Multiple Linear Regression - 19BCE1460

```
require("datasets")
penguinsdata <- read.csv("S:/WIN SEM 21-22/Data Visualization/Lab/penguins_lter.csv")
penguinsdata <- na.omit(penguinsdata)
head(penguinsdata)
```

```
##   studyName Sample.Number                                Species Region    Island
## 2   PAL0708             2 Adelie Penguin (Pygoscelis adeliae) Anvers Torgersen
## 3   PAL0708             3 Adelie Penguin (Pygoscelis adeliae) Anvers Torgersen
## 5   PAL0708             5 Adelie Penguin (Pygoscelis adeliae) Anvers Torgersen
## 6   PAL0708             6 Adelie Penguin (Pygoscelis adeliae) Anvers Torgersen
## 7   PAL0708             7 Adelie Penguin (Pygoscelis adeliae) Anvers Torgersen
## 8   PAL0708             8 Adelie Penguin (Pygoscelis adeliae) Anvers Torgersen
##                Stage Individual.ID Clutch.Completion   Date.Egg CulmenLengthmm
## 2 Adult, 1 Egg Stage          N1A2               Yes 11-11-2007           39.5
## 3 Adult, 1 Egg Stage          N2A1               Yes   11/16/07           40.3
## 5 Adult, 1 Egg Stage          N3A1               Yes   11/16/07           36.7
## 6 Adult, 1 Egg Stage          N3A2               Yes   11/16/07           39.3
## 7 Adult, 1 Egg Stage          N4A1                No   11/15/07           38.9
## 8 Adult, 1 Egg Stage          N4A2                No   11/15/07           39.2
##   CulmenDepthmm FlipperLengthmm BodyMassg    Sex Delta.15.N..o.oo.
## 2          17.4             186      3800 FEMALE           8.94956
## 3          18.0             195      3250 FEMALE           8.36821
## 5          19.3             193      3450 FEMALE           8.76651
## 6          20.6             190      3650   MALE           8.66496
## 7          17.8             181      3625 FEMALE           9.18718
## 8          19.6             195      4675   MALE           9.46060
##   Delta.13.C..o.oo.                              