Applying the Regression Anatomy Formula

Open R and verify that the mtcars dataset is automatically loaded.

```
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
```

You are interested in the following model:

$$mpg = \beta_0 + \beta_1 hp + \beta_2 wt + u$$

Your task is to figure out what the ols estimate for β_1 would be, *without* conducting a multiple regression in R, instead only relying on simple regressions.

Applying the regression anatomy formula,

$$\hat{\beta}_1 = \frac{\hat{cov}(y, r_1)}{\hat{var}(r_1)}$$

where r_1 is the residual from a regression of hp on wt.

1. Use R to compute the residuals r_1, then compute the numerator of the regression anatomy formula.
2. Compute the denominator of the regression anatomy formula.
3. Explain, in a sentence or two, why this method works to compute β_1.