Final Project -QMM

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Data set up

What are the three factors that influence group success?

The GPA- range on scale of 0.0-4.0 Experience - consider experience 0-4 years Interest - the factor whether students are interested in the group project or not impact the successfullness of the project-(0-not interested, 1-interested)

Due to the dataset is not provided we have randomly generated student information under above mentioned three factors.

```
library(lpSolve)
```

```
## Warning: package 'lpSolve' was built under R version 4.2.3
```

```
library(lpSolveAPI)
```

```
## Warning: package 'lpSolveAPI' was built under R version 4.2.3
```

GPA

```
 round(runif(15, min = 0, max = 4.0), 2)  # Simulating GPAs between 0 and 4.0
```

```
##  [1] 1.31 0.21 0.09 2.45 1.79 1.48 2.08 0.73 3.04 1.46 2.85 2.27 2.97 1.62 3.23
```

Each time the code is executed, the values generated for the random GPAs will differ.Therefore the result of my execution is 3.57 3.18 2.02 1.69 2.62 3.55 3.57 0.71 1.03 0.45 3.19 0.44 3.32 3.08 3.77

Experience

```
round(runif(15,min = 0,max = 4)) # Assume that students do not have experience more than 4 years
```

```
##  [1] 2 0 4 0 2 3 1 1 1 3 4 0 3 1 1
```

Each time the code is executed, the values generated for the random Experience will differ.Therefore the result of my execution is 4 4 1 4 2 2 2 3 0 1 3 1 3 1 2.

Interest

```
round(runif(15,min = 0,max=1)) # Assume 0 as not interested and 1 as interested
```

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

Each time the code is executed, the values generated for the random Interest will differ.Therefore the result of my execution is 1 1 0 0 0 1 1 1 1 1 1 1 1 1 1

All the data of above three factors are in the same scale, so we do not need to re scale the above data.

For better understanding we can summarize as follow the results of above three factors for each 15 students. *Y1: GPA= 3.57, Experience= 4, Interest = Yes(1)* Y2: GPA= 3.18, Experience= 4, Interest = Yes(1) *Y3: GPA= 2.02, Experience= 1, Interest = No(0)* Y4: GPA= 1.69, Experience= 4, Interest = No(0) *Y5: GPA= 2.62, Experience= 2, Interest = No(0)* Y6: GPA= 3.55, Experience= 2, Interest = Yes(1) *Y7: GPA= 3.57, Experience= 2 , Interest = Yes(1)* Y8: GPA= 0.71, Experience= 3 , Interest = Yes(1) *Y9: GPA= 1.03, Experience= 0, Interest = Yes(1)* Y10: GPA= 0.45, Experience= 1 , Interest = Yes(1) *Y11: GPA= 3.19, Experience= 3 , Interest = Yes(1)* Y12: GPA= 0.44, Experience= 1 , Interest = Yes(1) *Y13: GPA= 3.32, Experience= 3 , Interest = Yes(1)* Y14: GPA= 3.08, Experience= 1 , Interest = Yes(1) *Y15: GPA= 3.77, Experience= 2 , Interest = Yes(1)

We assume that all variables are equally important to make success the group project. So we assign equal weight for each factor and calculate the weighted average of the data = 5.412667

Define the GPAs, Experiences, and Interests for each Y

```
GPAs <- c(3.57, 3.18, 2.02, 1.69, 2.62, 3.55, 3.57, 0.71, 1.03, 0.45, 3.19, 0.44, 3.32, 3.08, 3.77)
Experiences <- c(4, 4, 1, 4, 2, 2, 2, 3, 0, 1, 3, 1, 3, 1, 2)
Interests <- c(1, 1, 0, 0, 0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1)
```

```
Y_totals <- GPAs + Experiences + Interests
```

calculate weighted average of data

```
Weighted_average <- mean(Y_totals) # We assume all factors equally important and assign equal weight
Weighted_average
```

```
## [1] 5.412667
```