Comments
## 2         -24.69454
## 3         -25.33302
## 5         -25.32426
## 6         -25.29805
## 7         -25.21799 Nest never observed with full clutch.
## 8         -24.89958 Nest never observed with full clutch.
```

```
x1 = penguinsdata$CulmenLengthmm #Independent Variable
x2 = penguinsdata$CulmenDepthmm #Independent Variable
x3 = penguinsdata$FlipperLengthmm #Independent Variable
y = penguinsdata$BodyMassg #Dependent Variable

x1
```

```
##   [1] 39.5 40.3 36.7 39.3 38.9 39.2 42.0 37.8 34.6 38.7 42.5 34.4 46.0 37.8 37.7
##  [16] 35.9 38.2 38.8 35.3 40.6 40.5 37.9 40.5 39.5 37.2 39.5 40.9 36.4 39.2 38.8
##  [31] 42.2 37.6 36.5 36.0 44.1 37.0 39.6 36.0 42.3 39.6 40.1 35.0 42.0 34.5 41.4
##  [46] 39.0 40.6 36.5 37.6 35.7 41.3 37.6 41.1 36.4 41.6 35.5 41.1 35.9 41.8 33.5
```

```
##  [61] 39.7 39.6 45.8 35.5 42.8 40.9 37.2 36.2 42.1 34.6 42.9 36.7 35.1 37.3 41.3
##  [76] 36.3 36.9 38.3 38.9 35.7 41.1 34.0 39.6 36.2 40.8 38.1 40.3 33.1 43.2 35.0
##  [91] 41.0 37.7 37.8 37.9 39.7 38.6 38.2 38.1 43.2 38.1 45.6 39.7 42.2 39.6 42.7
## [106] 38.6 37.3 35.7 41.1 36.2 37.7 40.2 41.4 35.2 40.6 38.8 41.5 39.0 44.1 38.5
## [121] 43.1 36.8 37.5 38.1 41.1 35.6 40.2 37.0 39.7 40.2 40.6 32.1 40.7 37.3 39.0
## [136] 39.2 36.6 36.0 37.8 36.0 41.5 46.5 50.0 51.3 45.4 52.7 45.2 46.1 51.3 46.0
## [151] 51.3 46.6 51.7 47.0 52.0 45.9 50.5 50.3 58.0 46.4 49.2 42.4 48.5 43.2 50.6
## [166] 46.7 52.0 50.5 49.5 46.4 52.8 40.9 54.2 42.5 51.0 49.7 47.5 47.6 52.0 46.9
## [181] 53.5 49.0 46.2 50.9 45.5 50.9 50.8 50.1 49.0 51.5 49.8 48.1 51.4 45.7 50.7
## [196] 42.5 52.2 45.2 49.3 50.2 45.6 46.8 45.7 55.8 43.5 49.6 50.8 50.2 46.1 50.0
## [211] 48.7 50.0 47.6 46.5 45.4 46.7 43.3 46.8 40.9 49.0 45.5 48.4 45.8 49.3 42.0
## [226] 49.2 46.2 48.7 50.2 45.1 46.5 46.3 42.9 46.1 44.5 47.8 48.2 50.0 42.8 