```r
rm(list=ls())                                          #clear work area
files=list.files("experiment5")                        #list files in target subdirectory
n=length(files)                                        #count of files
print(n)
```

```
## [1] 100
```

```r
#
for (i in 1:n){                                        #read each file and extract SGP values
  fname=paste("experiment5/",files[[i]],sep="")        #file to load
  load(fname)
  if(i==1){                                            #initialize data frame with column of le
    df=data.frame(rep(c(1,2,3),1+nrow(MCAS_sgp$Panel_Data)/3)[1:nrow(MCAS_sgp$Panel_Data)])
    colnames(df)=c("levels")
  }
  df=cbind(df,MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP)   #add column for SGP values
}
str(df)                                                #show structure of data frame
```

```
## 'data.frame': 70000 obs. of  101 variables:
##  $ levels                                    : num  1 2 3 1 2 3 1 2 3 1 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  30 9 33 98 3 9 24 88 17 29 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  62 17 52 75 12 35 56 95 1 28 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  47 1 51 98 89 30 15 85 9 28 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  61 2 37 91 1 21 31 83 13 22 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  55 86 38 79 98 23 55 80 17 20 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  54 96 48 94 1 12 55 65 90 28 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  51 17 26 8 19 38 42 81 13 28 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  45 96 31 13 85 15 15 57 99 13 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  56 3 30 2 3 31 9 95 12 18 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  61 2 34 93 90 55 37 80 92 20 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  48 3 39 3 96 32 40 92 12 35 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  49 2 30 96 25 25 74 90 1 29 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  30 21 16 97 3 42 55 80 1 19 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  54 24 39 97 3 21 33 88 85 10 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  41 12 24 1 9 23 35 86 14 38 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  55 67 35 1 3 22 61 93 1 25 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  42 8 44 14 2 31 36 65 1 21 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  42 7 28 90 91 15 35 86 3 17 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  52 99 32 98 2 32 32 1 95 17 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  61 91 21 86 1 22 20 2 15 27 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  60 6 33 82 7 9 46 95 10 28 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  55 2 44 82 86 14 61 83 1 21 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  49 2 40 2 1 43 42 58 96 25 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  40 97 33 76 2 48 33 79 98 15 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  49 96 25 98 3 70 49 68 99 25 ...
```

```
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  48 3 36 90 94 36 13 2 98 14 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  66 94 39 94 21 21 61 83 6 20 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  56 7 34 1 2 9 35 3 98 17 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  43 4 46 97 7 15 36 86 87 20 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  55 1 38 95 2 36 48 92 1 43 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  47 99 56 8 78 42 31 99 9 18 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  55 96 31 79 99 33 36 97 98 25 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  61 26 45 3 98 32 31 99 11 25 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  48 21 38 91 12 14 36 81 16 32 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  50 1 37 92 9 1 17 84 12 23 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  55 2 26 1 1 24 30 96 17 26 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  55 93 40 84 10 61 55 81 87 26 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  48 18 22 5 91 61 32 12 11 24 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  61 92 37 4 7 43 46 88 1 25 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  74 85 40 96 91 34 49 96 1 28 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  57 94 35 90 24 31 43 89 5 29 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  61 1 23 95 1 23 21 76 4 23 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  61 2 36 1 12 44 44 98 98 24 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  51 91 35 1 12 23 32 92 1 23 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  55 11 36 3 92 13 54 82 8 27 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  51 17 27 97 95 35 31 82 1 35 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  62 11 27 6 97 12 33 74 4 29 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  55 83 42 90 1 23 39 3 5 29 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  42 12 40 73 2 21 30 87 1 23 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  51 7 48 96 95 23 36 76 17 30 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  50 12 40 93 95 31 50 95 89 33 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  51 97 35 10 17 44 37 83 17 27 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  55 3 23 1 17 34 56 87 11 32 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  56 2 23 97 98 43 55 83 96 7 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  46 30 28 91 2 31 23 90 7 43 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  45 1 25 88 2 21 39 77 1 36 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  45 97 33 88 3 36 32 79 10 39 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  43 90 49 85 3 35 24 3 99 28 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  55 97 32 85 97 13 36 87 16 16 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  54 31 40 83 3 30 54 80 9 18 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  50 12 31 5 88 44 10 15 13 37 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  56 10 27 74 3 42 8 92 91 11 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  43 26 41 95 82 22 48 85 3 37 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  47 82 31 1 18 22 35 1 1 29 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  35 96 21 81 27 21 39 2 15 24 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  61 2 40 97 31 15 25 70 1 49 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  36 3 22 6 3 47 22 74 11 31 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  61 6 32 4 7 21 28 98 1 25 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  50 26 42 82 2 55 61 99 2 25 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  50 16 40 74 4 16 35 82 99 28 ...
