

assignment_07_KanaparthiVenkata

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```
library(ggm)
```

```
## Warning: package 'ggm' was built under R version 4.0.5
```

```
library(ggplot2)
```

Set the working directory to the root of your DSC 520 directory

```
setwd('E:/MSDS-SEM2/DSC520/CodingAssignments/DSC520KANAPARTHI')  
## Load the `data/r4ds/heights.csv` to  
heights_df <- read.csv("data/r4ds/heights.csv", stringsAsFactors = FALSE)
```

Fit a linear model

```
earn_lm <- lm(earn ~ height + sex + ed + age + race, data=heights_df)  
earn_lm
```

```
##  
## Call:  
## lm(formula = earn ~ height + sex + ed + age + race, data = heights_df)  
##  
## Coefficients:  
## (Intercept)      height      sexmale          ed          age  
##    -41478.5       202.5      10325.6      2768.4      178.3  
## racehispanic  raceother  racewhite  
##    -1414.3       371.0      2432.5
```

View the summary of your model

```
summary(earn_lm)
```

```
##  
## Call:  
## lm(formula = earn ~ height + sex + ed + age + race, data = heights_df)  
##
```

```
## Residuals:
##      Min       1Q   Median       3Q      Max
## -39423  -9827  -2208   6157 158723
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  -41478.4    12409.4  -3.342 0.000856 ***
## height        202.5       185.6   1.091 0.275420
## sexmale       10325.6     1424.5   7.249 7.57e-13 ***
## ed            2768.4       209.9  13.190 < 2e-16 ***
## age           178.3        32.2   5.537 3.78e-08 ***
## racehispanic -1414.3      2685.2  -0.527 0.598507
## raceother     371.0       3837.0   0.097 0.922983
## racewhite     2432.5       1723.9   1.411 0.158489
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 17250 on 1184 degrees of freedom
## Multiple R-squared:  0.2199, Adjusted R-squared:  0.2153
## F-statistic: 47.68 on 7 and 1184 DF,  p-value: < 2.2e-16
```

```
earn_test_df <- as.double(c(200,20000,50000,100000,200000))
ed_test_df <- as.integer(c(3,7,10,14,18))
height_test_df <- as.double(c(57.50,62.75,72.11,74.77,77.05))
age_test_df <- as.integer(c(18,36,54,72,80))
sex_test_df <-c("male","female","female","male","male")
race_test_df <- c("white","other","hispanic","black","other")
test_df <- data.frame(earn_test_df,ed_test_df,height_test_df,age_test_df,sex_test_df,race_test_df, stringr::str_c(" ",rep(" ",5)))
names(test_df) <- c("earn","ed","height","age","sex","race")
head (test_df)
```

```
##      earn ed height age      sex      race
## 1 2e+02  3  57.50  18   male   white
## 2 2e+04  7  62.75  36 female  other
## 3 5e+04 10  72.11  54 female hispanic
## 4 1e+05 14  74.77  72   male   black
## 5 2e+05 18  77.05  80   male   other
```

```
predicted_df <- data.frame(earn = predict(earn_lm, test_df), ed=test_df$ed, race=test_df$race, height=test_df$height)
```

Compute deviation (i.e. residuals)

```
mean_earn <- mean(heights_df$earn)
mean_earn
```

```
## [1] 23154.77
```

Corrected Sum of Squares Total

```
sst <- sum((mean_earn - heights_df$earn)^2)
sst
```

```
## [1] 451591883937
```

Corrected Sum of Squares for Model

```
ssm <- sum((mean_earn - predicted_df$earn)^2)
ssm
```

```
## [1] 2506020178
```

Residuals

```
residuals <- heights_df$earn - predicted_df$earn
```

```
## Warning in heights_df$earn - predicted_df$earn: longer object length is not a
## multiple of shorter object length
```