45.1
## [241] 59.6 49.1 48.4 42.6 44.4 44.0 48.7 42.7 49.6 45.3 49.6 50.5 43.6 45.5 50.5
## [256] 44.9 45.2 46.6 48.5 45.1 50.1 46.5 45.0 43.8 45.5 43.2 50.4 45.3 46.2 45.7
## [271] 54.3 45.8 49.8 46.2 49.5 43.5 50.7 47.7 46.4 48.2 46.5 46.4 48.6 47.5 51.1
## [286] 45.2 45.2 49.1 52.5 47.4 50.0 44.9 50.8 43.4 51.3 47.5 52.1 47.5 52.2 45.5
## [301] 49.5 44.5 50.8 49.4 46.9 48.4 51.1 48.5 55.9 47.2 49.1 47.3 46.8 41.7 53.4
## [316] 43.3 48.1 50.5 49.8 43.5 51.5 46.2 55.1 44.5 48.8 47.2 46.8 50.4 45.2 49.9
```

```
x2
```

```
##   [1] 17.4 18.0 19.3 20.6 17.8 19.6 20.2 17.1 21.1 19.0 20.7 18.4 21.5 18.3 18.7
##  [16] 19.2 18.1 17.2 18.9 18.6 17.9 18.6 18.9 16.7 18.1 17.8 18.9 17.0 21.1 20.0
##  [31] 18.5 19.3 18.0 18.5 19.7 16.9 18.8 17.9 21.2 17.7 18.9 17.9 19.5 18.1 18.6
##  [46] 17.5 18.8 16.6 19.1 16.9 21.1 17.0 18.2 17.1 18.0 16.2 19.1 16.6 19.4 19.0
##  [61] 18.4 17.2 18.9 17.5 18.5 16.8 19.4 16.1 19.1 17.2 17.6 18.8 19.4 17.8 20.3
##  [76] 19.5 18.6 19.2 18.8 18.0 18.1 17.1 18.1 17.3 18.9 18.6 18.5 16.1 18.5 17.9
##  [91] 20.0 16.0 20.0 18.6 18.9 17.2 20.0 17.0 19.0 16.5 20.3 17.7 19.5 20.7 18.3
## [106] 17.0 20.5 17.0 18.6 17.2 19.8 17.0 18.5 15.9 19.0 17.6 18.3 17.1 18.0 17.9
## [121] 19.2 18.5 18.5 17.6 17.5 17.5 20.1 16.5 17.9 17.1 17.2 15.5 17.0 16.8 18.7
## [136] 18.6 18.4 17.8 18.1 17.1 18.5 17.9 19.5 19.2 18.7 19.8 17.8 18.2 18.2 18.9
## [151] 19.9 17.8 20.3 17.3 18.1 17.1 19.6 20.0 17.8 18.6 18.2 17.3 17.5 16.6 19.4
## [166] 17.9 19.0 18.4 19.0 17.8 20.0 16.6 20.8 16.7 18.8 18.6 16.8 18.3 20.7 16.6
## [181] 19.9 19.5 17.5 19.1 17.0 17.9 18.5 17.9 19.6 18.7 17.3 16.4 19.0 17.3 19.7
## [196] 17.3 18.8 16.6 19.9 18.8 19.4 16.5 17.0 19.8 18.1 18.2 19.0 18.7 13.2 16.3
## [211] 14.1 15.2 14.5 13.5 14.6 15.3 13.4 15.4 13.7 16.1 13.7 14.6 14.6 15.7 13.5
## [226] 15.2 14.5 15.1 14.3 14.5 14.5 15.8 13.1 15.1 14.3 15.0 14.3 