Assignment 1 | Exercise 2

2022-06-16

1. Graph let us see the outlier which is very far from the rest. At first I wanted to use IQR method but there was no need for that. It could be done manually and IQR method would take also other observations which are not really outliers.

```
library(ggplot2)

numbers <- read.table("~/Downloads/DataAssignment1.txt", quote="\"", comment.char="")
summary(numbers)
```

```
##        V1
##  Min.   :  -4.369
##  1st Qu.:   1.332
##  Median :   2.022
##  Mean   :  10.763
##  3rd Qu.:   4.078
##  Max.   :4218.714
```

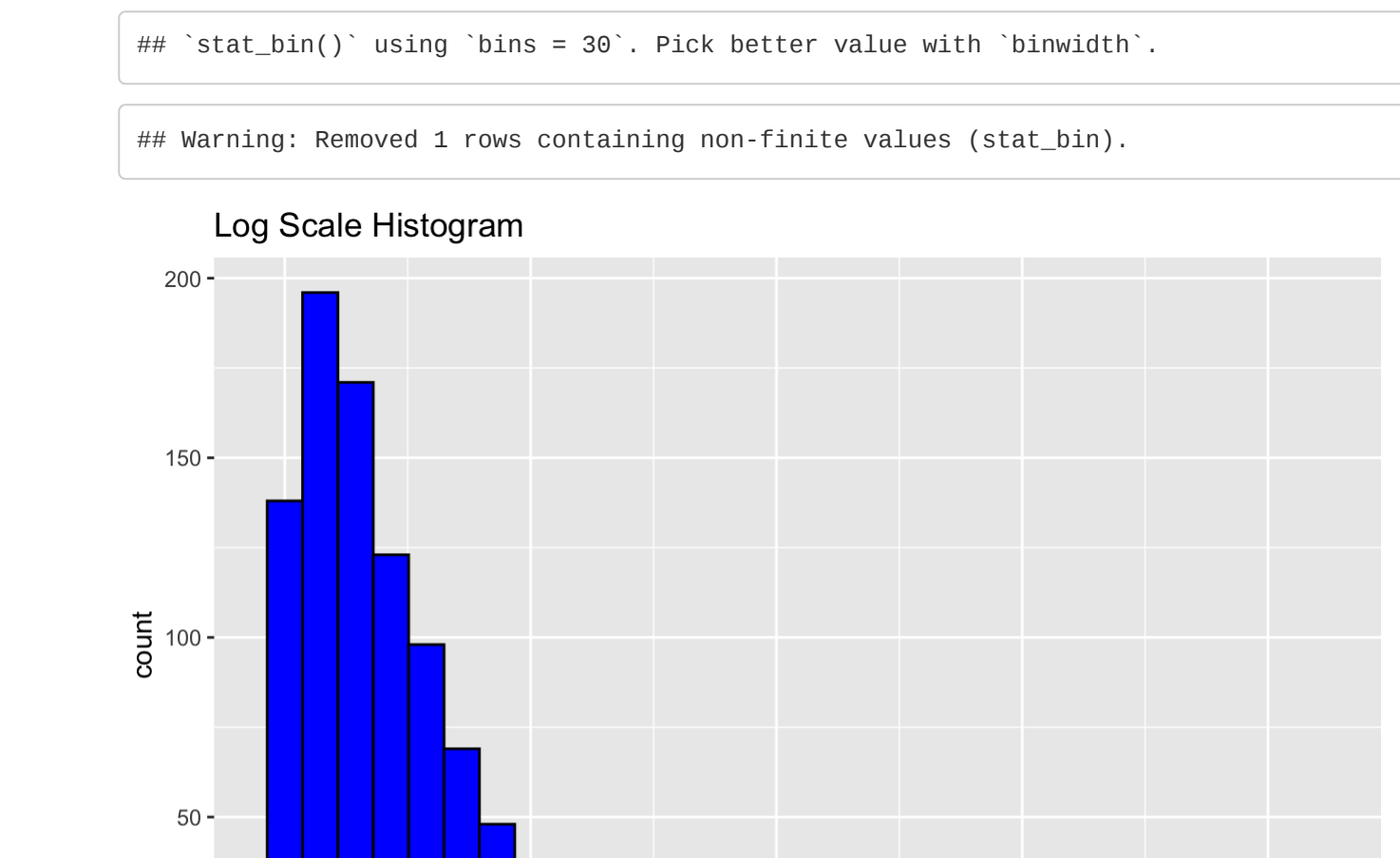
```
data_log <- log(numbers)
```

```
## Warning in FUN(X[[i]], ...): wyprodukowano wartości NaN
```

```
H=ggplot(data = data_log) + aes( x = V1) + geom_histogram(color = "black", fill = "Blue") + ggtitle("Log Scale Histogram")
H
```

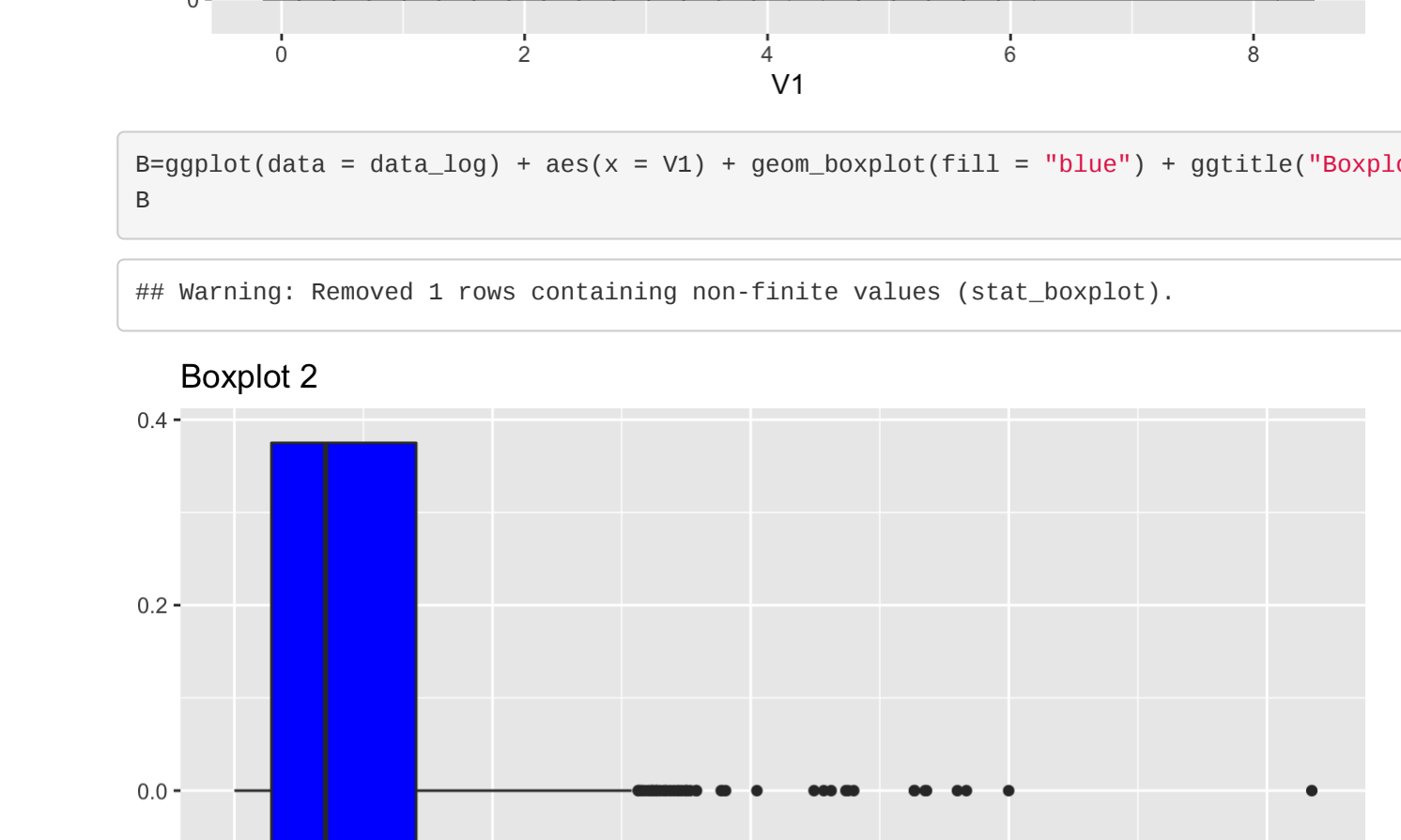
```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```