```
residuals
```

```
##      [1] 55563.53539 62604.68643 20980.26228 14418.93408 2086.39970
##      [6] 14563.53539 31604.68643 22980.26228 -33581.06592 -21913.60030
##     [11] 12093.53539 32604.68643 2980.26228 -23581.06592 -26913.60030
##     [16] 22563.53539 42604.68643 34980.26228 -28581.06592 4086.39970
##     [21] 10563.53539 16604.68643 -3519.73772 4418.93408 -14913.60030
##     [26] 15563.53539 29604.68643 40980.26228 5418.93408 -33913.60030
##     [31] 30563.53539 77604.68643 17980.26228 -23581.06592 -41413.60030
##     [36] 35563.53539 23604.68643 17980.26228 -32581.06592 -23913.60030
##     [41] 29563.53539 34604.68643 980.26228 -24581.06592 -30213.60030
##     [46] 25563.53539 6104.68643 3980.26228 -10581.06592 -27913.60030
##     [51] 39563.53539 8604.68643 7980.26228 -581.06592 -44913.60030
##     [56] 19563.53539 12604.68643 15980.26228 -19581.06592 -32913.60030
##     [61] 22063.53539 6604.68643 -5179.73772 -13581.06592 -48713.60030
##     [66] 31563.53539 5104.68643 7980.26228 -27581.06592 -36913.60030
##     [71] 15563.53539 12604.68643 5980.26228 -33181.06592 -18913.60030
##     [76] 35563.53539 12604.68643 -4019.73772 -23581.06592 -28913.60030
##     [81] 25563.53539 22604.68643 -7819.73772 -34881.06592 -28913.60030
##     [86] 15563.53539 32604.68643 30980.26228 -10581.06592 -38913.60030
##     [91] 65563.53539 20604.68643 7020.26228 -20581.06592 -38913.60030
##     [96] 38563.53539 20604.68643 5980.26228 -14581.06592 -27913.60030
##    [101] 42563.53539 40604.68643 7980.26228 -3581.06592 -21413.60030
##    [106] 22063.53539 27604.68643 17980.26228 -30581.06592 21086.39970
##    [111] 10563.53539 7604.68643 10980.26228 -31581.06592 11086.39970
##    [116] 10563.53539 32604.68643 60980.26228 14418.93408 -4913.60030
##    [121] 35563.53539 12604.68643 13980.26228 9418.93408 -33913.60030
##    [126] 9563.53539 19604.68643 20980.26228 -8081.06592 -43225.60030
```

##	[131]	23563.53539	45604.68643	22980.26228	-25581.06592	11086.39970
##	[136]	26563.53539	5004.68643	-8019.73772	-8581.06592	-42313.60030
##	[141]	21563.53539	92604.68643	-1019.73772	-15581.06592	-33913.60030
##	[146]	17563.53539	26604.68643	10980.26228	-16581.06592	-38913.60030
##	[151]	45563.53539	27604.68643	15980.26228	-10581.06592	-29913.60030
##	[156]	49563.53539	17604.68643	7980.26228	-11581.06592	-25913.60030
##	[161]	18563.53539	67604.68643	-2019.73772	4418.93408	-33913.60030
##	[166]	25563.53539	22604.68643	10980.26228	-10581.06592	86.39970
##	[171]	30563.53539	13604.68643	6980.26228	-581.06592	76086.39970
##	[176]	28563.53539	19604.68643	17980.26228	34418.93408	-13913.60030
##	[181]	15563.53539	37604.68643	5980.26228	-23581.06592	-40913.60030
##	[186]	13563.53539	37604.68643	35980.26228	-20581.06592	-33913.60030
##	[191]	29563.53539	27604.68643	15980.26228	-15581.06592	-24913.60030
##	[196]	49563.53539	71604.68643	52980.26228	-3581.06592	-28913.60030
##	[201]	37563.53539	27604.68643	160980.26228	-581.06592	-8913.60030
##	[206]	38563.53539	20604.68643	20980.26228	-9581.06592	-43913.60030
##	[211]	25563.53539	19604.68643	22980.26228	-20581.06592	1086.39970
##	[216]	13563.53539	42604.68643	30980.26228	-2831.06592	-28913.60030
##	[221]	41563.53539	8604.68643	2980.26228	24418.93408	-8913.60030
##	[226]	48563.53539	47604.68643	-3019.73772	-27581.06592	-28913.60030
##	[231]	22563.53539	4604.68643	55980.26228	14418.93408	