15.3 14.2 14.5
## [241] 17.0 14.8 16.3 13.7 17.3 13.6 15.7 13.7 16.0 13.7 15.0 15.9 13.9 13.9 15.9
## [256] 13.3 15.8 14.2 14.1 14.4 15.0 14.4 15.4 13.9 15.0 14.5 15.3 13.8 14.9 13.9
## [271] 15.7 14.2 16.8 14.4 16.2 14.2 15.0 15.0 15.6 15.6 14.8 15.0 16.0 14.2 16.3
## [286] 13.8 16.4 14.5 15.6 14.6 15.9 13.8 17.3 14.4 14.2 14.0 17.0 15.0 17.1 14.5
## [301] 16.1 14.7 15.7 15.8 14.6 14.4 16.5 15.0 17.0 15.5 15.0 13.8 16.1 14.7 15.8
## [316] 14.0 15.1 15.2 15.9 15.2 16.3 14.1 16.0 15.7 16.2 13.7 14.3 15.7 14.8 16.1
```

```
x3
```

```
##   [1] 186 195 193 190 181 195 190 186 198 195 197 184 194 174 180 189 185 180
##  [19] 187 183 187 172 180 178 178 188 184 195 196 190 180 181 182 186 196 185
##  [37] 190 190 191 186 188 190 200 187 191 186 193 181 194 185 195 185 192 184
##  [55] 192 195 188 190 198 190 190 196 197 190 195 191 184 187 195 189 196 187
##  [73] 193 191 194 190 189 189 190 202 205 185 186 187 208 190 196 178 192 192
##  [91] 203 183 190 193 184 199 190 181 197 198 191 193 197 191 196 188 199 189
## [109] 189 187 198 176 202 186 199 191 195 191 210 190 197 193 199 187 190 191
```

```
## [127] 200 185 193 193 187 188 190 192 185 190 184 195 193 187 201 192 196 193
## [145] 188 197 198 178 197 195 198 193 194 185 201 190 201 197 181 190 195 181
## [163] 191 187 193 195 197 200 200 191 205 187 201 187 203 195 199 195 210 192
## [181] 205 210 187 196 196 196 201 190 212 187 198 199 201 193 203 187 197 191
## [199] 203 202 194 189 195 207 202 193 210 198 211 230 210 218 215 210 211 219
## [217] 209 215 214 216 214 213 210 217 210 221 209 222 218 215 213 215 215 215
## [235] 216 215 210 220 209 207 230 220 220 213 219 208 208 208 225 210 216 222
## [253] 217 210 225 213 215 210 220 210 225 217 220 208 220 208 224 208 221 214
## [271] 231 219 230 214 229 220 223 216 221 221 217 216 230 209 220 215 223 212
## [289] 221 212 224 212 228 218 218 212 230 218 228 212 224 214 226 216 222 203
## [307] 225 219 228 215 228 216 215 210 219 208 209 216 229 213 230 217 230 217
## [325] 222 214 215 222 212 213
```

