1. Given to rating data from 29 husband-wife dyads (in rating.xls) and the description of different profiles used in the conjoint study, we did some steps:
    a) First, to create dummy codes for different lawn mower profiles to subsequently perform a regression analysis on rating data.

    b) Second, to fit a regression model for all the husband ratings to obtain husband utilities for different lawn mower attribute levels at the aggregate level.

```
lm(formula = Husband_Rating ~ F_hp + S_brand + in22 + P_250,
    data = HW_Conjoint_Ratings)

Residuals:
    Min      1Q  Median      3Q     Max
-62.569 -13.810   0.966  17.431  48.862

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)   38.759      3.255  11.908  < 2e-16 ***
F_hp          15.052      2.911   5.170 5.13e-07 ***
S_brand      -18.586      2.911  -6.384 9.61e-10 ***
in22          15.914      2.911   5.466 1.21e-07 ***
P_250         17.897      2.911   6.147 3.51e-09 ***
```

    c) Third, for all the wife ratings.

```
lm(formula = Wife_Rating ~ F_hp + S_brand + in22 + P_250, data = HW_Conjoint_Ratings)

Residuals:
    Min      1Q  Median      3Q     Max
-74.832 -14.812   4.082  14.192  50.608

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)   40.022      3.303  12.116  < 2e-16 ***
F_hp           5.716      2.954   1.935 0.054286 .
S_brand      -15.629      2.954  -5.290 2.87e-07 ***
in22          10.698      2.954   3.621 0.000362 ***
P_250         25.112      2.954   8.500 2.55e-15 ***
```

    d) Forth, to interpret and compare the regression outputs obtained from both husband-and-wife ratings.

    Based on the output, we can find that either husband or wife prefer 5 H.P., Toro brands, bigger wheel, and cheaper price. And husband prefer more on H.P., brand and wheel size. Wife is looking more on price.

2. The individual utility estimates for different lawn mower attribute levels for husbands are provided in utility_husbands.xls. I used a hierarchical Bayes method to obtain these estimates. What additional insights do these individual level estimates provide compared to the aggregate estimates obtained from your analysis in 1(b)?

   Date from utility_husbands are lower than what I obtained from my analysis in 1b other than HP. Which mean HP might be the more important feature husbands looking for.

3. Let us assume that Toro and Sears constitute the entire market, and each brand offers only one model of lawn mower:

	Toro (P1)	**Sears (P2)**
Horsepower	5 H.P.	4 H.P.
Swath	20 inches	22 inches
Price	$400	$250

   Please compute predicted market share for Toro using the share of utility rule for husband utilities. Briefly comment on the findings. (Hint: (i) Look up formulae that I use in the coffeemaker example. The excel spreadsheet is on the course website. (ii) Note that you will have an intercept term in your calculations that the coffeemaker example does not. Use the intercept term in all calculations for this homework).

   Market Share for Toro will be 50.12%. We find out each brand have their own proc and cons. Higher H.P. also more expensive and cheater price also lower horsepower. Which means customer will be based their what they need to purchase, and Toro is little bit better than Sears, but no one really is showing a higher preference compare to another

4. To have a better compete with Sears, Toro plans to launch another model in the market. Toro is considering two options for its new model:

	NP1	**NP2**
Horsepower	4 H.P.	4 H.P.
Swath	22 inches	20 inches
Price	$400	$250

   Please compute predicted market share for the following two options using the share of utility rule:

   (i) Option 1: Market comprises of P1, P2 and NP1
   31.90%
   (ii) Option 2: Market comprises of P1, P2 and NP2
   32.63%
   Which option results in a higher market share for the new Toro product? For each option, please comment on the cannibalization effect of the new product on the existing Toro product.

   Option 2 results in a higher market share for the new Toro Product. But also, option 2 will have larger cannibalization effect to the existing Toro product compare to the Option 1.

5. The following information regarding incremental cost of manufacturing different models of lawn mower for Toro is available.

Component	Cost per Unit
Base cost	$75
5 H.P.	$125
4 H.P.	$25
22-inches Swath	$85
20-inches Swath	$15

Please conduct a profit analysis using husbands' utilities. Based on your analysis, do you think Toro should introduce the new model of lawn mower at all? If yes, which model do you think is more desirable? Why?

I think toro should introduce the new model. Based on the market share and profit. Either new product will increase Toro's profit and after comparing the two new products. NP1 showing a better performace compare to others.

	Profit
P1	92.72
P1+NP1	131.72
P1+NP2	106.52

6. Please discuss the limitations of conjoint analysis in the context of this homework and suggest possible changes to enhance the accuracy and usefulness of the analysis for Toro's new product introduction decision.

   They also can have different area's average housing income to have different conjoint analysis. Different income people might value different character differently. And company also can publish different model to different area based on house income to build up different strategy to try to increase their market share.