```
## Warning: Removed 1 rows containing non-finite values (stat_bin).
```




```
B=ggplot(data = data_log) + aes(x = V1) + geom_boxplot(fill = "blue") + ggtitle("Boxplot 2")
B
```

```
## Warning: Removed 1 rows containing non-finite values (stat_boxplot).
```



2. Second exercise I calculated in two ways. First is with taking into consideration two outliers and second with usage of IQR method. After replacing two outliers the exploratory analysis can be done.

```
numbers$V1[805] <- 10.763
numbers$V1[416] <- 10.763
summary(numbers$V1)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   1.000   1.333   2.029   6.570   4.120 402.944
```

Simply changing the rows values to mean ones.

```
summary(data_log$V1)
```

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.     NA's
## 0.000065 0.287482 0.706791 1.009119 1.408321 8.347286        1
```

```
Q1 <- quantile(data_log$V1,.25,na.rm = TRUE)
Q3 <- quantile(data_log$V1,.75,na.rm= TRUE)
IQR <- IQR(data_log$V1, na.rm = TRUE)


no_outliers <- subset(data_log, data_log > (Q1 - 1.5*IQR) & data_log < (Q3 + 1.5*IQR))

dim(no_outliers)
```

```
## [1] 952   1
```

3 It was not really precised, so I applied means after removing outliers from log scaled dataset and the one from raw dataset. After removing the outliers the mean slightly decreased comparing to the log scaled dataset.

Second mean and median is after replacing the outliers.

```
summary(no_outliers)
```

```
##        V1
##  Min.   :0.0000652
##  1st Qu.:0.2765963
##  Median :0.6607687
##  Mean   :0.8628062
##  3rd Qu.:1.2579054
##  Max.   :3.0785722
```

```
summary(numbers$V1)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   1.000   1.333   2.029   6.570   4.120 402.944
```

4. We have to not take into consideration two missing values and then we are ready to work on the data. One is negative and second one is way too big comparing to the other outcomes.

```
rmean1 <- sapply(1:length(numbers$V1), function(i)  mean(head(numbers$V1,i)))
rmean1
```

```
##    [1] 3.894559 3.705747 3.993412 3.377509 2.975658 2.725912 2.490098 3.261450
##    [9] 3.048760 3.905852 3.650305 3.525498 3.344274 3.328995 3.381121 3.294524
##   [17] 3.167172 3.167234 3.100017 3.083106 2.998211 2.911609 3.644397 4.797142
##   [25] 4.656359 4.677260 4.614983 4.738330 4.610429 4.674605 4.735413 4.628584
##   [33] 4.528988 4.437190 4.725827 4.722940 4.709359 4.621828 4.544010 4.497186
##   [41] 4.437027 4.393033 4.341557 4.266398 4.296476 4.236691 4.169805 4.123830
##   [49] 4.083376 4.185273 4.155813 4.525640 4.462086 4.404188 4.342598 4.296488
##   [57] 4.641849 4.596106 4.553858 4.506564 4.449203 4.635682 4.587785 4.536026
##   [65] 4.484719 