-37913.60030
##	[236]	40563.53539	29604.68643	-5519.73772	6418.93408	-28913.60030
##	[241]	20563.53539	12604.68643	-3019.73772	-18581.06592	-13913.60030
##	[246]	33563.53539	17604.68643	10980.26228	-15581.06592	-38413.60030
##	[251]	18563.53539	12604.68643	-6019.73772	-11581.06592	-31913.60030
##	[256]	16563.53539	34604.68643	7980.26228	-32581.06592	-46813.60030
##	[261]	8755.53539	19604.68643	20980.26228	-20581.06592	-24913.60030
##	[266]	15563.53539	52604.68643	40980.26228	-15581.06592	-18913.60030
##	[271]	27563.53539	29604.68643	-5019.73772	-18081.06592	-32413.60030
##	[276]	33563.53539	54604.68643	5980.26228	-16581.06592	-21913.60030
##	[281]	20563.53539	17604.68643	5480.26228	-11581.06592	-30913.60030
##	[286]	9563.53539	6604.68643	-8319.73772	-11581.06592	-21913.60030
##	[291]	17563.53539	24604.68643	20980.26228	-581.06592	-28913.60030
##	[296]	37563.53539	8604.68643	2980.26228	-25581.06592	-47913.60030
##	[301]	17563.53539	18604.68643	15980.26228	-10581.06592	-16913.60030
##	[306]	40563.53539	8604.68643	70980.26228	-15581.06592	-47913.60030
##	[311]	33563.53539	28604.68643	17980.26228	-17581.06592	-46913.60030
##	[316]	25563.53539	8604.68643	15980.26228	-23581.06592	-36913.60030
##	[321]	35563.53539	6604.68643	16980.26228	-12581.06592	-27913.60030
##	[326]	30563.53539	20604.68643	-5019.73772	-11681.06592	-13913.60030
##	[331]	31563.53539	27604.68643	14480.26228	-23581.06592	-33913.60030
##	[336]	8563.53539	8604.68643	4980.26228	-20581.06592	126086.39970
##	[341]	6563.53539	12604.68643	35980.26228	-20581.06592	-28913.60030
##	[346]	40563.53539	42604.68643	25980.26228	14418.93408	51086.39970
##	[351]	40563.53539	26604.68643	25980.26228	2418.93408	-18913.60030
##	[356]	10563.53539	150604.68643	20980.26228	-29081.06592	-45913.60030
##	[361]	28563.53539	42604.68643	20980.26228	-21581.06592	-33913.60030
##	[366]	31563.53539	10604.68643	14980.26228	-30457.06592	-38913.60030
##	[371]	17563.53539	52604.68643	13980.26228	4418.93408	-42913.60030
##	[376]	10563.53539	112604.68643	31980.26228	-12581.06592	-27913.60030
##	[381]	9563.53539	27604.68643	20980.26228	-21581.06592	-42913.60030
##	[386]	19563.53539	45604.68643	15980.26228	4418.93408	16086.39970
##	[391]	21563.53539	10604.68643	10980.26228	-21581.06592	-3913.60030
##	[396]	13563.53539	14604.68643	-1019.73772	-19581.06592	-42913.60030

##	[401]	24563.53539	23604.68643	33980.26228	-581.06592	-40913.60030
##	[406]	26563.53539	8404.68643	7980.26228	-11581.06592	-43913.60030
##	[411]	16563.53539	12604.68643	30980.26228	4418.93408	-24913.60030
##	[416]	29563.53539	22604.68643	50980.26228	-24581.06592	-43913.60030
##	[421]	32563.53539	91604.68643	30980.26228	-20581.06592	-47913.60030
##	[426]	27563.53539	14604.68643	12980.26228	4418.93408	-8913.60030
##	[431]	40563.53539	9604.68643	4980.26228	-20581.06592	-42913.60030
##	[436]	16563.53539	12604.68643	10980.26228	-28581.06592	-10913.60030
##	[441]	34563.53539	22604.68643	-1019.73772	418.93408	-47413.60030
##	[446]	47563.53539	27604.68643	3980.26228	-5581.06592	-41913.60030
##	[451]	36563.53539	17604.68643	40980.26228	-30581.06592	-48313.60030
##	[456]	19563.53539	42604.68643	14980.26228	-13581.06592	-28913.60030
##	[461]	25675.53539	14604.68643	31980.26228	-22581.06592	11086.39970
##	[466]	29563.53539	40604.68643	-6019.73772	-22581.06592	-43913.60030
##	[471]	25563.53539	24604.68643	18980.26228	-13581.06592	