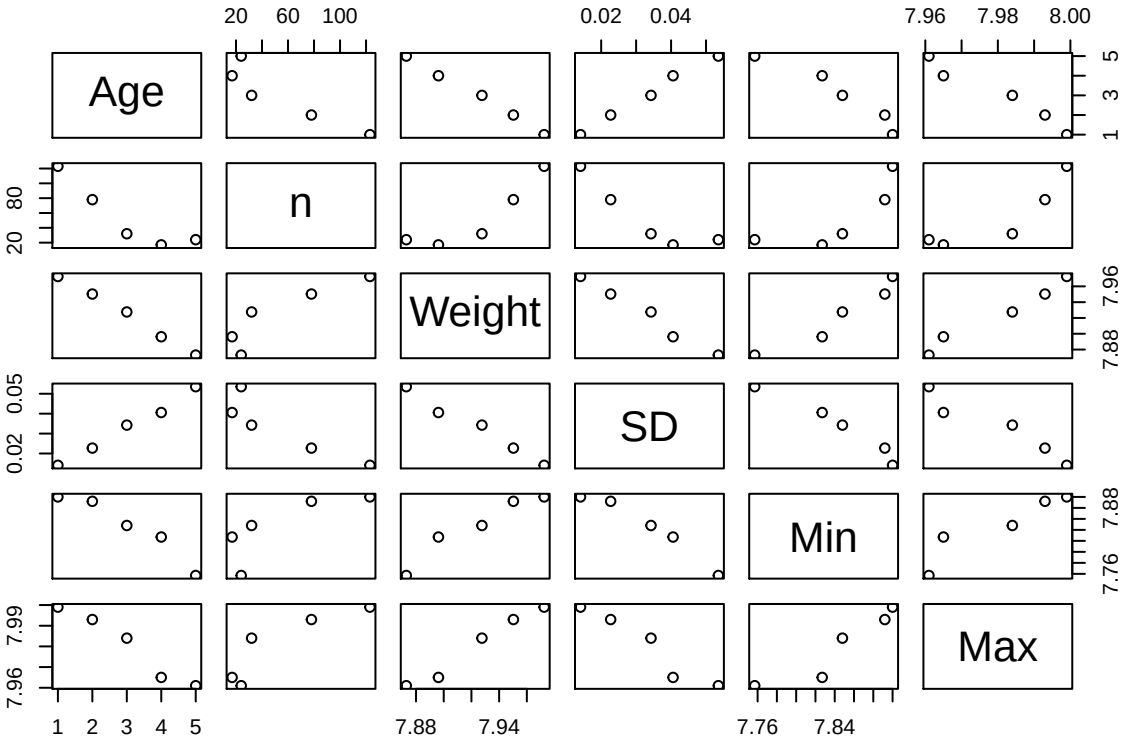
```
##   Age   n Weight      SD   Min   Max
## 1   1 123 7.9725 0.01409 7.900 7.999
## 2   2  78 7.9503 0.02272 7.892 7.993
## 3   3  32 7.9276 0.03426 7.848 7.984
## 4   4  17 7.8962 0.04057 7.827 7.965
## 5   5  24 7.8730 0.05353 7.757 7.961
```

```
summary(jevons)
```