4.466912 4.420028 4.384691 4.348186 4.455205 4.804634 4.772337
##   [73] 7.366883 7.296051 7.214762 7.136419 7.057416 6.981998 7.133867 7.071546
##   [81] 6.998133 6.925810 6.854613 6.787250 6.739759 6.673368 6.667548 6.608888
##   [89] 6.585163 6.543042 6.532912 6.489483 6.432926 6.391198 6.455477 6.425812
##   [97] 6.416368 6.379788 6.375384 6.326789 6.319447 6.281557 6.230747 6.183231
##  [105] 6.271827 6.222990 6.175624 6.129914 6.088757 6.093668 6.050037 6.005153
##  [113] 5.964312 5.926893 5.982107 5.969693 5.929887 5.952994 5.912553 5.914423
##  [121] 5.875379 5.842774 9.071239 9.016486 8.954372 8.906242 8.845024 8.792511
##  [129] 8.736004 8.678469 9.538320 9.485920 9.424335 9.380183 9.326098 9.269009
##  [137] 9.213941 9.205541 9.154760 9.114061 9.072511 9.145019 9.190299 9.134524
##  [145] 9.279154 9.392093 9.380252 9.333419 9.283234 9.244829 9.194625 9.141058
##  [153] 9.092297 9.052260 9.005314 8.965801 8.917172 8.870870 8.824120 8.787268
##  [161] 8.749252 8.704376 8.663567 8.618866 8.581499 8.536035 8.520731 8.476054
##  [169] 8.434289 8.404128 8.360965 8.346398 8.314989 8.272965 8.262106 8.295483
##  [177] 8.289383 8.249873 8.217968 8.189423 8.153269 8.120368 8.081948 8.044167
##  [185] 8.034215 8.000755 7.991287 7.964466 7.980579 7.947320 7.911016 7.964697
##  [193] 7.949962 7.915638 7.887174 7.880955 8.022782 7.988149 7.954325 7.921019
##  [201] 7.889128 7.857793 7.859094 7.830219 7.800147 7.770225 7.743909 7.714167
##  [209] 7.692471 7.663260 7.631708 7.602938 7.573507 7.543091 7.513585 7.486624
##  [217] 7.456923 7.428907 7.408324 7.385155 7.426129 7.397317 7.417242 7.395418
##  [225] 7.408434 7.396943 7.370580 7.346286 7.331755 7.311279 7.286254 7.259232
##  [233] 7.236456 7.213338 7.190069 7.165732 7.139893 7.115285 7.184040 7.162186
##  [241] 7.139938 7.127153 7.102015 7.081660 7.062036 7.038342 7.044585 7.022560
##  [249] 6.998971 6.975751 6.955282 6.932012 6.909639 6.890319 6.872745 6.853495
##  [257] 6.833988 6.811837 6.799564 6.777551 6.767164 6.751181 6.734558 6.714836
##  [265] 6.707852 6.688555 6.698307 6.677693 6.658462 6.691271 6.680113 6.664678
##  [273] 6.652791 6.704250 6.683610 6.667093 6.661426 6.642539 6.622316 6.603006
##  [281] 6.589961 6.578196 6.672538 6.660123 6.640931 6.670413 6.651968 6.634849
##  [289] 6.617480 6.603745 6.634406 6.615648 6.623383 6.606444 6.588191 6.572401
##  [297] 6.557234 6.539855 6.526532 6.592538 6.602387 6.586068 6.572832 6.555561
##  [305] 6.548093 6.532407 6.518645 6.579146 6.572505 6.554877 6.537554 6.520753
##  [313] 6.504181 6.492174 6.475235 6.461003 6.450928 6.447860 6.433260 6.417310
##  [321] 6.403341 6.387334 6.395685 6.379432 6.364194 6.357784 6.357592 