-18913.60030
##	[476]	35563.53539	32604.68643	22980.26228	-9581.06592	-26913.60030
##	[481]	30563.53539	13604.68643	3980.26228	-25581.06592	-36913.60030
##	[486]	12563.53539	59604.68643	26980.26228	-6581.06592	-40913.60030
##	[491]	8563.53539	22604.68643	23980.26228	-20581.06592	-32913.60030
##	[496]	10563.53539	10604.68643	22980.26228	-21081.06592	-35913.60030
##	[501]	12563.53539	52604.68643	2980.26228	-16581.06592	-39913.60030
##	[506]	25563.53539	57604.68643	980.26228	-22581.06592	-28913.60030
##	[511]	35563.53539	14604.68643	16980.26228	-23081.06592	-40913.60030
##	[516]	20563.53539	67604.68643	15980.26228	-27581.06592	-33913.60030
##	[521]	17563.53539	37604.68643	30980.26228	-6581.06592	-33913.60030
##	[526]	25563.53539	5604.68643	-8019.73772	-27581.06592	-43913.60030
##	[531]	30563.53539	22604.68643	20980.26228	-23581.06592	-38913.60030
##	[536]	21563.53539	47604.68643	30980.26228	-10581.06592	-29913.60030
##	[541]	23163.53539	9604.68643	20980.26228	-17581.06592	-23913.60030
##	[546]	11563.53539	72604.68643	5980.26228	-10581.06592	-13913.60030
##	[551]	23563.53539	30604.68643	5980.26228	-13581.06592	-13913.60030
##	[556]	23563.53539	37604.68643	7380.26228	-13581.06592	-18913.60030
##	[561]	22563.53539	27604.68643	980.26228	4418.93408	-36413.60030
##	[566]	40563.53539	107604.68643	90980.26228	-14581.06592	-38913.60030
##	[571]	38563.53539	28604.68643	50980.26228	-17581.06592	-33913.60030
##	[576]	10563.53539	62604.68643	2980.26228	-7581.06592	-6913.60030
##	[581]	7563.53539	22604.68643	18980.26228	-25581.06592	-17913.60030
##	[586]	22563.53539	18604.68643	25980.26228	-32581.06592	-32913.60030
##	[591]	40563.53539	29604.68643	15980.26228	4418.93408	-3913.60030
##	[596]	19563.53539	27604.68643	30980.26228	-1581.06592	-8913.60030
##	[601]	40563.53539	14604.68643	20980.26228	-12581.06592	-46913.60030
##	[606]	25563.53539	12604.68643	50980.26228	-23581.06592	-23913.60030
##	[611]	27563.53539	10604.68643	-7019.73772	-16981.06592	-28913.60030
##	[616]	105563.53539	52604.68643	17980.26228	-34581.06592	-30913.60030
##	[621]	22563.53539	12604.68643	4980.26228	-28381.06592	-15913.60030
##	[626]	28563.53539	12604.68643	12980.26228	-22581.06592	-15913.60030
##	[631]	41563.53539	12604.68643	-3019.73772	-23581.06592	-38913.60030
##	[636]	26563.53539	28604.68643	12980.26228	-12581.06592	-28913.60030
##	[641]	15563.53539	17604.68643	-2019.73772	-20581.06592	-22913.60030
##	[646]	15563.53539	5604.68643	17980.26228	-7581.06592	-33913.60030
##	[651]	60563.53539	22604.68643	-519.73772	-5581.06592	-28913.60030
##	[656]	27563.53539	27604.68643	-6019.73772	-19581.06592	-38913.60030
##	[661]	20563.53539	30604.68643	22480.26228	59418.93408	-10913.60030
##	[666]	35563.53539	38504.68643	2980.26228	-25581.06592	-3913.60030

##	[671]	45563.53539	24104.68643	4980.26228	2418.93408	-47913.60030
##	[676]	19563.53539	17604.68643	14980.26228	-31081.06592	-30913.60030
##	[681]	19563.53539	12604.68643	480.26228	-24581.06592	-31913.60030
##	[686]	11563.53539	5104.68643	30980.26228	-10581.06592	-20913.60030
##	[691]	38563.53539	6604.68643	-4919.73772	-10581.06592	-16913.60030
##	[696]	18563.53539	10604.68643	7980.26228	-20581.06592	-30913.60030
##	[701]	17563.53539	9604.68643	-7819.73772	-21581.06592	-31913.60030
##	[706]	35563.53539	27604.68643	12980.26228	-20581.06592	-21913.60030
##	[711]	25563.53539	11604.68643	7980.26228	-33781.06592	