```
y
```

```
##   [1] 3800 3250 3450 3650 3625 4675 4250 3300 4400 3450 4500 3325 4200 3400 3600
##  [16] 3800 3950 3800 3800 3550 3200 3150 3950 3250 3900 3300 3900 3325 4150 3950
##  [31] 3550 3300 3150 3100 4400 3000 4600 3450 4150 3500 4300 3450 4050 2900 3700
##  [46] 3550 3800 2850 3750 3150 4400 3600 4050 2850 3950 3350 4100 3050 4450 3600
##  [61] 3900 3550 4150 3700 4250 3700 3900 3550 4000 3200 4700 3800 4200 3350 3550
##  [76] 3800 3500 3950 3600 3550 4300 3400 4450 3300 4300 3700 4350 2900 4100 3725
##  [91] 4725 3075 4250 2925 3550 3750 3900 3175 4775 3825 4600 3200 4275 3900 4075
## [106] 2900 3775 3350 3325 3150 3500 3450 3875 3050 4000 3275 4300 3050 4000 3325
## [121] 3500 3500 4475 3425 3900 3175 3975 3400 4250 3400 3475 3050 3725 3000 3650
## [136] 4250 3475 3450 3750 3700 4000 3500 3900 3650 3525 3725 3950 3250 3750 4150
## [151] 3700 3800 3775 3700 4050 3575 4050 3300 3700 3450 4400 3600 3400 2900 3800
## [166] 3300 4150 3400 3800 3700 4550 3200 4300 3350 4100 3600 3900 3850 4800 2700
## [181] 4500 3950 3650 3550 3500 3675 4450 3400 4300 3250 3675 3325 3950 3600 4050
## [196] 3350 3450 3250 4050 3800 3525 3650 3650 4000 3400 3775 4100 3775 4500 5700
## [211] 4450 5700 5400 4550 4800 5200 4400 5150 4650 5550 4650 5850 4200 5850 4150
## [226] 6300 4800 5350 5700 5000 4400 5050 5000 5100 4100 5650 4600 5550 4700 5050
## [241] 6050 5150 5400 4950 5250 4350 5350 3950 5700 4300 4750 5550 4900 4200 5400
## [256] 5100 5300 4850 5300 4400 5000 4900 5050 4300 5000 4450 5550 4200 5300 4400
## [271] 5650 4700 5700 4650 5800 4700 5550 4750 5000 5100 5200 4700 5800 4600 6000
## [286] 4750 5950 4625 5450 4725 5350 4750 5600 4600 5300 4875 5550 4950 5400 4750
## [301] 5650 4850 5200 4925 4875 4625 5250 4850 5600 4975 5500 4725 5500 4700 5500
## [316] 4575 5500 5000 5950 4650 5500 4375 5850 4875 6000 4925 4850 5750 5200 5400
```