Calculate the total score of each student

```
for (i in 1:length(Y_totals)) {
  cat("Total for Y", i, ":", Y_totals[i], "\n")
}
```

```
## Total for Y 1 : 8.57
## Total for Y 2 : 8.18
## Total for Y 3 : 3.02
## Total for Y 4 : 5.69
```

```
## Total for Y 5 : 4.62
## Total for Y 6 : 6.55
## Total for Y 7 : 6.57
## Total for Y 8 : 4.71
## Total for Y 9 : 2.03
## Total for Y 10 : 2.45
## Total for Y 11 : 7.19
## Total for Y 12 : 2.44
## Total for Y 13 : 7.32
## Total for Y 14 : 5.08
## Total for Y 15 : 6.77
```

Now we want to calculate in how many points each student is away from the weighted average. Hence that we calculate the variance as follow.

Calculate variance

```
y1<- 8.57 - Weighted_average
Y2<- 8.18 - Weighted_average
Y3<- 3.02 - Weighted_average
Y4<- 5.69 - Weighted_average
Y5<- 4.62 - Weighted_average
Y6<- 6.55 - Weighted_average
Y7<- 6.57 - Weighted_average
Y8<- 4.71 - Weighted_average
Y9<- 2.03 - Weighted_average
Y10<- 2.45 - Weighted_average
Y11<- 7.19 - Weighted_average
Y12<- 2.44 - Weighted_average
Y13<- 7.32 - Weighted_average
Y14<- 5.08 - Weighted_average
Y15<- 6.77 - Weighted_average

y1
```

```
## [1] 3.157333
```

```
Y2
```

```
## [1] 2.767333
```

```
Y3
```

```
## [1] -2.392667
```

```
Y4
```

```
## [1] 0.2773333
```

```
Y5
```

```
## [1] -0.7926667
```

```
Y6
```

```
## [1] 1.137333
```

```
Y7
```

```
## [1] 1.157333
```

```
Y8
```

```
## [1] -0.7026667
```

```
Y9
```

```
## [1] -3.382667
```

```
Y10
```

```
## [1] -2.962667
```

```
Y11
```

```
## [1] 1.777333
```

```
Y12
```

```
## [1] -2.972667
```

```
Y13
```

```
## [1] 1.907333
```

```
Y14
```

```
## [1] -0.3326667
```

```
Y15
```

```
## [1] 1.357333
```

According to the above results, we can identify some of the students get minus values and they are away from the average. Hence that our goal should be minimizing the variance of each student to see all of them around the weighted average value.

The objective function we can build up as follow. S refer for Student and G refer for Group.

Objective (Minimize) = 3.16S1G1 + 3.16S1G2 + 3.16S1G3 + 3.16S1G4 + 3.16S1G5 + 2.77S2G1 + 2.77S2G2 + 2.77S2G3 + 2.77S2G4 + 2.77S2G5 + 2.39S3G1 + 2.39S3G2 + 2.39S3G3 + 2.39S3G4 + 2.39S3G5 + 0.28S4G1 + 0.28S4G2 + 0.28S4G3 + 0.28S4G4 + 0.28S4G5 + 0.79S5G1 + 0.79S5D2 + 0.79S5G3 + 0.79S5F4 + 0.79S5G5 + 1.14S6G1 + 1.14S6G2 + 1.14S6G3 + 1.14S6G4 + 1.14S6G5 + 1.16S7G1 + 1.16S7G2 + 1.16S7G3 + 1.16S7G4 + 1.16S7G5 + 0.70S8G1 + 0.70S8G2 + 0.70S8G3 + 0.70S8G4 + 0.70S8G5 + 3.38S9G1 + 3.38S9G2 + 3.38S9G3 + 3.38S9G4 + 3.38S9G5 + 2.96S10G1 + 2.96S10G2 + 2.96S10G3 + 2.96S10G4 + 2.96S10G5 + 1.77S11G1 + 1.77S11G2 + 1.77S11G3 + 1.77S11G4 + 1.77S11G5 + 2.98S12G1 + 2.98S12G2 + 2.98S12G3 + 2.98S12G4 + 2.98S12G5 + 1.91S13G1 + 1.91S13G2 + 1.91S13G3 + 1.91S13G4 + 1.91S13G5 + 0.33S14G1 + 0.33S14G2 + 0.33S14G3 + 0.33S14G4 + 0.33S14G5 + 1.36S15G1 + 1.39S15G1 + 1.39S15G3 + 1.39S15G4 + 1.39S15G5