-30913.60030
##	[716]	30563.53539	22604.68643	65980.26228	-32081.06592	-12913.60030
##	[721]	35563.53539	27604.68643	-8019.73772	24418.93408	-13913.60030
##	[726]	14563.53539	37604.68643	1980.26228	-23581.06592	-18913.60030
##	[731]	24563.53539	11604.68643	20980.26228	-26581.06592	-33913.60030
##	[736]	13563.53539	12604.68643	23980.26228	-23581.06592	-30913.60030
##	[741]	35563.53539	15104.68643	980.26228	-27081.06592	-27913.60030
##	[746]	26563.53539	23604.68643	-4019.73772	-13581.06592	-18913.60030
##	[751]	128563.53539	10604.68643	-7019.73772	-27981.06592	-38913.60030
##	[756]	40563.53539	17604.68643	-5019.73772	-19581.06592	-48713.60030
##	[761]	28563.53539	18604.68643	-3019.73772	-34981.06592	-20913.60030
##	[766]	9563.53539	17604.68643	5980.26228	-10581.06592	-33913.60030
##	[771]	45563.53539	32604.68643	-4019.73772	-581.06592	-32913.60030
##	[776]	33563.53539	22604.68643	11980.26228	-18581.06592	-24913.60030
##	[781]	30563.53539	42604.68643	-1019.73772	-16581.06592	-3913.60030
##	[786]	10563.53539	26604.68643	-4019.73772	-2581.06592	-24913.60030
##	[791]	11563.53539	92604.68643	47980.26228	-21781.06592	-18913.60030
##	[796]	20563.53539	17604.68643	21980.26228	-2581.06592	-18913.60030
##	[801]	17563.53539	7604.68643	11980.26228	-7581.06592	-36913.60030
##	[806]	24563.53539	8604.68643	-3719.73772	-20581.06592	-31913.60030
##	[811]	10263.53539	12104.68643	-7319.73772	-30181.06592	-38913.60030
##	[816]	30563.53539	37604.68643	18980.26228	6418.93408	-3913.60030
##	[821]	60563.53539	38604.68643	15980.26228	-16581.06592	-10913.60030
##	[826]	20563.53539	7104.68643	86980.26228	-24581.06592	-39913.60030
##	[831]	10563.53539	52604.68643	-3019.73772	64418.93408	-32413.60030
##	[836]	37563.53539	32604.68643	980.26228	-20581.06592	-42413.60030
##	[841]	31563.53539	19604.68643	12980.26228	-25581.06592	1086.39970
##	[846]	25563.53539	3004.68643	6980.26228	-25581.06592	-34913.60030
##	[851]	10563.53539	42604.68643	-4019.73772	-10581.06592	-36913.60030
##	[856]	63563.53539	20604.68643	-8019.73772	-14581.06592	-37913.60030
##	[861]	18563.53539	22604.68643	15980.26228	-34981.06592	-23913.60030
##	[866]	41563.53539	17604.68643	-5519.73772	-16576.06592	13086.39970
##	[871]	30563.53539	52604.68643	30980.26228	-9581.06592	-26913.60030
##	[876]	26563.53539	8712.68643	20980.26228	-29581.06592	-21913.60030
##	[881]	9563.53539	7020.68643	-4019.73772	9418.93408	-30913.60030
##	[886]	11563.53539	16604.68643	25980.26228	-20581.06592	-36913.60030
##	[891]	6563.53539	34604.68643	-7519.73772	-32581.06592	-13913.60030
##	[896]	75563.53539	23604.68643	40980.26228	-20581.06592	-39913.60030
##	[901]	15563.53539	32604.68643	6980.26228	-15581.06592	51086.39970
##	[906]	15563.53539	37604.68643	-2019.73772	-27581.06592	-37913.60030
##	[911]	30563.53539	27604.68643	20980.26228	12418.93408	-31913.60030
##	[916]	31563.53539	12604.68643	50980.26228	-13581.06592	-42713.60030
##	[921]	29563.53539	22604.68643	-2019.73772	-5581.06592	-25913.60030
##	[926]	25563.53539	5604.68643	20980.26228	-23581.06592	-8913.60030
##	[931]	20563.53539	38604.68643	980.26228	-22581.06592	-38913.60030
##	[936]	35563.53539	25604.68643	10980.26228	-16581.06592	-28913.60030

##	[941]	33563.53539	15604.68643	2980.26228	-15581.06592	-23913.60030
##	[946]	30563.53539	20604.68643	-3019.73772	-19581.06592	-3913.60030
##	[951]	30563.53539	14604.68643	-7019.73772	-25581.06592	