

Data 605 - HW11

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Import Packages

```
library(tidyverse)
```

Examine Data Set

```
head(mtcars)
```

| ## | mpg | cyl | disp | hp | drat | wt | qsec | vs | am | gear | carb |
|----------------------|------|-----|------|-----|------|-------|-------|----|----|------|------|
| ## Mazda RX4 | 21.0 | 6 | 160 | 110 | 3.90 | 2.620 | 16.46 | 0 | 1 | 4 | 4 |
| ## Mazda RX4 Wag | 21.0 | 6 | 160 | 110 | 3.90 | 2.875 | 17.02 | 0 | 1 | 4 | 4 |
| ## Datsun 710 | 22.8 | 4 | 108 | 93 | 3.85 | 2.320 | 18.61 | 1 | 1 | 4 | 1 |
| ## Hornet 4 Drive | 21.4 | 6 | 258 | 110 | 3.08 | 3.215 | 19.44 | 1 | 0 | 3 | 1 |
| ## Hornet Sportabout | 18.7 | 8 | 360 | 175 | 3.15 | 3.440 | 17.02 | 0 | 0 | 3 | 2 |
| ## Valiant | 18.1 | 6 | 225 | 105 | 2.76 | 3.460 | 20.22 | 1 | 0 | 3 | 1 |