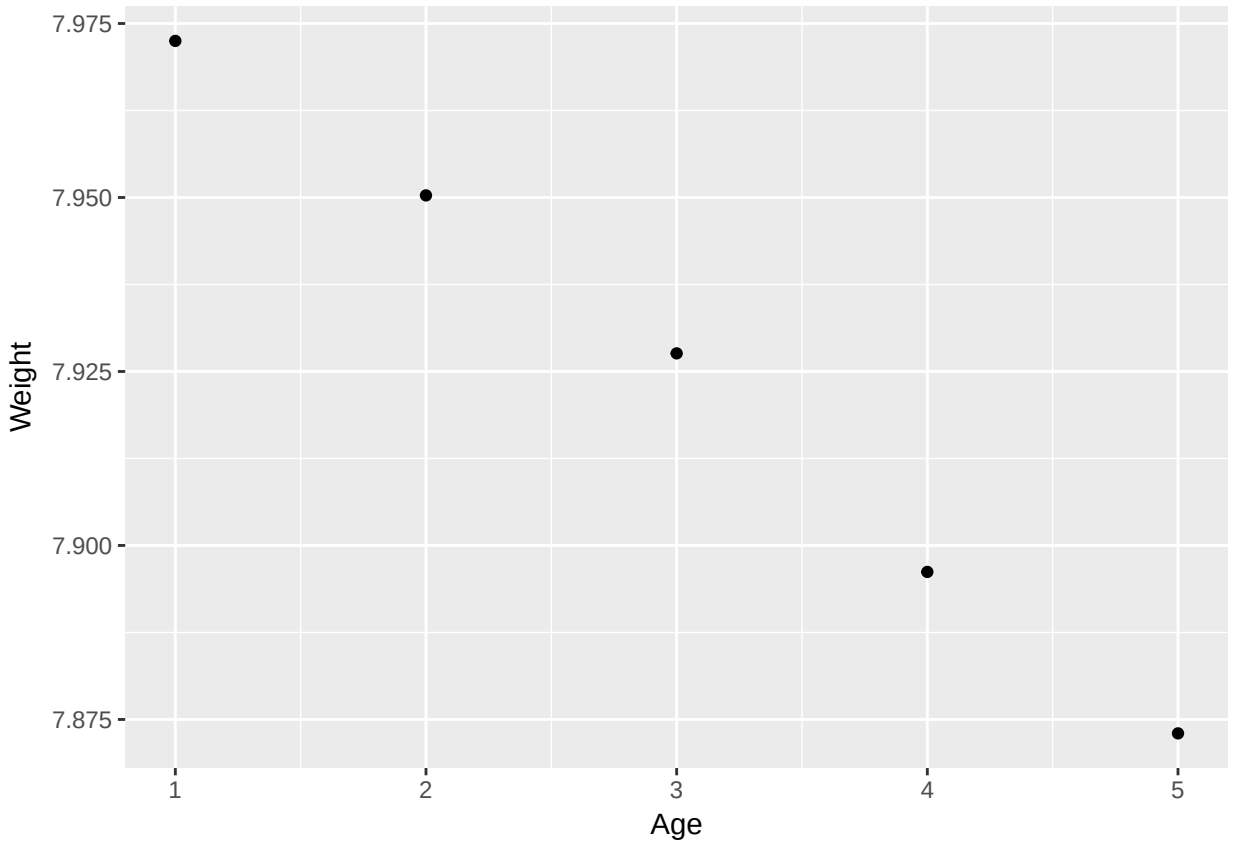
```
##       Age          n             Weight            SD
##  Min.   :1   Min.   : 17.0   Min.   :7.873   Min.   :0.01409
##  1st Qu.:2   1st Qu.: 24.0   1st Qu.:7.896   1st Qu.:0.02272
##  Median :3   Median : 32.0   Median :7.928   Median :0.03426
##  Mean   :3   Mean   : 54.8   Mean   :7.924   Mean   :0.03303
##  3rd Qu.:4   3rd Qu.: 78.0   3rd Qu.:7.950   3rd Qu.:0.04057
```

```
##  Max.   :5   Max.   :123.0   Max.   :7.973   Max.   :0.05353
##       Min              Max
##  Min.   :7.757   Min.   :7.961
##  1st Qu.:7.827   1st Qu.:7.965
##  Median :7.848   Median :7.984
##  Mean   :7.845   Mean   :7.980
##  3rd Qu.:7.892   3rd Qu.:7.993
##  Max.   :7.900   Max.   :7.999
```

