Final Project

```
library(lpSolveAPI)
a <- read.lp("final.lp")
a
```

```
## Model name:
##   a linear program with 48 decision variables and 16 constraints
```

Factors: Our group selected: Attendance, Current Grade and GPA as the factors which we thought would be important for group assignment.

We normalized all the values by creating a percentage for each. For example a student might have an attendance percentage of .9 indicating that they were present for 90% of the total classes. The course grade was also computed as a percentage. Finally the GPA was calculated as a percentage by taking the individual's GPA and dividing by 4.

By doing this we now have a value for each of those categories which we can use to compare on equal grounds.

Next each student was assigned an overall contribution score by summing the values for the 3 factors. This score was used as the "benefit" added by that individual to each group in our objective function.

/* Fake Data */

Group:	1	2	3	4
Person 1:	2.74	2.74	2.74	2.74
Person 2:	2.755	2.755	2.755	2.755
Person 3:	2.18	2.18	2.18	2.18
Person 4:	2.5825	2.5825	2.5825	2.5825
Person 5:	2.925	2.925	2.925	2.925
Person 6:	2.8275	2.8275	2.8275	2.8275
Person 7:	3	3	3	3
Person 8:	2.15	2.15	2.15	2.15
Person 9:	2.915	2.915	2.915	2.915
Person 10:	2.6925	2.6925	2.6925	2.6925
Person 11:	2.795	2.795	2.795	2.795
Person 12:	2.7825	2.7825	2.7825	2.7825

Data collection: The attendance and class grade could be readily obtained by the professor. The GPA is the only difficult piece of information to get. The student might have to provide this information in order to get a complete picture.

The formulation for our project consisted of creating a table of all the possible group assignments for each person. Thus there are 48 different variables in the objective function (One for each of the 12 people being assigned to each of the 4 groups). The constraints limit each of the 4 groups to a maximum of 3 people. And requires that each person be assigned to a group.

/* Objective function */

max: 2.74 x11 + 2.74 x12 + 2.74 x13 + 2.74 x14 + 2.755 x21 + 2.755 x22 + 2.755 x23 + 2.755 x24 + 2.18 x31 + 2.18 x32 + 2.18 x33 + 2.18 x34 + 2.5825 x41 + 2.5825 x42 + 2.5825 x43 + 2.5825 x44 + 2.925 x51 + 2.925 x52 + 2.925 x53 + 2.925 x54 + 2.8275 x61 + 2.8275 x62 + 2.8275 x63 + 2.8275 x64 +3 x71 + 3 x72 + 3 x73 + 3 x74 + 2.15 x81 + 2.15 x82 + 2.15 x83 + 2.15 x84 + 2.915 x91 + 2.915 x92 + 2.915 x93 + 2.915 x94 + 2.6925 x101 + 2.6925 x102 + 2.6925 x103 + 2.6925x104 + 2.795 x111 + 2.795 x112 + 2.795 x113 + 2.795 x114 + 2.7825 x121 + 2.7825 x122 + 2.7825 x123 + 2.7825 x124;

/* Constraints */ x11 + x21 + x31 + x41 + x51 + x61 + x71 + x81 + x91 + x101 + x111 + x121 = 3;

x12 + x22 + x32 + x42 + x52 + x62 + x72 + x82 + x92 + x102 + x112 + x122 = 3;

x13 + x23 + x33 + x43 + x53 + x63 + x73 + x83 + x93 + x103 + x113 + x123 = 3;

x14 + x24 + x34 + x44 + x54 + x64 + x74 + x84 + x94 + x104 + x114 + x124 = 3;

x11 + x12 + x13 + x14 = 1;

x21 + x22 + x23 + x24 = 1;

x31 + x32 + x33 + x34 = 1;

x41 + x42 + x43 + x44 = 1;

x51 + x52 + x53 + x54 = 1;

x61 + x62 + x63 + x64 = 1;

x71 + x72 + x73 + x74 = 1;

x81 + x82 + x83 + x84 = 1;

x91 + x92 + x93 + x94 = 1;

x101 + x102 + x103 + x104 = 1;

x111 + x112 + x113 + x114 = 1;

x121 + x122 + x123 + x124 = 1;

```
solve(a)
```

```
## [1] 0
```

```
get.objective(a)
```

```
## [1] 32.345
```

```
get.variables(a)
```

```
##  [1] 0 0 1 0 0 0 1 0 0 0 0 1 0 0 0 1 1 0 0 0 0 1 0 0 1 0 0 0 0 0 0 1 1 0 0 0 0 0
## [39] 1 0 0 1 0 0 0 1 0 0
```

The analysis of these results shows the following group assignments:

Group:	1	2	3	4
Person 1:	0	0	1	0
Person 2:	0	0	1	0
Person 3:	0	0	0	1

Group:	1	2	3	4
Person 4:	0	0	0	1
Person 5:	1	0	0	0
Person 6:	0	1	0	0
Person 7:	1	0	0	0
Person 8:	0	0	0	1
Person 9:	1	0	0	0
Person 10:	0	0	1	0
Person 11:	0	1	0	0
Person 12:	0	1	0	0

Group 1: Person 5, Person 7, and Person 9
Group 2: Person 6, Person 11, and Person 12
Group 3: Person 1, Person 2, and Person 10
Group 4: Person 3, Person 4, and Person 8