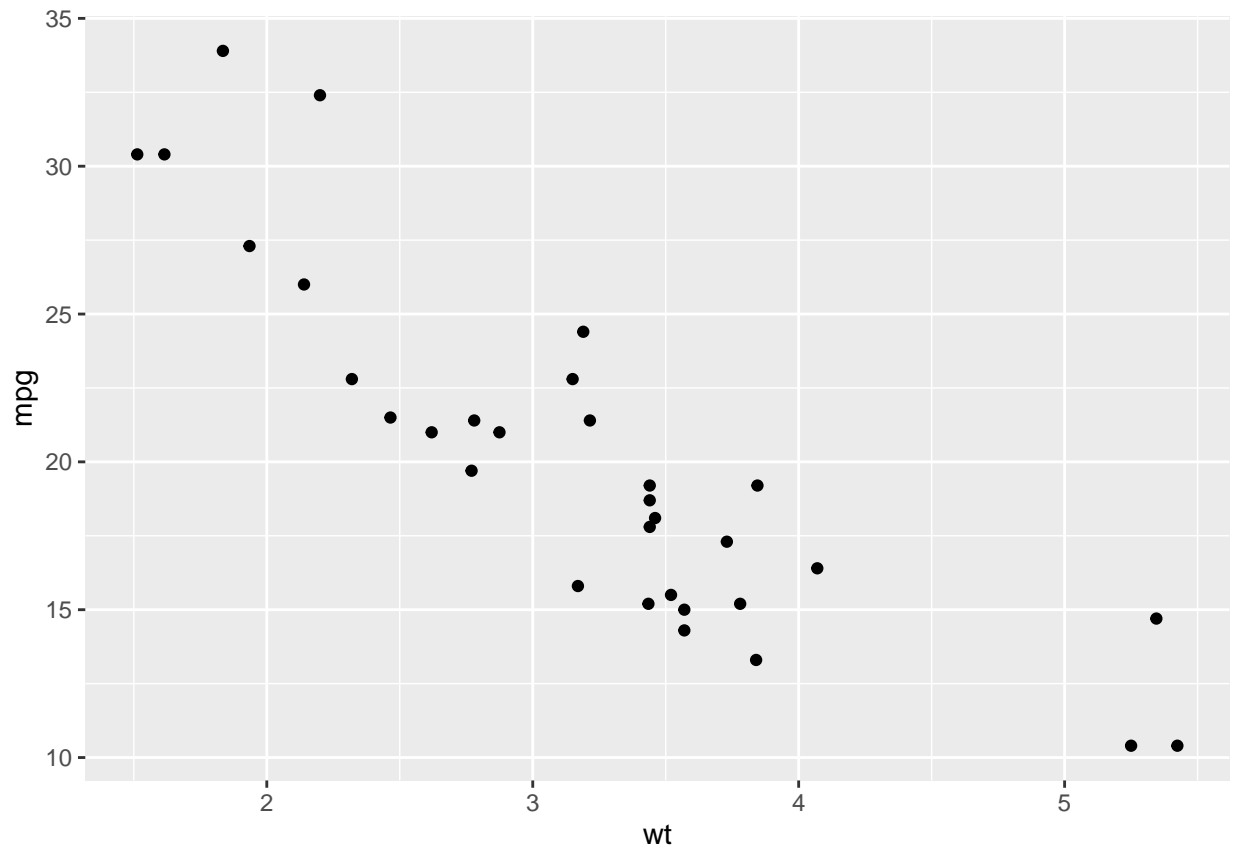
```
summary(mtcars)
```

| ## | mpg | cyl | disp | hp |
|-------------|---------|---------------|---------------|----------------|
| ## Min. | :10.40 | Min. :4.000 | Min. : 71.1 | Min. : 52.0 |
| ## 1st Qu.: | :15.43 | 1st Qu.:4.000 | 1st Qu.:120.8 | 1st Qu.: 96.5 |
| ## Median : | :19.20 | Median :6.000 | Median :196.3 | Median :123.0 |
| ## Mean : | :20.09 | Mean :6.188 | Mean :230.7 | Mean :146.7 |
| ## 3rd Qu.: | :22.80 | 3rd Qu.:8.000 | 3rd Qu.:326.0 | 3rd Qu.:180.0 |
| ## Max. | :33.90 | Max. :8.000 | Max. :472.0 | Max. :335.0 |
| ## | drat | wt | qsec | vs |
| ## Min. | :2.760 | Min. :1.513 | Min. :14.50 | Min. :0.0000 |
| ## 1st Qu.: | :3.080 | 1st Qu.:2.581 | 1st Qu.:16.89 | 1st Qu.:0.0000 |
| ## Median : | :3.695 | Median :3.325 | Median :17.71 | Median :0.0000 |
| ## Mean : | :3.597 | Mean :3.217 | Mean :17.85 | Mean :0.4375 |
| ## 3rd Qu.: | :3.920 | 3rd Qu.:3.610 | 3rd Qu.:18.90 | 3rd Qu.:1.0000 |
| ## Max. | :4.930 | Max. :5.424 | Max. :22.90 | Max. :1.0000 |
| ## | am | gear | carb | |
| ## Min. | :0.0000 | Min. :3.000 | Min. :1.000 | |
| ## 1st Qu.: | :0.0000 | 1st Qu.:3.000 | 1st Qu.:2.000 | |
| ## Median : | :0.0000 | Median :4.000 | Median :2.000 | |
| ## Mean : | :0.4062 | Mean :3.688 | Mean :2.812 | |
| ## 3rd Qu.: | :1.0000 | 3rd Qu.:4.000 | 3rd Qu.:4.000 | |
| ## Max. | :1.0000 | Max. :5.000 | Max. :8.000 | |

```
mpg_wt <- dplyr::select(mtcars, mpg, wt)
```

Visualize the Data Set

```
ggplot(mpg_wt, aes(x= wt, y= mpg)) +  
  geom_point()
```