6.341724
##  [329] 6.331002 6.326123 6.318708 6.304859 6.321542 6.305692 6.294420 6.285060
##  [337] 6.271243 6.274407 6.261189 6.250658 6.236269 6.230512 6.215324 6.201386
##  [345] 6.186497 6.171519 6.163650 6.150867 6.195499 6.182883 6.174064 6.168742
##  [353] 6.172495 6.158816 6.161766 6.150754 6.147792 6.134570 6.121325 6.195755
##  [361] 6.189452 6.180327 6.166203 6.153788 6.140102 6.126366 6.116805 6.103117
##  [369] 6.106830 6.099842 6.091285 6.078099 6.065676 6.056177 6.074903 6.064311
##  [377] 6.053107 6.043126 6.029832 6.036782 6.023870 6.014903 6.005236 5.993449
##  [385] 5.983239 6.006684 6.020127 6.008437 5.999691 5.986886 5.974283 5.968195
##  [393] 5.972590 5.970104 5.958287 5.949319 5.969618 6.007148 5.996918 5.986182
##  [401] 5.975836 5.963788 5.953028 5.950233 5.938517 5.926703 5.914659 5.906630
##  [409] 5.897083 5.885177 5.873696 5.862279 5.851026 5.849810 6.303356 6.314077
##  [417] 6.303567 6.290943 6.279828 6.267803 6.255414 6.250651 6.239612 6.245467
##  [425] 6.245528 6.254613 6.246259 6.238036 6.226721 6.215995 6.203893 6.192450
##  [433] 6.185004 6.180868 6.176553 6.166616 6.252853 6.242782 6.232498 6.254451
##  [441] 6.242702 6.232343 6.222353 6.225950 6.214285 6.205644 6.250475 6.240742
##  [449] 6.236208 6.224897 6.215361 6.204644 6.194924 6.185675 6.182942 6.172965
##  [457] 6.203032 6.191721 6.182288 6.171754 6.161233 6.152618 6.144763 6.377546
##  [465] 6.373239 6.365940 6.354978 6.345428 6.335285 6.414242 6.411946 6.400671
##  [473] 6.393291 6.382580 6.375490 6.369168 6.364820 6.358999 6.355536 6.345680
##  [481] 6.352646 6.353222 6.342281 6.333386 6.322640 6.317470 6.307248 6.297030
##  [489] 6.287606 6.277398 6.269254 6.261016 6.252090 6.244879 6.236956 6.233121
##  [497] 6.225827 6.217094 6.210521 6.201426 6.197349 6.190302 6.199382 6.193610
##  [505] 6.187727 6.204921 6.195725 6.188887 6.192721 6.182660 6.179904 6.169792
##  [513] 6.159754 6.151349 6.147849 6.139926 6.133731 6.127595 6.339467 6.885833
##  [521] 6.875101 6.865741 6.855396 6.844254 6.835335 6.824581 6.814053 6.803044
##  [529] 6.792188 6.781416 6.772537 6.764845 6.754605 6.745868 6.751396 6.747998
##  [537] 6.742691 6.732414 6.723266 6.717658 6.718232 6.708006 6.698731 6.873628
##  [545] 6.864131 6.853866 6.843869 6.837216 6.826933 6.816435 6.806647 6.797837
##  [553] 6.793449 6.792522 6.784428 6.775006 6.766746 6.763614 6.757318 6.748630
##  [561] 6.739015 6.736563 6.727301 6.717786 6.719820 6.711400 6.749419 6.740910
##  [569] 6.732078 6.727029 6.761544 6.751831 6.746016 6.736020 6.746996 6.741412
##  [577] 6.741677 6.732168 6.725851 6.716362 6.707671 6.698032 6.688600 6.679376
##  [585] 6.744792 6.735060 6.728192 6.721765 