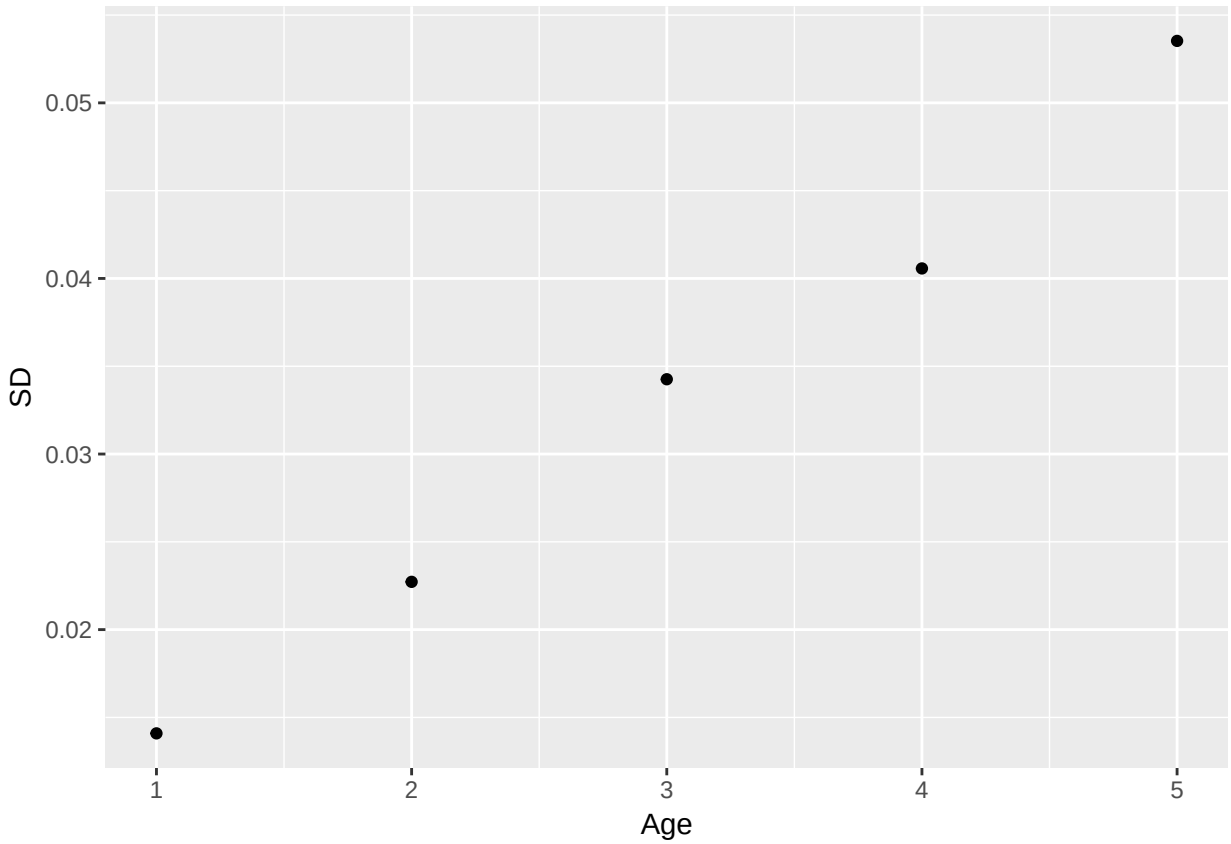
```
plot(jevons)
```




```
ggplot(jevons, aes(Age, Weight)) +
  geom_point()
```




```
ggplot(jevons, aes(Age, SD)) +
  geom_point()
```




```
summary(jevons)
```

```
##       Age           n             Weight           SD
##  Min.   :1   Min.   : 17.0   Min.   :7.873   Min.   :0.01409
##  1st Qu.:2   1st Qu.: 24.0   1st Qu.:7.896   1st Qu.:0.02272
##  Median :3   Median : 32.0   Median :7.928   Median :0.03426
##  Mean   :3   Mean   : 54.8   Mean   :7.924   Mean   :0.03303
##  3rd Qu.:4   3rd Qu.: 78.0   3rd Qu.:7.950   3rd Qu.:0.04057
##  Max.   :5   Max.   :123.0   Max.   :7.973   Max.   :0.05353
##       Min             Max
##  Min.   :7.757   Min.   :7.961
##  1st Qu.:7.827   1st Qu.:7.965
##  Median :7.848   Median :7.984
##  Mean   :7.845   Mean   :7.980
##  3rd Qu.:7.892   3rd Qu.:7.993
##  Max.   :7.900   Max.   :7.999
```

