

introduction_short.R

lol553

2022-09-02

```
##### the first thing to do to use rstudio is

# create a project and folder to save all your datasets, R files, and outputs

##### input simple data into R #####

# create a vector
x <- 1:10
x <- seq (30,3, by = -2)
a <- c(66.32, 69.87, 70.12, 90.37, 50.08, 61.20, 65.00, 57.65)
d <- a [1]
a [1] <- 85.34

mean (a)

## [1] 68.70375

ma <- mean (a)
# read a vector of numbers from a file
x <- scan("numbers.txt")

# one can also read number withoug saving to a file
y <- scan(text = "7 8 9 10 11 12 13 13 14 17 17 45")

# create a matrix
A <- matrix (0, 4, 2)

A <- matrix (1:8, 4,2)

D <- matrix (a, 4, 2, byrow=T)

?matrix

D <- matrix(1:8, 2, 4)

# create another matrix with all entry 0
B <- matrix (0, 100, 50)
# assign a number to B
B[1,4] <- 4.5
B[1,] <- 1:50

# create a list
```

```

E <- list (newa = a, newA = A)
# list the names of components
names (E)

## [1] "newa" "newA"

# to look at the component of E
E$newA

##      [,1] [,2]
## [1,]    1    5
## [2,]    2    6
## [3,]    3    7
## [4,]    4    8

E$newa <- 10:17

# create a dataframe
scores <- c (30, 45, 50)
names <- c("Peter", "John", "Alice")
stat245_scores <- data.frame (names, scores)
stat245_scores$names

## [1] "Peter" "John"  "Alice"

stat245_scores$scores [2] <- 17
stat245_scores$perc <- stat245_scores$score/50 * 100 + 10

#####
#### import a dataset into R environment
#####

# import myagpop.xls into an R data frame called 'myagpop'
agpop <- read.csv ("data/agpop.csv")

# Now, we can use the data:

# preview agpop
head (agpop)

##      county state acres92 acres87 acres82 farms92 farms87 farms82 largef92
## 1 ALEUTIAN ISLANDS AREA AK  683533 726596 764514      26      27      28      14
## 2 ANCHORAGE AREA AK    47146  59297 256709     217     245     223      9
## 3 FAIRBANKS AREA AK   141338 154913 204568     168     175     170     25
## 4 JUNEAU AREA AK      210    214    127      8      8      12      0
## 5 KENAI PENINSULA AREA AK   50810  85712  98035      93     119     137      9
## 6 AUTAUGA COUNTY AL  107259 116050 145044     322     388     453     25
## largef87 largef82 smallf92 smallf87 smallf82 region
## 1      16      20      6      4      1      W
## 2      10      11     41     52     38      W
## 3      28      21     12     18     25      W
## 4       0       0      5      4      8      W
## 5      18      17     12     18     19      W
## 6      32      32      8     19     17      S

```

```
# look at the variable name
```

```
colnames (agpop)
```

```
## [1] "county" "state" "acres92" "acres87" "acres82" "farms92" "farms87"  
## [8] "farms82" "largef92" "largef87" "largef82" "smallf92" "smallf87" "smallf82"  
## [15] "region"
```

```
# find number of cols
```

```
ncol (agpop)
```

```
## [1] 15
```

```
# find number of rows
```

```
nrow (agpop)
```

```
## [1] 3078
```

```
# access a certain row
```

```
agpop [2, ]
```

```
##           county state acres92 acres87 acres82 farms92 farms87 farms82 largef92 largef87  
## 2 ANCHORAGE AREA   AK   47146   59297  256709      217      245      223          9         10  
## largef82 smallf92 smallf87 smallf82 region  
## 2          11          41          52          38          W
```

```
# access a certain column
```

```
agpop [, "acres92"] ## equivalent to
```

```