6.712634 6.707919 6.713050 6.705694
##  [593] 6.748290 6.740541 6.732240 6.723314 6.736977 6.734189 6.725426 6.718920
##  [601] 6.711813 6.860458 6.852913 6.843628 6.834107 6.827683 6.818446 6.811583
##  [609] 6.802339 6.801056 6.791867 6.785142 6.776482 6.767312 6.763694 6.758576
##  [617] 6.752386 6.752077 6.750861 6.746722 6.740301 6.732560 6.724264 6.716370
##  [625] 6.712882 6.793692 6.803874 6.796487 6.791205 6.782386 6.782936 6.773801
##  [633] 6.766695 6.757774 6.752463 6.745034 6.739860 6.734114 6.730825 6.724215
##  [641] 6.717945 6.714020 6.706170 6.700166 6.692163 6.685405 6.677312 6.669958
##  [649] 6.661935 6.653281 6.678285 6.670134 6.661794 6.653746 6.645729 6.648374
##  [657] 6.654516 6.648031 6.639690 6.637941 6.631926 6.624471 6.617353 6.626219
##  [665] 6.623206 6.614864 6.610581 6.603829 6.596016 6.588633 6.580672 6.613056
##  [673] 6.616149 6.608181 6.600623 6.592939 6.586009 6.579379 6.572693 6.565899
##  [681] 6.561625 6.553639 6.545912 6.563625 6.556740 6.551597 6.544599 6.537919
##  [689] 6.531122 6.523845 6.516849 6.514271 6.506450 6.498557 6.500387 6.493397
##  [697] 6.490530 6.507592 6.503762 6.499830 6.492550 6.485767 6.478248 6.471003
##  [705] 6.466880 6.459992 6.453776 6.451504 6.445571 6.438022 6.431380 6.423820
##  [713] 6.416372 6.414608 6.407743 6.401176 6.396234 6.395044 6.391000 6.383571
##  [721] 6.380467 6.374418 6.371227 6.365066 6.369176 6.363232 6.356034 6.349662
##  [729] 6.345164 6.339715 6.333283 6.329407 6.327169 6.320115 6.313863 6.308327
##  [737] 6.302193 6.297766 6.293151 6.286697 6.280020 6.274402 6.311908 6.307791
##  [745] 6.301630 6.296515 6.290986 6.283924 6.285347 6.288455 6.282059 6.275511
##  [753] 6.268659 6.272214 6.273552 6.266688 6.265027 6.261101 6.255144 6.250291
##  [761] 6.243561 6.240409 6.233588 6.229707 6.231277 6.224781 6.218330 6.211972
##  [769] 6.209091 6.202378 6.197452 6.191110 6.219049 6.213898 6.208776 6.208522
##  [777] 6.213176 6.211321 6.207907 6.201958 6.195586 6.190147 6.184307 6.184762
##  [785] 6.178191 6.171700 6.165850 6.161352 6.158876 6.152874 6.151688 6.145752
##  [793] 6.139456 6.134249 6.131028 6.128225 6.122186 6.117011 6.112516 6.106824
##  [801] 6.114095 6.107964 6.101919 6.096564 6.102360 6.096545 6.095537 6.091273
##  [809] 6.085337 6.106234 6.114474 6.110323 6.104711 6.108153 6.108854 6.111342
##  [817] 6.115218 6.111529 6.106203 6.100110 6.094481 6.090828 6.086542 6.080568
##  [825] 6.079982 6.073869 6.069976 6.066143 6.061723 6.057601 6.051651 6.046323
##  [833] 6.040300 6.034556 6.028665 6.023040 6.026801 6.022865 6.018210 6.012969
##  [841] 6.007126 6.009767 6.004900 5.999035 6.002538 5.996721 5.990861 5.985130
##  [849] 5.979439 