Lab 4

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Part 1

From the linear solver built into R, we can see that there is a positive, strong correlation between the neck girth and weight of the bear (due to the very small p-value we can see that the correlation is strong). For every inch in neck girth, we can estimate about 20 pounds of weight added to the bear, given some minimum weight we expect the bear to have. The intercept doesn't seem to make sense as it is a negative value, and the bear cannot have a negative weight.

When calculating the p-value by hand we can see that the value agrees with the linear solver. Our p-value is to the order of 10^-49, which is much smaller than 10^-16 as indicated in the summary. This p-value being small shows a strong correlation between weight and neck size.

Part 2

Again, we can see that our calculated p-values agree with the linear solver. However, while the neck girth still has high correlation (low p-value) with the weight, the head width seems to be fairly independent of the weight as indicated by the higher p-value.

CODE

Part 1

```
> TSS - (RSS1 + SS_reg)
[1] -6.984919e-09
> var_error
[1] 15.4955592  0.7148337
> t
          [,1]
[1,] -15.79733
[2,]  28.80384
> pvalue
              [,1]
[1,] 1.433795e-28
[2,] 2.475672e-49
> summary(lm_neck)

Call:
lm(formula = bear$Weight ~ bear$Neck.G)

Residuals:
    Min      1Q  Median      3Q     Max
-97.011 -19.446  -3.831  15.644 168.594

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) -244.7885    15.4956   -15.8   <2e-16 ***
bear$Neck.G   20.5900     0.7148    28.8   <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 37.01 on 97 degrees of freedom
Multiple R-squared:  0.8953,    Adjusted R-squared:  0.8942
F-statistic: 829.7 on 1 and 97 DF,  p-value: < 2.2e-16
```

Part 2

```
> TSS - (RSS1 + SS_reg)
[1] -7.683411e-09
> var_error
[1] 17.471073  1.208252  4.503687
> t
             [,1]
[1,] -13.8922970
[2,]  17.2482028
[3,]  -0.2568191
> pvalue
              [,1]
[1,] 8.435318e-25
[2,] 2.614679e-31
[3,] 7.978623e-01

> summary(lm_multi)

Call:
lm(formula = bear$Weight ~ bear$Neck.G + bear$Head.W)

Residuals:
    Min      1Q  Median      3Q     Max
-96.572 -19.677  -4.368  16.749 169.096

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) -242.713     17.562 -13.821   <2e-16 ***
bear$Neck.G   20.840      1.215  17.159   <2e-16 ***
bear$Head.W   -1.157      4.527  -0.255    0.799
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 37.19 on 96 degrees of freedom
Multiple R-squared:  0.8954,    Adjusted R-squared:  0.8932
F-statistic: 410.9 on 2 and 96 DF,  p-value: < 2.2e-16
```