-34913.60030
##	[956]	20563.53539	12604.68643	-7819.73772	-20581.06592	-38913.60030
##	[961]	7563.53539	6604.68643	980.26228	-34081.06592	-30913.60030
##	[966]	9563.53539	30604.68643	980.26228	-32581.06592	-36913.60030
##	[971]	24563.53539	38604.68643	-2019.73772	-581.06592	-8913.60030
##	[976]	20563.53539	10604.68643	15980.26228	-7581.06592	-26913.60030
##	[981]	27063.53539	5604.68643	13980.26228	-17581.06592	-28913.60030
##	[986]	21563.53539	17604.68643	43980.26228	-9581.06592	-44913.60030
##	[991]	15563.53539	45604.68643	7980.26228	-31581.06592	1086.39970
##	[996]	60563.53539	30604.68643	-4019.73772	-17581.06592	-27913.60030
##	[1001]	17563.53539	35604.68643	40980.26228	-29581.06592	-32913.60030
##	[1006]	40563.53539	27604.68643	10980.26228	-17581.06592	-14913.60030
##	[1011]	30563.53539	22604.68643	23980.26228	-31581.06592	-28913.60030
##	[1016]	45563.53539	16604.68643	2980.26228	-10581.06592	21086.39970
##	[1021]	43563.53539	16604.68643	5980.26228	-18581.06592	11086.39970
##	[1026]	20563.53539	27604.68643	8980.26228	34418.93408	-18913.60030
##	[1031]	13563.53539	32604.68643	17980.26228	11418.93408	-36913.60030
##	[1036]	29563.53539	15604.68643	70980.26228	-30581.06592	-23913.60030
##	[1041]	33563.53539	10604.68643	980.26228	-26581.06592	-28913.60030
##	[1046]	17563.53539	17604.68643	10980.26228	-7581.06592	-48648.60030
##	[1051]	40563.53539	28604.68643	17980.26228	-21581.06592	-16913.60030
##	[1056]	15563.53539	9604.68643	18980.26228	24418.93408	-36913.60030
##	[1061]	20563.53539	17604.68643	16980.26228	-9581.06592	-30193.60030
##	[1066]	17563.53539	82604.68643	38980.26228	-17581.06592	36086.39970
##	[1071]	40563.53539	7604.68643	-19.73772	-5581.06592	31086.39970
##	[1076]	40563.53539	14604.68643	190980.26228	-31581.06592	-46913.60030
##	[1081]	29563.53539	4604.68643	5980.26228	-29581.06592	-43913.60030
##	[1086]	7063.53539	30604.68643	-19.73772	24418.93408	-47713.60030
##	[1091]	6963.53539	9604.68643	11980.26228	8418.93408	-19913.60030
##	[1096]	8563.53539	14604.68643	10980.26228	-34381.06592	-11913.60030
##	[1101]	13563.53539	37604.68643	15980.26228	-17581.06592	-18913.60030
##	[1106]	25563.53539	14604.68643	980.26228	-17581.06592	-28913.60030
##	[1111]	36563.53539	8604.68643	2980.26228	-22581.06592	-22913.60030
##	[1116]	20563.53539	32604.68643	-7019.73772	-30581.06592	4086.39970
##	[1121]	7563.53539	27604.68643	-4019.73772	-14581.06592	-31913.60030
##	[1126]	17563.53539	44604.68643	11980.26228	-29581.06592	-23913.60030
##	[1131]	8563.53539	6204.68643	-5019.73772	-15581.06592	3086.39970
##	[1136]	65563.53539	17604.68643	80980.26228	-9581.06592	-46913.60030
##	[1141]	21563.53539	26604.68643	5980.26228	6418.93408	-38913.60030
##	[1146]	22563.53539	32604.68643	22980.26228	418.93408	-38913.60030
##	[1151]	25563.53539	26604.68643	7980.26228	-12581.06592	-23913.60030
##	[1156]	55563.53539	22604.68643	20980.26228	-28581.06592	-41913.60030
##	[1161]	35563.53539	5604.68643	10980.26228	4418.93408	-38913.60030
##	[1166]	21563.53539	13604.68643	6980.26228	-17581.06592	-36913.60030
##	[1171]	9563.53539	62604.68643	33980.26228	-4581.06592	1086.39970
##	[1176]	32563.53539	32604.68643	2980.26228	-15581.06592	-33913.60030
##	[1181]	30563.53539	4604.68643	-6019.73772	74418.93408	6086.39970
##	[1186]	63563.53539	12604.68643	9980.26228	-20581.06592	-40913.60030
##	[1191]	65563.53539	8604.68643			

Sum of Squares for Error