5.989675 5.984047 5.978949 6.013995 6.018971 6.013388 6.008598
##  [857] 6.002767 5.998177 5.993826 5.988238 5.983376 5.979616 5.974820 5.975277
##  [865] 5.975128 5.971417 5.977351 5.971762 5.972043 5.979732 5.979707 5.977217
##  [873] 6.214595 6.209550 6.203763 6.232026 6.226651 6.222670 6.221607 6.221753
##  [881] 6.216741 6.211443 6.206390 6.201262 6.195535 6.190508 6.184732 6.179036
##  [889] 6.175261 6.170091 6.164544 6.162733 6.159948 6.156851 6.153650 6.149131
##  [897] 6.143770 6.162357 6.157670 6.152361 6.146798 6.142880 6.154239 6.148815
##  [905] 6.143720 6.141599 6.136513 6.133527 6.128184 6.122966 6.118386 6.114200
##  [913] 6.110936 6.121365 6.116412 6.121930 6.116590 6.115821 6.110362 6.107592
##  [921] 6.102081 6.097470 6.092330 6.087165 6.086280 6.082708 6.077411 6.072022
##  [929] 6.066687 6.072807 6.067701 6.062985 6.059912 6.054637 6.049838 6.044854
##  [937] 6.040236 6.034879 6.032943 6.029211 6.033225 6.028225 6.023335 6.029925
##  [945] 6.026028 6.305979 6.301661 6.321866 6.316920 6.313349 6.308038 6.303015
##  [953] 6.316129 6.403010 6.397592 6.611573 6.608164 6.606513 6.611163 6.607161
##  [961] 6.605063 6.599336 6.614300 6.608867 6.603097 6.598633 6.617336 6.626880
##  [969] 6.621152 6.615429 6.612094 6.607200 6.601560 6.597198 6.592241 6.586624
##  [977] 6.581024 6.575395 6.569821 6.564397 6.585226 6.579876 6.577543 6.575465
##  [985] 6.570430 6.565359 6.571026 6.577990 6.593679 6.612714 6.610130 6.605032
##  [993] 6.599926 6.595876 6.590285 6.584844 6.580286 6.574861 6.570603 6.570362
```

```
summary(rmean1)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   2.490   6.128   6.355   6.443   6.725   9.538
```

```
rmedian <- sapply(1:length(numbers$V1), function(i)  median(head(numbers$V1,i)))
rmedian
```

```
##    [1] 3.894559 3.705747 3.894559 3.705747 3.516936 2.523367 1.529798 2.523367
##    [9] 1.529798 2.523367 1.529798 1.841213 1.529798 1.841213 2.152627 2.074098
##   [17] 1.995569 2.074098 1.995569 2.074098 1.995569 1.942836 1.995569 2.074098
##   [25] 1.995569 2.074098 2.152627 2.457210 2.152627 2.457210 2.761793 2.457210
##   [33] 2.152627 2.074098 2.152627 2.457210 2.761793 2.457210 2.152627 2.411848
##   [41] 2.152627 2.370963 2.179541 2.166084 2.179541 2.166084 2.152627 2.091635
##   [49] 2.141569 2.147098 2.152627 2.166084 2.152627 2.147098 2.141569 2.086106
##   [57] 2.141569 2.086106 2.103504 2.067074 2.030643 2.067074 2.030643 2.013106
##   [65] 1.995569 2.013106 1.995569 2.006340 1.995569 2.006340 2.017111 2.023877
##   [73] 2.030643 2.067074 2.030643 2.023877 2.017111 2.006340 2.017111 2.023877
##   [81] 2.017111 2.006340 1.995569 1.992159 1.995569 1.992159 1.995569 1.992159
##   [89] 