MATH 208 Assignment4

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```r
library(tidyverse)
```

Question 1

(a)

```r
ceramic_data<-dget("ceramic.txt")
ceramic_data
```

```
## , , Wheel_Grit = 140/170, Direction = Longitudinal, Batch = Batch 1
##
##            Down_Feed_Rate
## Table_Speed  Slow    Fast
##       Slow 680.45 702.14
##       Fast 722.48 666.93
##
## , , Wheel_Grit = 80/100, Direction = Longitudinal, Batch = Batch 1
##
##            Down_Feed_Rate
## Table_Speed  Slow    Fast
##       Slow 703.67 692.98
##       Fast 642.14 669.26
##
## , , Wheel_Grit = 140/170, Direction = Transverse, Batch = Batch 1
##
##            Down_Feed_Rate
## Table_Speed  Slow    Fast
##       Slow 491.58 478.76
##       Fast 475.52 568.23
##
## , , Wheel_Grit = 80/100, Direction = Transverse, Batch = Batch 1
##
##            Down_Feed_Rate
## Table_Speed  Slow    Fast
##       Slow 444.72 428.51
##       Fast 410.37 491.47
##
## , , Wheel_Grit = 140/170, Direction = Longitudinal, Batch = Batch 2
##
##            Down_Feed_Rate
## Table_Speed  Slow    Fast
##       Slow 607.34 610.55
##       Fast 620.80 638.04
##
## , , Wheel_Grit = 80/100, Direction = Longitudinal, Batch = Batch 2
##
##            Down_Feed_Rate
```

```
## Table_Speed   Slow   Fast
##         Slow 585.19 601.67
##         Fast 586.17 608.31
##
## , , Wheel_Grit = 140/170, Direction = Transverse, Batch = Batch 2
##
##               Down_Feed_Rate
## Table_Speed   Slow   Fast
##         Slow 442.90 417.66
##         Fast 434.41 510.84
##
## , , Wheel_Grit = 80/100, Direction = Transverse, Batch = Batch 2
##
##               Down_Feed_Rate
## Table_Speed   Slow   Fast
##         Slow 392.11 385.52
##         Fast 343.22 446.73
```

```r
class(ceramic_data)
```

```
## [1] "array"
```

The class of object is ceramic_data is array.

(b)

```r
# Batch -> dim5
b<-apply(ceramic_data,5,median)
b
```

```
## Batch 1 Batch 2
## 605.185 548.015
```

Clearly, the median of all observations in "Batch 1" is greater than that in "Batch 2". The difference is 605.185-548.015=57.17

(c)

```r
sd(ceramic_data)
```

```
## [1] 112.2785
```

(d)

```r
# Table_Speed -> dim1; Direction -> dim4
d<-apply(ceramic_data,c(1,4),mean)
d
```

```
##             Direction
## Table_Speed Longitudinal Transverse
##        Slow     647.9987   435.2200
##        Fast     644.2663   460.0987
```

(e)

```r
apply(d,c("Table_Speed"),diff)
```

```
##      Slow      Fast
## -212.7787 -184.1675
```