## [1] 683533 47146 141338 210 50810 107259 167832 177189 48022 137426  
## [11] 144799 96427 73841 109555 121504 99466 67950 61426 68478 47200  
## [21] 175209 138135 82466 40832 166490 111315 196859 134555 233422 210733  
## [31] 104364 85872 85821 64755 130063 195536 128357 167583 166949 191810  
## [41] 204487 35748 56102 201892 173468 67962 207226 199714 138437 224370  
## [51] 199117 89228 142873 104342 110066 231243 155914 144193 106206 179319  
## [61] 96435 112620 78176 71697 167923 104199 78889 96194 50257 85086  
## [71] 141260 56680 411473 151325 92708 293745 250819 30196 18818 246184  
## [81] 269122 98919 313573 108046 34115 57253 167572 350402 145744 326808  
## [91] 324539 20589 262021 110260 210692 168755 223889 42794 37606 251710  
## [101] 168848 78498 105721 263182 183895 367969 281864 108913 107841 281895  
## [111] 298547 186685 143104 186829 382714 268075 142856 173861 484751 219444  
## [121] 79803 69422 102560 32003 67044 357416 70872 404585 122871 156363  
## [131] 313232 111895 253948 305401 45609 114762 195510 115019 131353 159013  
## [141] 136309 31190 119930 352322 358904 274843 190363 5785707 1891644 5989961  
## [151] 1151284 1846497 137834 246038 729947 1981938 7229585 3472248 1902452 334284  
## [161] 2108834 229365 286288 4768 236222 452347 246077 450236 163036 12594  
## [171] 102028 1774664 473920 597766 532866 247550 2839531 775829 164130 487499  
## [181] 183569 749465 168879 206138 725118 978831 686876 103294 1372778 235290  
## [191] 72471 60740 137723 119514 423602 379044 600073 1287057 517860 7  
## [201] 783715 1324403 57418 836989 342653 52905 388084 55446 647446 340328  
## [211] 517114 759649 318156 1016851 116083 1354262 137530 320597 518907 234781  
## [221] 685813 207448 322823 155465 1257229 796892 157493 84172 914094 7129  
## [231] 304592 330826 423785 156801 260728 -99 167106 231364 213004 1105614  
## [241] 857404 331639 440581 13296 299142 177333 9021 641755 472018 103470  
## [251] 878447 1341738 14411 587339 540412 2286947 1660146 1066453 420233 15539  
## [261] 1159813 834018 447412 751517 633279 119287 388902 459659 32072 1004360  
## [271] 896994 546538 219612 576397 462086 -99 200674 310394 38467 104010  
## [281] 1333577 2086292 1433111 9975 56510 86581 19830 25882 65987 38715
```

| | | | | | | | | | | | |
|----|-------|--------|--------|--------|--------|--------|--------|--------|--------|---------|--------|
| ## | [291] | 55263 | 197375 | 87134 | 304680 | 191140 | 24489 | 9135 | 36230 | 199724 | 23735 |
| ## | [301] | 43314 | 227202 | 70672 | 86026 | 301977 | 96968 | 83681 | 334623 | 31693 | 40039 |
| ## | [311] | 57179 | 52259 | -99 | 57853 | 70987 | 369965 | 14203 | 69405 | 327611 | 529835 |
| ## | [321] | 61019 | 483835 | 265443 | 86706 | 174673 | 244185 | 118352 | 95833 | 199098 | 106721 |
| ## | [331] | 100764 | 190553 | 11738 | 132208 | 299699 | 296242 | 190788 | 32 | 44962 | 56704 |
| ## | [341] | 351885 | 138418 | 716542 | 637934 | 221232 | 4123 | 611336 | 105621 | 48839 | 300622 |
| ## | [351] | 79270 | 151242 | 59642 | 253330 | 161936 | -99 | 48280 | 138208 | 8679 | 96730 |
| ## | [361] | 45214 | 105538 | 77659 | 78739 | 108840 | 32976 | 49397 | 35851 | 85075 | 47071 |
| ## | [371] | 129216 | 17105 | 62983 | 27561 | 168861 | 15948 | 213943 | 166511 | 29213 | 113861 |
| ## | [381] | 17944 | 57074 | 82549 | 29451 | 21697 | 8518 | 5901 | 52651 | 33641 | 11559 |
| ## | [391] | 42678 | 4519 | 13563 | 10192 | 178861 | 198184 | 26984 | 72636 | 41972 | 37973 |
| ## | [401] | 109923 | 25802 | 19060 | 168593 | 3046 | 97215 | 156805 | 71135 | 8151 | 184137 |
| ## | [411] | 16362 | 43775 | 54233 | 123702 | 40608 | 15577 | 22212 | 73659 | 36260 | 74641 |
| ## | [421] | 21975 | 25376 | 28535 | 9681 | 73869 | 137637 | 46748 | 24239 | 36074 | 53944 |