1.995569 2.006340 2.017111 2.023877 2.017111 2.023877 2.030643 2.067074
##   [97] 2.103504 2.114433 2.125362 2.114433 2.125362 2.133465 2.125362 2.114433
##  [105] 2.125362 2.114433 2.103504 2.067074 2.030643 2.067074 2.030643 2.023877
##  [113] 2.017111 2.006340 2.017111 2.023877 2.017111 2.023877 2.017111 2.023877
##  [121] 2.017111 2.006340 2.017111 2.023877 2.017111 2.023877 2.017111 2.023877
##  [129] 2.017111 2.006340 2.017111 2.023877 2.017111 2.023877 2.030643 2.023877
##  [137] 2.017111 2.023877 2.030643 2.054685 2.078727 2.091116 2.103504 2.091116
##  [145] 2.103504 2.113461 2.123419 2.124390 2.123419 2.124390 2.123419 2.113461
##  [153] 2.103504 2.113461 2.103504 2.113461 2.103504 2.091116 2.078727 2.091116
##  [161] 2.103504 2.091116 2.078727 2.065675 2.078727 2.065675 2.078727 2.065675
##  [169] 2.052623 2.065675 2.052623 2.065675 2.078727 2.065675 2.078727 2.091116
##  [177] 2.103504 2.091116 2.103504 2.113461 2.103504 2.113461 2.103504 2.091116
##  [185] 2.103504 2.091116 2.103504 2.113461 2.123419 2.113461 2.103504 2.113461
##  [193] 2.123419 2.113461 2.123419 2.124390 2.125362 2.124390 2.123419 2.113461
##  [201] 2.103504 2.091116 2.103504 2.091116 2.078727 2.065675 2.078727 2.065675
##  [209] 2.078727 2.065675 2.052623 2.041633 2.030643 2.023877 2.017111 2.006340
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##  [337] 1.977918 1.983334 1.977918 1.983334 1.977918 1.983334 1.977918 1.973157
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##  [449] 1.977918 1.973157 1.968397 1.965705 1.963013 1.965705 1.968397 1.965705
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##  [473] 1.968397 1.965705 1.968397 1.973157 1.977918 1.983334 1.988749 1.983334
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##  [529] 1.995855 1.995712 1.995855 1.998865 1.995855 1.998865 2.001874 2.002120
##  [537] 2.002365 2.002120 2.001874 2.002120 2.002365 2.002120 2.001874 2.002120
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##  [985] 2.017111 2.015217 2.017111 2.022293 2.027474 2.029058 2.030643 2.029058
##  [993] 2.027474 2.029058 2.027474 2.022293 2.027474 2.022293 2.027474 2.029058
```
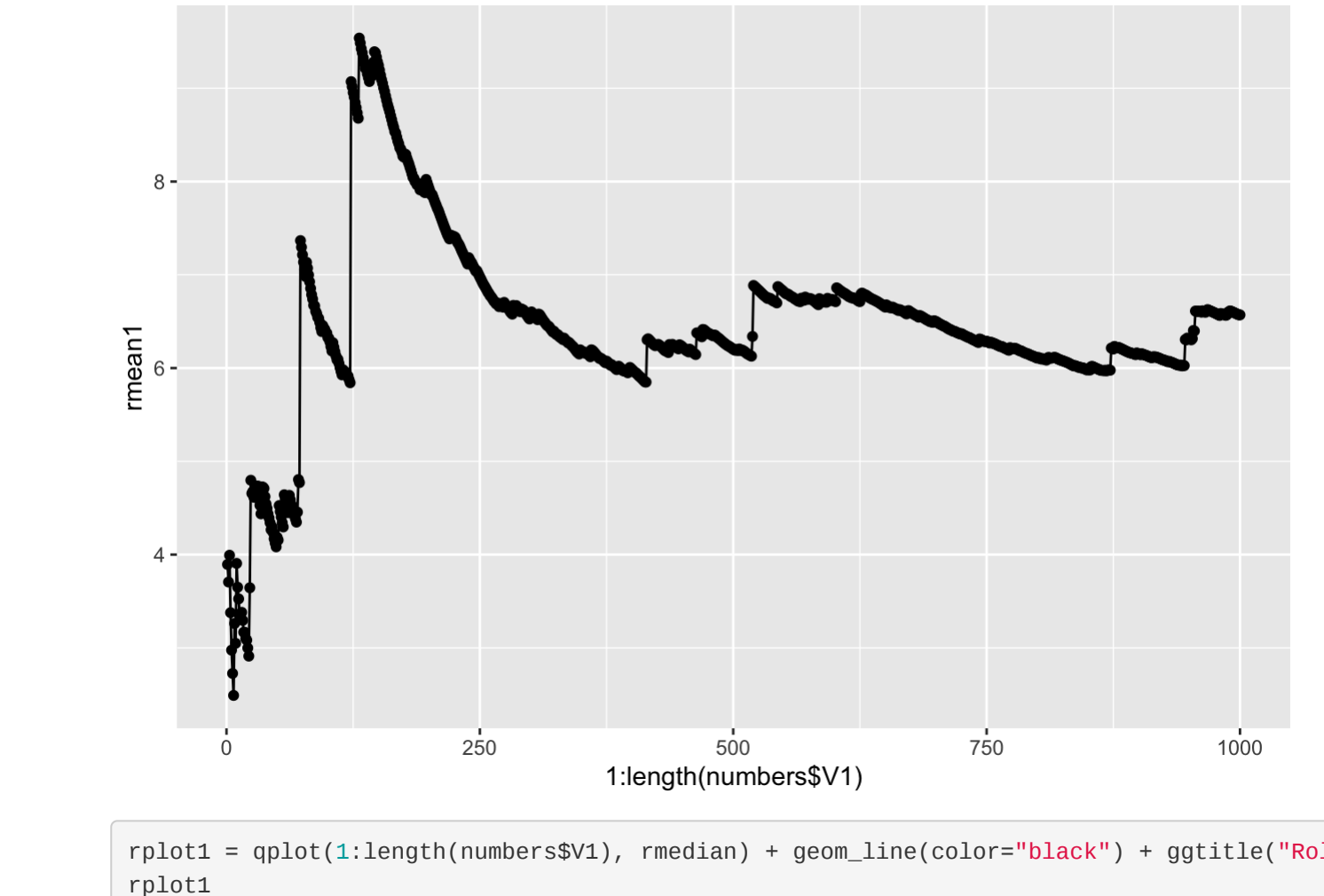

```
summary(rmedian)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   1.530   1.992   2.023   2.035   2.038   3.895
```

After checking both graphs, median is the best measure to use in this example because the graph is way more flat(stable).

```
rplot = qplot(1:length(numbers$V1), rmean1) + geom_line(color="black") + ggtitle("Rolling mean graph")
rplot
```




```
rplot1 = qplot(1:length(numbers$V1), rmedian) + geom_line(color="black") + ggtitle("Rolling median graph")
rplot1
```