There are few constraints as follow,

1. Group constraints:The total number of students in each group must be 3. *Group 1: S1G1 + S2G1 + S3G1 + S4G1 + S5G1 + S6G1 + S7G1 + S8G1 + S9G1 + S10G1 + S11G1 + S12G1 + S13G1 + S14G1 + S15G1 = 3* Group 2: S1G2 + S2G2 + S3G2 + S4G2 + S5G2 + S6G2 + S7G2 + S8G2 + S9G2 + S10G2 + S11G2 + S12G2 + S13G2 + S14G2 + S15G2 = 3 *Group 3: S1G3 + S2G3 + S3G3 + S4G3 + S5G3 + S6G3 + S7G3 + S8G3 + S9G3 + S10G3 + S11G3 + S12G3 + S13G3 + S14G3 + S15G3 = 3* Group 4: S1G4 + S2G4 + S3G4 + S4G4 + S5G4 + S6G4 + S7G4 + S8G4 + S9G4 + S10G4 + S11G4 + S12G4 + S13G4 + S14G4 + S15G4 = 3 *Group 5: S1G5 + S2G5 + S3G5 + S4G5 + S5G5 + S6G5 + S7G5 + S8G5 + S9G5 + S10G5 + S11G5 + S12G5 + S13G5 + S14G5 + S15G5 = 3

2. Student constraints: Each student should be assigned to only one group. *S1G1 + S1G2 + S1G3 + S1G4 + S1G5 = 1* S2G1 + S2G2 + S2G3 + S2G4 + S2G5 = 1 *S3G1 + S3G2 + S3G3 + S3G4 + S3G5 = 1* S4G1 + S4S2 + S4G3 + S4G4 + S4G5 = 1 *S5G1 + S5G2 + S5G3 + S5G4 + S5G5 = 1* S6G1 + S6G2 + S6G3 + S6G4 + S6G5 = 1 *S7G1 + S7G2 + S7G3 + S7G4 + S7G5 = 1* S8G1 + S8G2 + S8G3 + S8G4 + S8G5 = 1 *S9G1 + S9G2 + S9G3 + S9G4 + S10G5 = 1* S10G1 + S10G2 + S10G3 + S10G4 + S10G5 = 1 *S11G1 + S11G2 + S11G3 + S11G4 + S11G5 = 1* S12G1 + S12G2 + S12G3 + S12G4 + S12G5 = 1 *S13G1 + S13G2 + S13G3 + S13G4 + S13G5 = 1* S14G1 + S14G2 + S14G3 + S14G4 + S14G5 = 1 *S15G1 + S15G2 + S15G3 + S15G4 + S15G5 = 1

3. Factor 1 constraint: GPA *Group 1: S1G1 + S2G1 + S3G1 + S4G1 + S5G1 + S6G1 + S7G1 + S8G1 + S9G1 + S10G1 + S11G1 + S12G1 + S13G1 + S14G1 + S15G1 = 2.42 (Average of Total GPA)* Group 2: S1G2 + S2G2 + S3G2 + S4G2 + S5G2 + S6G2 + S7G2 + S8G2 + S9G2 + S10G2 + S11G2 + S12G2 + S13G2 + S14G2 + S15G2 = 2.42 *Group 3: S1G3 + S2G3 + S3G3 + S4G3 + S5G3 + S6G3 + S7G3 + S8G3 + S9G3 + S10G3 + S11G3 + S12G3 + S13G3 + S14G3 + S15G3 = 2.42* Group 4: S1G4 + S2G4 + S3G4 + S4G4 + S5G4 + S6G4 + S7G4 + S8G4 + S9G4 + S10G4 + S11G4 + S12G4 + S13G4 + S14G4 + S15G4 = 2.42 *Group 5: S1G5 + S2G5 + S3G5 + S4G5 + S5G5 + S6G5 + S7G5 + S8G5 + S9G5 + S10G5 + S11G5 + S12G5 + S13G5 + S14G5 + S15G5 = 2.42