```

```
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  55 8 24 89 2 34 31 78 1 28 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  61 98 40 97 17 20 20 3 2 10 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  40 10 19 98 30 23 28 78 2 27 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  47 97 26 96 25 55 9 98 96 26 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  32 3 47 99 14 35 40 95 1 33 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  61 93 28 85 2 30 32 88 93 33 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  54 91 24 4 96 35 40 89 8 23 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  42 18 18 1 26 48 22 1 1 19 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  56 99 24 86 7 28 32 91 4 7 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  61 95 46 1 3 18 56 93 99 40 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  57 1 45 7 2 21 31 84 18 33 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  61 4 30 89 16 21 48 95 98 12 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  30 12 24 95 3 20 35 64 12 14 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  42 11 39 1 1 48 18 98 13 31 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  66 68 27 1 11 42 33 66 17 26 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  61 89 42 88 1 43 50 75 1 21 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  48 1 41 70 7 25 40 89 1 26 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  51 3 25 92 3 15 35 90 1 18 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  55 93 35 81 30 31 41 80 21 21 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  51 2 39 1 3 42 28 61 95 30 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  33 2 25 98 18 23 49 70 12 35 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  42 87 45 97 92 48 46 96 4 20 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  49 97 47 2 92 49 28 71 12 17 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  22 94 36 1 3 31 23 95 6 34 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  48 93 25 7 1 36 48 74 4 20 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  61 17 41 77 88 36 22 80 6 31 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  50 26 37 1 84 21 21 89 18 41 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  56 84 36 3 97 6 56 77 9 35 ...
##   [list output truncated]
```

```
means=apply(df[,2:ncol(df)],1,mean)                  #compute vector of row means
sds=apply(df[,2:ncol(df)],1,sd)                      #compute vector of row standard deviatio
levels=as.factor(rep(c(1,2,3),1+length(means)/3))[1:length(means)]   #vector of levels for m
df2=data.frame(levels,means,sds)                     #data frame for means and standard devia
str(df2)
```

```
## 'data.frame': 70000 obs. of  3 variables:
##  $ levels: Factor w/ 3 levels "1","2","3": 1 2 3 1 2 3 1 2 3 1 ...
##  $ means : num  51.2 40.8 34.2 58.6 32.6 ...
##  $ sds   : num  9.11 40.79 8.53 41.85 38.91 ...
```

```
dfs=split(df2,df2$levels)                            #split by level
mean(dfs[[1]]$means)                                 #mean of level 1 growth percentiles
```

```
## [1] 49.22222
```

```
sd(dfs[[1]]$means)                                   #sd of level 1 growth percentiles
```

```
## [1] 21.86498
mean(dfs[[2]]$means)                                    #mean of level 2 growth percentiles
## [1] 51.27779
sd(dfs[[2]]$means)                                      #sd of level 2 growth percentiles
## [1] 17.97484
mean(dfs[[3]]$means)                                    #mean of level 3 growth percentiles
## [1] 45.67391
sd(dfs[[3]]$means)                                      #sd of level 3 growth percentiles
## [1] 21.18534
```