```
sse <- sum(residuals^2)
sse
```

```
## [1] 1.041492e+12
```

R Squared

```
r_squared <- ssm/sst
r_squared
```

```
## [1] 0.005549303
```

Number of observations

```
n <- nrow(heights_df)
n
```

```
## [1] 1192
```

Number of regression parameters

```
p <- 8
p
```

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

Corrected Degrees of Freedom for Model

```
dfm <- p-1
dfm
```

```
## [1] 7
```

Degrees of Freedom for Error

```
dfe <- n-p
dfe
```

```
## [1] 1184
```


Corrected Degrees of Freedom Total: $DFT = n - 1$

```
dft <- n-1  
dft
```

```
## [1] 1191
```

Mean of Squares for Model: $MSM = SSM / DFM$

```
msm <- ssm/dfm  
msm
```

```
## [1] 358002883
```

Mean of Squares for Error: $MSE = SSE / DFE$

```
mse <- sse/dfc  
mse
```

```
## [1] 879638206
```

Mean of Squares Total: $MST = SST / DFT$

```
mst <- sst/dft  
mst
```

```
## [1] 379170348
```

F Statistic

```
f_score <- msm/mse  
f_score
```

```
## [1] 0.4069888
```

Adjusted R Squared $R^2 = 1 - (1 - R^2)(n - 1) / (n - p)$

```
adjusted_r_squared <- 1-((1 - r_squared)*(n - 1) / (n - p))  
adjusted_r_squared
```

```
## [1] -0.0003300508
```