Model

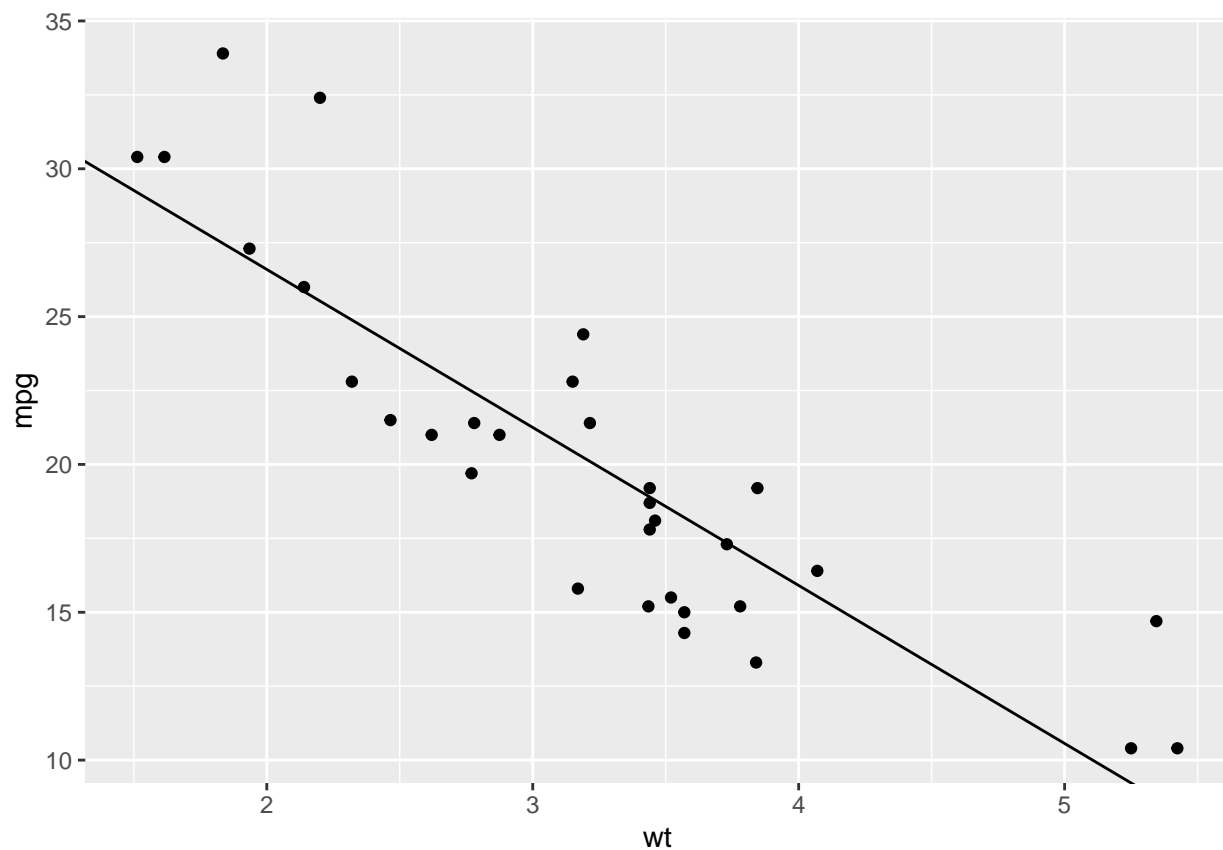
```
mpg_wt_lm <- lm(mpg ~ wt, data = mpg_wt)  
summary(mpg_wt_lm)
```

```
##  
## Call:  
## lm(formula = mpg ~ wt, data = mpg_wt)  
##  
## Residuals:  
##      Min       1Q   Median       3Q      Max   
## -4.5432 -2.3647 -0.1252  1.4096  6.8727   
##
```