4.Factor 2 constraint: Experience *Group 1: S1G1 + S2G1 + S3G1 + S4G1 + S5G1 + S6G1 + S7G1 + S8G1 + S9G1 + S10G1 + S11G1 + S12G1 + S13G1 + S14G1 + S15G1 = 2.2 (Average of experience)* Group 2: S1G2 + S2G2 + S3G2 + S4G2 + S5G2 + S6G2 + S7G2 + S8G2 + S9G2 + S10G2 + S11G2 + S12G2 + S13G2 + S14G2 + S15G2 = 2.2 *Group 3: S1G3 + S2G3 + S3G3 + S4G3 + S5G3 + S6G3 + S7G3 + S8G3 + S9G3 + S10G3 + S11G3 + S12G3 + S13G3 + S14G3 + S15G3 = 2.2* Group 4: S1G4 + S2G4 + S3G4 + S4G4 + S5G4 + S6G4 + S7G4 + S8G4 + S9G4 + S10G4 + S11G4 + S12G4 + S13G4 + S14G4 + S15G4 = 2.2 *Group 5: S1G5 + S2G5 + S3G5 + S4G5 + S5G5 + S6G5 + S7G5 + S8G5 + S9G5 + S10G5 + S11G5 + S12G5 + S13G5 + S14G5 + S15G5 = 2.2