| ## | [431] | 35387 | 31529 | 31037 | 58529 | 24242 | 45624 | 73417 | 135247 | 83074 | 60811 |
| ## | [441] | 72626 | 136082 | 77532 | 71379 | 31394 | 39712 | 40955 | 168051 | 104768 | 15583 |
| ## | [451] | 32657 | 11969 | 73023 | 23284 | 33785 | 8003 | 120839 | 61757 | 45448 | 68729 |
| ## | [461] | 121588 | 205573 | 44599 | 64901 | 93061 | 32950 | 4870 | 45845 | 51836 | 55310 |
| ## | [471] | 18644 | 44470 | 18254 | 80905 | 45450 | 46014 | 80396 | 34746 | 11559 | 12733 |
| ## | [481] | 95876 | 15974 | 12836 | 37923 | 138803 | 108967 | 24086 | 15521 | 49043 | 169989 |
| ## | [491] | 38313 | 19314 | 119873 | 54356 | 71097 | 142824 | 174020 | 114487 | 88811 | 9910 |
| ## | [501] | 32800 | 40783 | 98824 | 31161 | 21973 | 32865 | 88829 | 55779 | 53895 | 47000 |
| ## | [511] | 111801 | 54445 | 53291 | 48755 | 24127 | 38691 | 115516 | 93078 | 31838 | 200061 |
| ## | [521] | 926607 | 91998 | 214452 | 355786 | 328970 | 239800 | 321728 | 238609 | 268506 | 427215 |
| ## | [531] | 299502 | 330080 | 236668 | 333115 | 341923 | 315448 | 345567 | 359755 | 347353 | 338801 |
| ## | [541] | 308497 | 336254 | 274905 | 236409 | 314812 | 456954 | 368114 | 415104 | 312173 | 275319 |
| ## | [551] | 261494 | 336131 | 192467 | 202249 | 343870 | 224811 | 401625 | 287586 | 343367 | 302352 |
| ## | [561] | 366927 | 317205 | 328885 | 332377 | 329151 | 332358 | 399155 | 225835 | 260781 | 280797 |
| ## | [571] | 272831 | 321285 | 346569 | 431185 | 227073 | 284537 | 321950 | 322401 | 615034 | 266083 |
| ## | [581] | 349252 | 191291 | 219370 | 347599 | 305685 | 314887 | 268520 | 312858 | 237862 | 263047 |
| ## | [591] | 392835 | 223638 | 240100 | 219832 | 362109 | 260780 | 318778 | 338730 | 518247 | 359442 |
| ## | [601] | 229818 | 542855 | 340982 | 293266 | 364172 | 233217 | 353570 | 495769 | 331211 | 401858 |
| ## | [611] | 278922 | 236265 | 241422 | 195021 | 302487 | 309508 | 282723 | 408462 | 231977 | 357684 |
| ## | [621] | 442247 | 224632 | 353683 | 232879 | 221209 | 325338 | 269435 | 111510 | 1371605 | 266293 |
| ## | [631] | 80333 | 150021 | 453647 | 72664 | 159358 | 129490 | 391050 | 587693 | 666342 | 286711 |
| ## | [641] | 103246 | 140701 | 353528 | 230086 | 380928 | 197176 | 227114 | 744295 | 311296 | 207552 |
| ## | [651] | 131281 | 347293 | 193908 | 211039 | 132429 | 224369 | 208161 | 477839 | 271143 | 752032 |
| ## | [661] | 148776 | 435069 | 4428 | 134788 | 489993 | 78813 | 556131 | 464834 | 69354 | 182572 |
| ## | [671] | 135163 | 144435 | 482169 | 99675 | 238906 | 209437 | 571807 | 390149 | 259923 | 223764 |
| ## | [681] | 229120 | 263425 | 40917 | 223561 | 176012 | 377512 | 206271 | 259498 | 18206 | 354480 |
| ## | [691] | 116312 | 257761 | 341274 | 300127 | 160533 | 431415 | 171938 | 303715 | 225506 | 201567 |
| ## | [701] | 433246 | 37976 | 203974 | 453944 | 662629 | 186425 | 258014 | 217191 | 180675 | 290454 |
| ## | [711] | 94681 | 203590 | 358920 | 178222 | 385560 | 73142 | 612112 | 169292 | 414442 | 637551 |
| ## | [721] | 369952 | 344649 | 249240 | 709106 | 310518 | 402310 | 299709 | 253916 | 203749 | 282222 |
| ## | [731] | 98838 | 164158 | 312128 | 187039 | 371936 | 311266 | 184599 | 392639 | 261482 | 167602 |
| ## | [741] | 251277 | 443475 | 67998 | 82426 | 78081 | 270598 | 188999 | 175847 | 264140 | 141703 |
| ## | [751] | 446750 | 207388 | 128867 | 402212 | 169622 | 314886 | 336450 | 119370 | 488215 | 115517 |
| ## | [761] | 317467 | 297003 | 333238 | 234973 | 399312 | 325227 | 89591 | 203428 | 295844 | 197724 |
| ## | [771] | 285730 | 165091 | 270618 | 87329 | 223429 | 22555 | 220057 | 227711 | 105658 | 162433 |