```
summary(x1)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   32.10   39.50   44.90   44.05   48.58   59.60
```

```
summary(x2)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   13.10   15.50   17.25   17.11   18.60   21.50
```

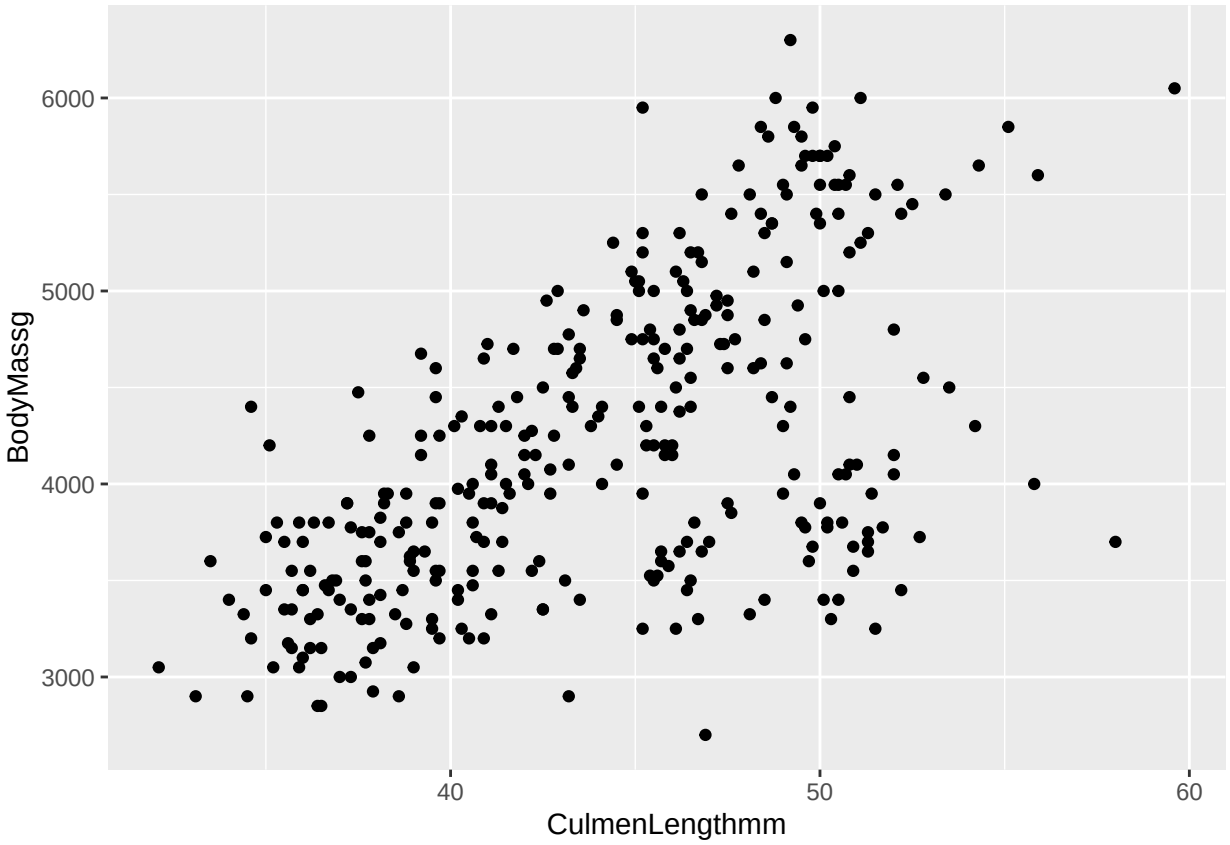
```
summary(x3)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   172.0   190.0   197.0   201.3   214.0   231.0
```

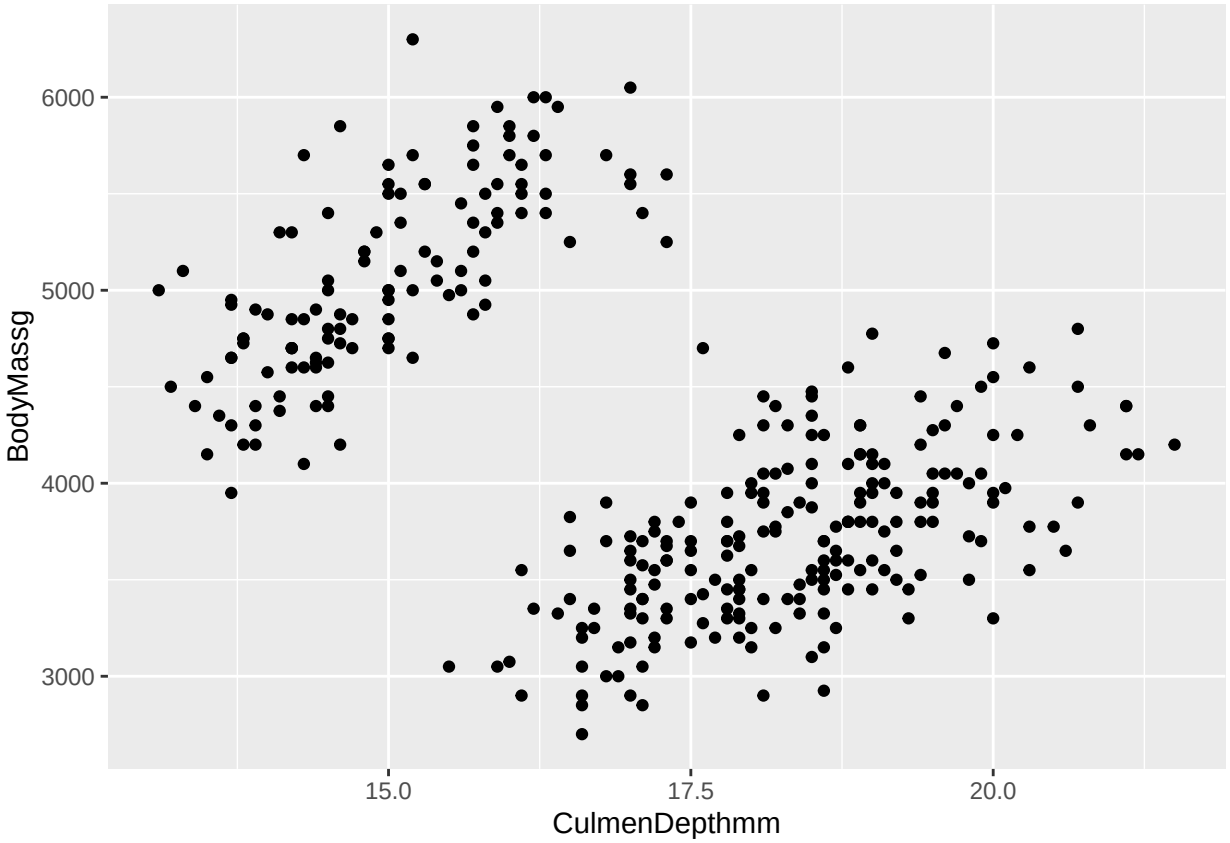
```
summary(y)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    2700    3550    4050    4216    4794    6300
```

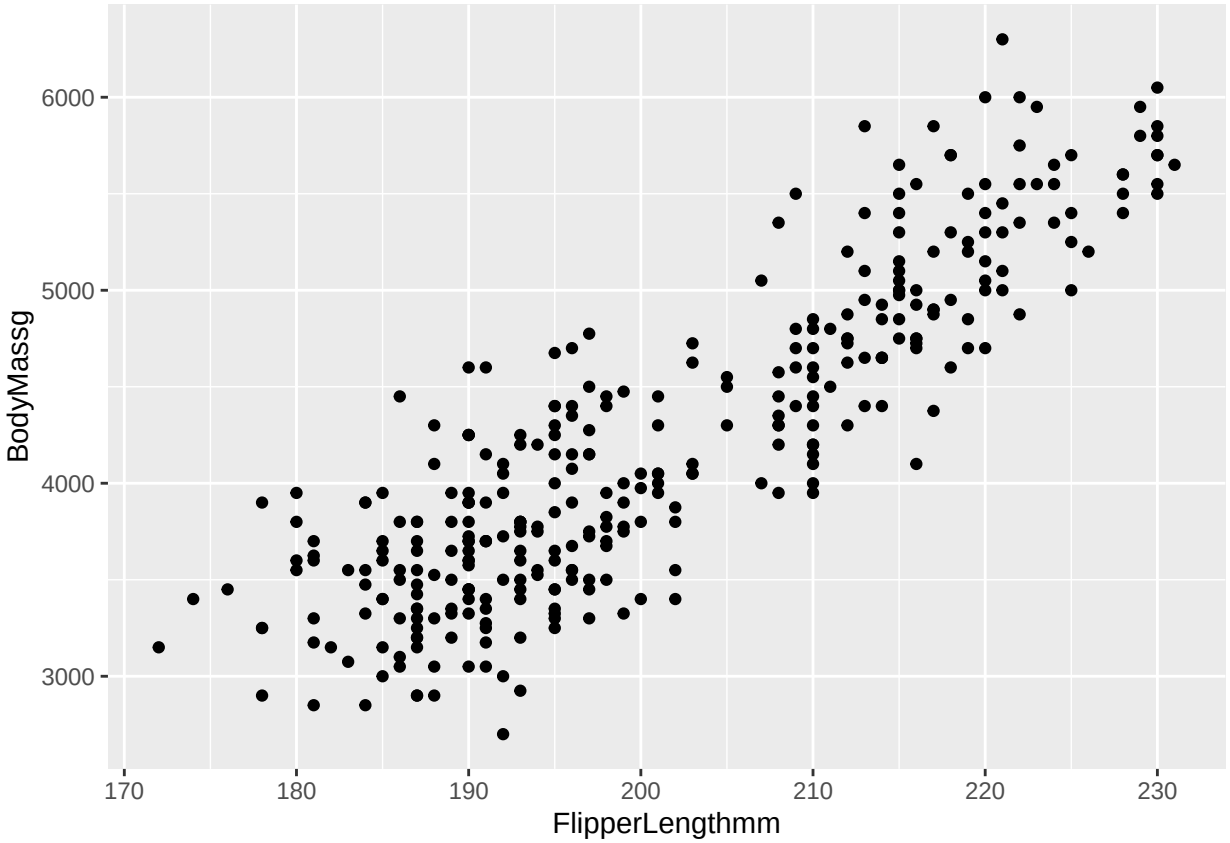
```
library(ggplot2)
qplot(CulmenLengthmm, BodyMassg, data=penguinsdata)
```




```
qplot(CulmenDepthmm, BodyMassg, data=penguinsdata)
```




```
qplot(FlipperLengthmm, BodyMassg, data=penguinsdata)
```




```
MLREG=lm(BodyMassg ~ CulmenLengthmm + CulmenDepthmm + FlipperLengthmm, penguinsdata)
summary(MLREG)
```

```
##
## Call:
## lm(formula = BodyMassg ~ CulmenLengthmm + CulmenDepthmm + FlipperLengthmm,
##     data = penguinsdata)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1040.89  -282.12   -27.91   252.14  1096.56
##
## Coefficients:
##                  Estimate Std. Error t value Pr(>|t|)
## (Intercept)     -6655.063    566.085 -11.756   <2e-16 ***
## CulmenLengthmm      4.413      5.344   0.826    0.409
## CulmenDepthmm      22.154     13.748   1.611    0.108
## FlipperLengthmm    51.152      2.495  20.501   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 389.4 on 326 degrees of freedom
## Multiple R-squared:  0.7682, Adjusted R-squared:  0.7661
## F-statistic: 360.2 on 3 and 326 DF,  p-value: < 2.2e-16
```