Problem 7.12

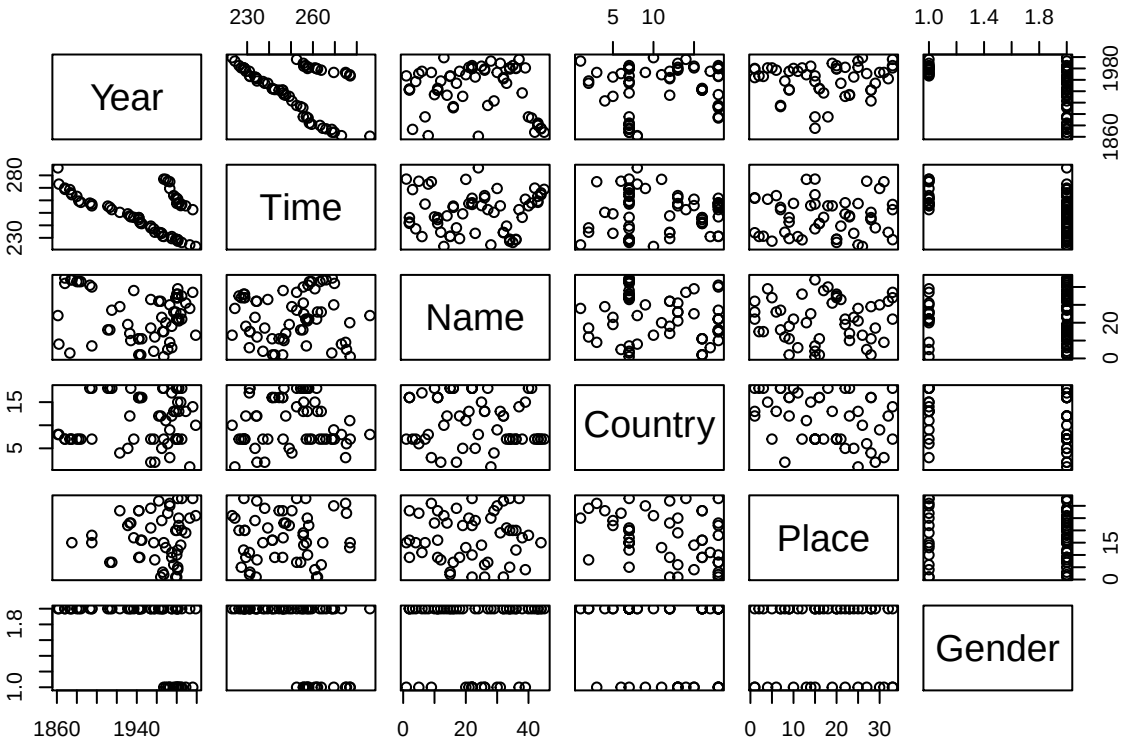
mile dataframe

```
head(mile)
```

```
##   Year  Time            Name Country Place Gender
## 1 1861 286.0     N.S. Greene     IRL  <NA>   Male
## 2 1862 273.0   George Farran     IRL  <NA>   Male
## 3 1868 269.8 Walter Chinnery     GBR  <NA>   Male
## 4 1868 268.8   William Gibbs     GBR  <NA>   Male
```

```
## 5 1873 268.6  Charles Gunton     GBR  <NA>   Male
## 6 1874 266.0    Walter Slade     GBR  <NA>   Male
```

```
plot(mile)
```




```
summary(mile)
```

```
##       Year           Time                    Name       Country
##  Min.   :1861   Min.   :223.1   Mary Decker   : 4   GBR     :19
##  1st Qu.:1917   1st Qu.:235.2   Arne Andersson: 3   USA     :12
##  Median :1960   Median :252.6   Gunder Hagg   : 3   SWE     : 6
##  Mean   :1945   Mean   :250.3   Sebastian Coe : 3   NZL     : 4
##  3rd Qu.:1980   3rd Qu.:261.5   Walter George : 3   ROM     : 4
##  Max.   :1999   Max.   :286.0   Jim Ryun      : 2   AUS     : 2
##                                 (Other)       :44   (Other):15
##        Place       Gender
##  London   : 4   Female:16
##  Auckland : 3   Male  :46
##  Goteborg : 3
##  Oslo     : 3
##  Stockholm: 3
##  (Other)  :35
##  NA's     :11
```

