Quantitative Final

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Final exam

Load libraries and lp file

```
library(lpSolveAPI)
library(lpSolve)

#call lp file
Students<- read.lp("Students.lp")
print(Students)
```

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

#Creating the table for the students group

```
#The matrix for the table
Studentstable <- matrix(c(1,2,3,4,5,6,7,8,9,10,11,12,
                          3.4,4,2.6,3.7,2.5,3,3.8,3.2,3.4,2,3.9,2.8,
                          27,23,24,30,26,25,27,29,27,24,25,28,
44124,44240,44242,44122,44240,44242,44240,44240,44240,44242,44240,44242,
44154.4,44267,44268.6,44155.7,44268.5,44270,44270.8,44272.2,44270.4,44268,44268.9,44272.8),ncol=5, byrou

#Column names
colnames(Studentstable) <- c("StudentID","GPA", "Age", "Location", "Total")

as.table(Studentstable)
```

```
##   StudentID     GPA     Age Location   Total
## A       1.0     3.4    27.0  44124.0 44154.4
## B       2.0     4.0    23.0  44240.0 44267.0
## C       3.0     2.6    24.0  44242.0 44268.6
## D       4.0     3.7    30.0  44122.0 44155.7
## E       5.0     2.5    26.0  44240.0 44268.5
## F       6.0     3.0    25.0  44242.0 44270.0
## G       7.0     3.8    27.0  44240.0 44270.8
## H       8.0     3.2    29.0  44240.0 44272.2
## I       9.0     3.4    27.0  44240.0 44270.4
```

```
## J      10.0     2.0    24.0  44242.0 44268.0
## K      11.0     3.9    25.0  44240.0 44268.9
## L      12.0     2.8    28.0  44242.0 44272.8
```

```
# This table represents the students and the randomly generated factors:
# The gpa is based on a 4.0 scale
# The age is generated from 20 to 30
# The location is based on zip codes across Kent and Cleveland
# The total column is the sum of each factor for each student
```

#Constraints and factors

```
#The constraints for this project is that each group must only have 3 students per group.
#Each student is also only able to belong to one group

#Factors
#Each factor plays a crucial role in determing the success of the group:
#A student with a high GPA combined with their age indicates a more intelligent and wiser who will now
#Students living in different zip codes may have a tough time being able to collaborate on the assignme
```

#Solving the lp model and objective function

```
#Solve the lp model
solve(Students)
```

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

```
#Getting the variables in which the students belong.
get.variables(Students)
```

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

```
# This data shows in what group each student will belong to in order to obtain the best results.
# Group1: Student 7, Student8 and Student12
# Group2: Student 6, Student9 and Student11
# Group3: Student 3, Student5 and Student10
# Group4: Student 1, Student2 and Student4

#Define the objective function
get.objective(Students)
```

```
## [1] 531007.3
```

```
# The objective function is equal to 531007.3


# The sum of students of each group:
# Group1: Student7 + Student8  + Student12 = 44270.8 + 44272.2 + 44272.8 = 132815.8
# Group2: Student6 + Student9  + Student11 = 44270  +   44270.4   + 44268.9 = 132809.3
# Group3: Student3 + Student5  + Student10 = 44268.6 + 44268.5 +  44268 = 132805.1
```

```
# Group4: Student1 + Student2  + Student4  = 44154.4 + 44267 + 44155.7 = 132577.1

#So as you can see the main objective function is equal to Group1 + Group2 + Group3 + Group4 for a tota

#531007.3
```