5.Factor 3 constraint: Interest *Group 1: S1G1 + S2G1 + S3G1 + S4G1 + S5G1 + S6G1 + S7G1 + S8G1 + S9G1 + S10G1 + S11G1 + S12G1 + S13G1 + S14G1 + S15G1 = 0.8 (Average of Interest)* Group 2: S1G2 + S2G2 + S3G2 + S4G2 + S5G2 + S6G2 + S7G2 + S8G2 + S9G2 + S10G2 + S11G2 + S12G2 + S13G2 + S14G2 + S15G2 = 0.8 *Group 3: S1G3 + S2G3 + S3G3 + S4G3 + S5G3 + S6G3 + S7G3 + S8G3 + S9G3 + S10G3 + S11G3 + S12G3 + S13G3 + S14G3 + S15G3 = 0.8* Group 4: S1G4 + S2G4 + S3G4 + S4G4 + S5G4 + S6G4 + S7G4 + S8G4 + S9G4 + S10G4 + S11G4 + S12G4 + S13G4 + S14G4 + S15G4 = 0.8 *Group 5: S1G5 + S2G5 + S3G5 + S4G5 + S5G5 + S6G5 + S7G5 + S8G5 + S9G5 + S10G5 + S11G5 + S12G5 + S13G5 + S14G5 + S15G5 = 0.8

```
lp_model <- make.lp(0,75)
set.objfn(lp_model,c(3.16,3.16,3.16,3.16,3.16,2.77,2.77,2.77,2.77,2.77,2.39,2.39,2.39,2.39,2.39,0.28,0.
lp.control(lp_model, sense = 'min', all.bin= TRUE)
```

```
## $anti.degen
## [1] "fixedvars" "stalling"
##
## $basis.crash
## [1] "none"
##
## $bb.depthlimit
## [1] -50
##
## $bb.floorfirst
## [1] "automatic"
##
## $bb.rule
## [1] "pseudononint" "greedy"       "dynamic"      "rcostfixing"
##
## $break.at.first
## [1] FALSE
##
## $break.at.value
## [1] -1e+30
##
## $epsilon
##       epsb       epsd      epsel     epsint epsperturb   epspivot
##      1e-10      1e-09      1e-12      1e-07      1e-05      2e-07
##
## $improve
## [1] "dualfeas" "thetagap"
##
## $infinite
## [1] 1e+30
##
## $maxpivot
## [1] 250
##
## $mip.gap
## absolute relative
##    1e-11    1e-11
##
## $negrange
## [1] -1e+06
##
```

```
## $obj.in.basis
## [1] TRUE
##
## $pivoting
## [1] "devex"    "adaptive"
##
## $presolve
## [1] "none"
##
## $scalelimit
## [1] 5
##
## $scaling
## [1] "geometric"   "equilibrate" "integers"
##
## $sense
## [1] "minimize"
##
## $simplextype
## [1] "dual"   "primal"
##
## $timeout
## [1] 0
##
## $verbose
## [1] "neutral"
```

```
add.constraint(lp_model, c(1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,
add.constraint(lp_model, c(0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,
add.constraint(lp_model, c(0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,
add.constraint(lp_model, c(0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,
add.constraint(lp_model, c(0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,
add.constraint(lp_model, c(1,1,1,1,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
add.constraint(lp_model, c(0,0,0,0,0,1,1,1,1,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
add.constraint(lp_model, c(0,0,0,0,0,0,0,0,0,0,1,1,1,1,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
add.constraint(lp_model, c(0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,1,1,1,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
add.constraint(lp_model, c(0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,1,1,1,1,0,0,0,0,0,0,0,0,0,0,0,0,0,
add.constraint(lp_model, c(0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,1,1,1,1,0,0,0,0,0,0,0,0,
add.constraint(lp_model, c(0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,1,1,1,1,0,0,0,
add.constraint(lp_model, c(0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,1,1,
add.constraint(lp_model, c(0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
add.constraint(lp_model, c(0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
add.constraint(lp_model, c(0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
add.constraint(lp_model, c(0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
add.constraint(lp_model, c(0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
add.constraint(lp_model, c(0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
add.constraint(lp_model, c(0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
add.constraint(lp_model, c(1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,
add.constraint(lp_model, c(0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,
add.constraint(lp_model, c(0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,
add.constraint(lp_model, c(0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,
add.constraint(lp_model, c(0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,
add.constraint(lp_model, c(1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,
add.constraint(lp_model, c(0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,
```

```r
add.constraint(lp_model, c(0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,
add.constraint(lp_model, c(0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,
add.constraint(lp_model, c(0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,
add.constraint(lp_model, c(1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,
add.constraint(lp_model, c(0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,
add.constraint(lp_model, c(0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,
add.constraint(lp_model, c(0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,
add.constraint(lp_model, c(0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,
```

```r
solve(lp_model)
```

```
## [1] 2
```

```r
get.objective(lp_model)
```

```
## [1] 1e+30
```

```r
get.variables(lp_model)
```

```
##  [1]  1.325483e-309  3.259386e-311  3.212612e-319  4.889111e-311  1.489475e+195
##  [6] -8.371161e+298 -5.829007e+303 -8.371161e+298 -8.371161e+298  7.291129e-304
## [11] -8.371161e+298  7.291122e-304  7.291122e-304  4.243992e-314  7.291122e-304
## [16]  4.243992e-314  5.177670e-312  1.273197e-313  1.254927e-321  1.909809e-313
## [21]  1.086462e-311  3.259386e-311  3.212612e-319  1.086462e-311  3.212612e-319
## [26]  3.225310e-319  1.086462e-311  3.212612e-319  5.432309e-312  1.264808e-321
## [31]  3.212612e-319  1.086462e-311  3.212612e-319  3.225310e-319  5.432310e-312
## [36]  1.320051e-309  5.432309e-312  1.320051e-309  7.062002e-311  5.432309e-312
## [41]  1.320051e-309  7.062002e-311  2.871041e-306  1.086462e-311  1.086462e-311
## [46]  1.086462e-311  1.086462e-311   0.000000e+00  1.629693e-311  2.172924e-311
## [51]  2.172924e-311  1.086462e-311  1.086462e-311  1.086462e-311  2.716155e-311
## [56]  3.259386e-311  2.172924e-311  2.172924e-311  1.629693e-311  1.094950e-311
## [61]  4.889111e-311  1.731170e-306  1.390671e-309  6.483618e+178  4.823377e+228
## [66]  2.171322e-306  1.054646e-311  1.054646e-311  1.054646e-311  1.054646e-311
## [71]  1.054646e-311  1.054646e-311  1.054646e-311  1.054646e-311  1.054646e-311
```