Problem 8.1

baeskel dataframe

```
dim(baeskel)
```

```
## [1] 12  2
```

```
names(baeskel)
```

```
## [1] "Sulfur"  "Tension"
```

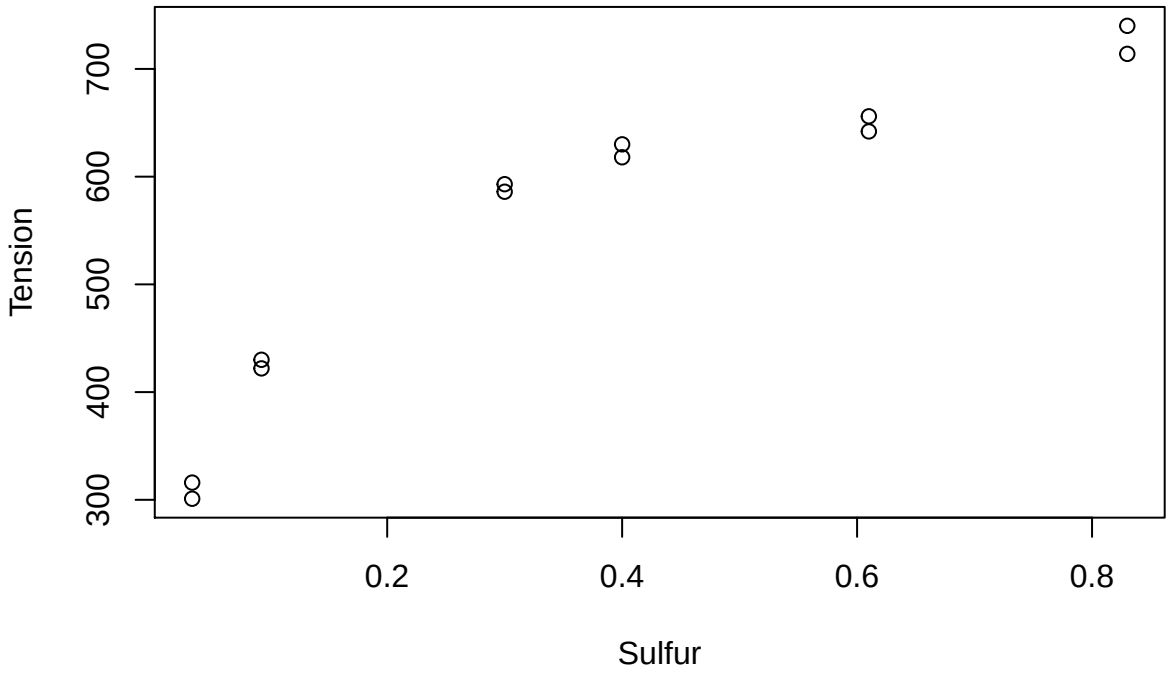
```
sapply(baeskel, class)
```

```
##    Sulfur   Tension
## "numeric" "integer"
```

```
head(baeskel)
```

```
##   Sulfur Tension
## 1  0.034     301
## 2  0.034     316
## 3  0.093     430
## 4  0.093     422
## 5  0.300     593
## 6  0.300     586
```

```
plot(baeskel)
```



Problem 8.2

stopping dataframe

```
dim(stopping)
```

```
## [1] 62  2
```

```
names(stopping)
```

```
## [1] "Speed"    "Distance"
```

```
sapply(stopping, class)
```