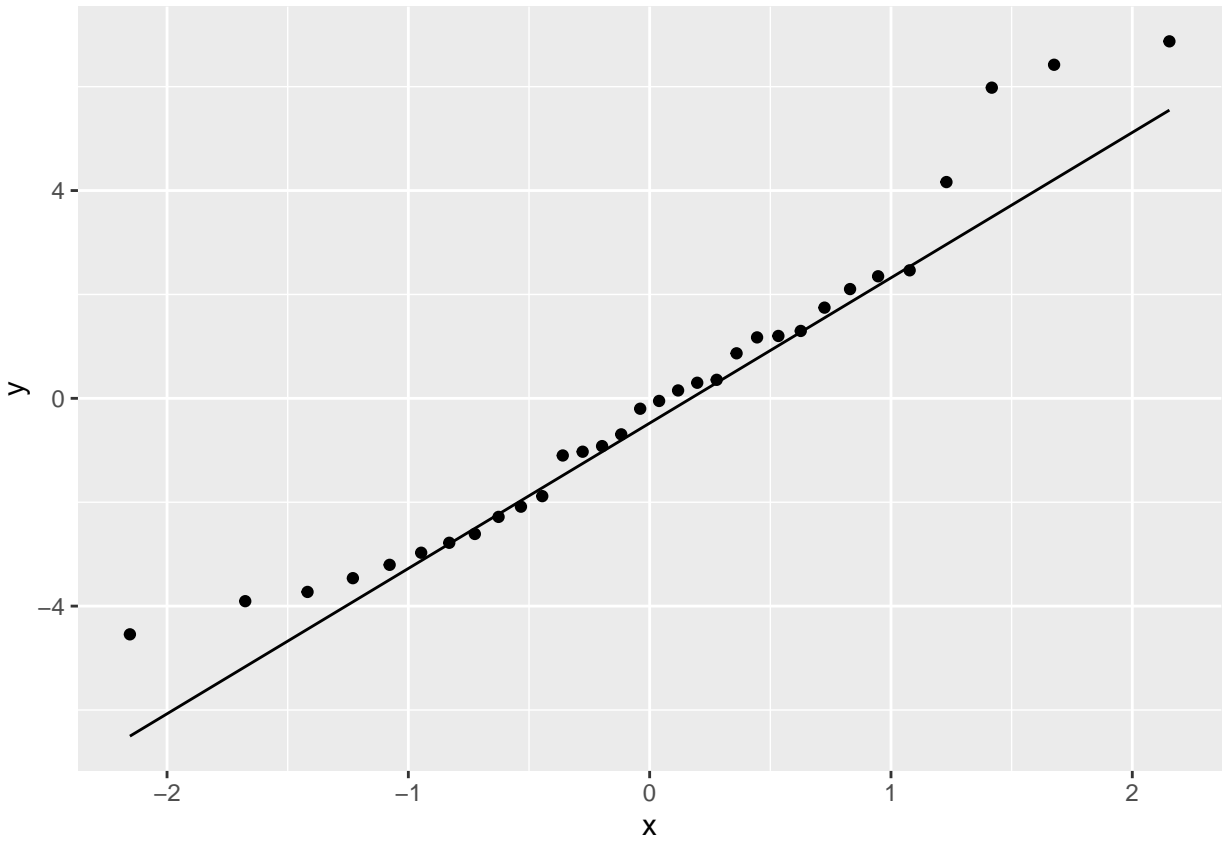
```
## Coefficients:
##           Estimate Std. Error t value Pr(>|t|)
## (Intercept)  37.2851     1.8776  19.858 < 2e-16 ***
## wt          -5.3445     0.5591  -9.559 1.29e-10 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.046 on 30 degrees of freedom
## Multiple R-squared:  0.7528, Adjusted R-squared:  0.7446
## F-statistic: 91.38 on 1 and 30 DF,  p-value: 1.294e-10
```

Visualize Model Fit

```
ggplot(mpg_wt, aes(x= wt, y= mpg)) +
  geom_point() + geom_abline(intercept = mpg_wt_lm$coefficients[1], slope= mpg_wt_lm$coefficients[2])
```



```
res <- as_data_frame(mpg_wt_lm$residuals)
ggplot(res, aes(sample = value)) +
  stat_qq() +
  stat_qq_line()
```



Conclusion The distribution of the residuals of the SLR model appear to be nearly normal in both the summary statistics and a quantile-quantile plot. The R squared value of .75 shows that much of the variability in a cars mpg is caused by variance in weight.