Extra Sums of Squares

In this example, we study the relation of amount of body fat (y) with the predictors triceps skinfold thickness (x_1) and thigh circumference (x_2). Two models are fitted

```
> result1<-lm(fat~triceps+thigh)
> result2<-lm(fat~thigh+triceps)
```

The corresponding ANOVA outputs are shown in the next two slides.

Output 1

```
> anova(result1)
Analysis of Variance Table

Response: fat
          Df Sum Sq Mean Sq F value    Pr(>F)
triceps    1 409.19  409.19 10284.8 < 2.2e-16 ***
thigh      1  69.57   69.57  1748.6 < 2.2e-16 ***
Residuals 17   0.68    0.04
```

Output 2

```
> anova(result2)
Analysis of Variance Table

Response: fat
          Df Sum Sq Mean Sq F value    Pr(>F)
thigh      1 100.47  100.47  2525.3 < 2.2e-16 ***
triceps    1 378.28  378.28  9508.1 < 2.2e-16 ***
Residuals 17   0.68    0.04
```

Ordering of Predictors

From Output 1, we have
$SS_R(\beta_1) = 409.19$,
$SS_R(\beta_2|\beta_1) = 69.57$,
$SS_{res}(\beta_1, \beta_2) = 0.68$.

From Output 2, we have
$SS_R(\beta_2) = 100.47$,
$SS_R(\beta_1|\beta_2) = 378.28$,
$SS_{res}(\beta_1, \beta_2) = 0.68$.

$SS_R(\beta_1, \beta_2) = SS_R(\beta_1) + SS_R(\beta_2|\beta_1) = SS_R(\beta_2) + SS_R(\beta_1|\beta_2) =$ _____.

We usually arrange the model so that the last coefficients are the ones under consideration to be dropped.