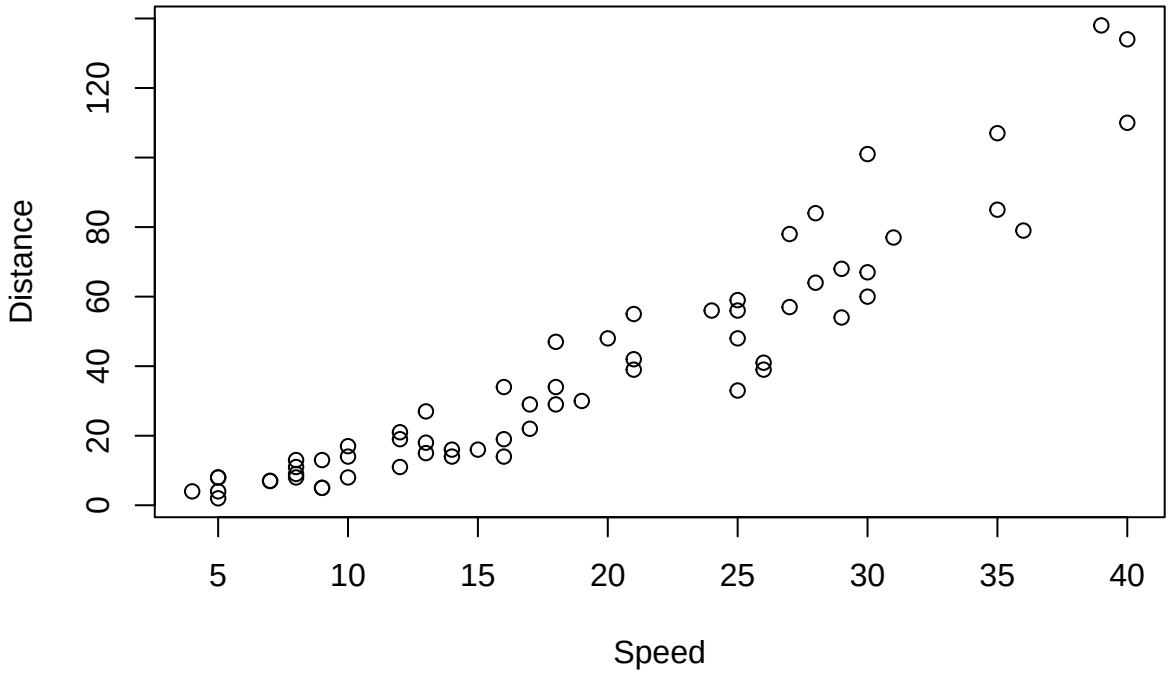
```
##     Speed  Distance
```

```
## "integer" "integer"
```

```
head(stopping)
```

```
##   Speed Distance
## 1     4        4
## 2     5        2
## 3     5        4
## 4     5        8
## 5     5        8
## 6     7        7
```

```
plot(stopping)
```




```
summary(stopping)
```

```
##      Speed          Distance
##  Min.   : 4.00   Min.   :  2.00
##  1st Qu.:10.00   1st Qu.: 13.25
##  Median :17.50   Median : 29.50
##  Mean   :18.92   Mean   : 39.31
##  3rd Qu.:26.75   3rd Qu.: 56.75
##  Max.   :40.00   Max.   :138.00
```

Problem 8.3

water dataframe

```
dim(water)
```

```
## [1] 43  8
```

```
names(water)
```

```
## [1] "Year"    "APMAM"   "APSAB"   "APSLAKE" "OPBPC"   "OPRC"    "OPSLAKE"
## [8] "BSAAM"
```

```
sapply(water, class)
```

```
##      Year     APMAM     APSAB   APSLAKE     OPBPC      OPRC   OPSLAKE
## "integer" "numeric" "numeric" "numeric" "numeric" "numeric" "numeric"
##     BSAAM
## "integer"
```

```
head(water)
```

```
##   Year APMAM APSAB APSLAKE OPBPC  OPRC OPSLAKE  BSAAM
## 1 1948  9.13  3.58    3.91  4.10  7.43    6.47  54235
## 2 1949  5.28  4.82    5.20  7.55 11.11   10.26  67567
## 3 1950  4.20  3.77    3.67  9.52 12.20   11.35  66161
## 4 1951  4.60  4.46    3.93 11.14 15.15   11.13  68094
## 5 1952  7.15  4.99    4.88 16.34 20.05   22.81 107080
## 6 1953  9.70  5.65    4.91  8.88  8.15    7.41  67594
```

```
plot(water)
```