| ## | [781] | 236073 | 59734 | 222435 | 86236 | 202429 | 153213 | 169265 | 193381 | 192311 | 111500 |
| ## | [791] | 29837 | 229097 | 148662 | 194312 | 241049 | 196537 | 207766 | 162670 | 163248 | 161745 |
| ## | [801] | 187079 | 190798 | 148609 | 187955 | 202896 | 301962 | 182836 | 130826 | 124694 | 139638 |
| ## | [811] | 305634 | 251603 | 187549 | 144305 | 267695 | 158788 | 223328 | 38783 | 219402 | 71596 |
| ## | [821] | 188843 | 59282 | 282764 | 139523 | 206885 | 184118 | 32318 | 116068 | 113129 | 181653 |

```
## [831] 80078 85366 142482 220959 242777 204165 236436 164025 233183 172348
## [841] 63332 217288 175124 134960 121710 181020 79235 257351 160930 80069
## [851] 80958 119318 144722 197947 201739 96219 189136 189467 198680 285169
## [861] 162244 282862 378517 245099 639327 580199 337300 339138 765688 351941
## [871] 386881 271015 592207 565274 380969 407464 353371 486997 627612 302849
## [881] 526064 514436 201798 222028 403375 324063 547483 442362 745371 671223
## [891] 316317 164081 671506 512728 341608 517623 424104 603755 532890 499112
## [901] 319686 366764 479903 340035 271713 484823 141386 517376 544071 399835
## [911] 346519 419423 206530 482434 273841 603177 485656 537914 588061 572989
## [921] 596103 286989 479310 323769 409839 427403 441417 326716 668420 465527
## [931] 349293 547369 380403 449151 582053 451362 432326 641109 700869 443290
## [941] 432701 228178 578283 427459 463690 403276 484415 510319 328094 227349
## [951] 535359 620144 537457 436242 411785 450829 687593 702549 484093 423064
## [961] 471658 521110 443802 312717 265978 22553 177858 156590 90033 111913
## [971] 248634 132979 5419 80864 206881 27836 108291 99009 42602 266730
## [981] 60911 140810 128807 137337 43447 78966 60812 112831 192189 299321
## [991] 144904 68373 75409 125133 108777 250128 92487 60294 69310 147154
## [ reached getOption("max.print") -- omitted 2078 entries ]
```

```
agpop$acres92
```

```
## [1] 683533 47146 141338 210 50810 107259 167832 177189 48022 137426
## [11] 144799 96427 73841 109555 121504 99466 67950 61426 68478 47200
## [21] 175209 138135 82466 40832 166490 111315 196859 134555 233422 210733
## [31] 104364 85872 85821 64755 130063 195536 128357 167583 166949 191810
## [41] 204487 35748 56102 201892 173468 67962 207226 199714 138437 224370
## [51] 199117 89228 142873 104342 110066 231243 155914 144193 106206 179319
## [61] 96435 112620 78176 71697 167923 104199 78889 96194 50257 85086
## [71] 141260 56680 411473 151325 92708 293745 250819 30196 18818 246184
## [81] 269122 98919 313573 108046 34115 57253 167572 350402 145744 326808
## [91] 324539 20589 262021 110260 210692 168755 223889 42794 37606 251710
## [101] 168848 78498 105721 263182 183895 367969 281864 108913 107841 281895
## [111] 298547 186685 143104 186829 382714 268075 142856 173861 484751 219444
## [121] 79803 69422 102560 32003 67044 357416 70872 404585 122871 156363
## [131] 313232 111895 253948 305401 45609 114762 195510 115019 131353 159013
## [141] 136309 31190 119930 352322 358904 274843 190363 5785707 1891644 5989961
## [151] 1151284 1846497 137834 246038 729947 1981938 7229585 3472248 1902452 334284
## [161] 2108834 229365 286288 4768 236222 452347 246077 450236 163036 12594
## [171] 102028 1774664 473920 597766 532866 247550 2839531 775829 164130 487499
## [181] 183569 749465 168879 206138 725118 978831 686876 103294 1372778 235290
## [191] 72471 60740 137723 119514 423602 379044 600073 1287057 517860 7
## [201] 783715 1324403 57418 836989 342653 52905 388084 55446 647446 340328
## [211] 517114 759649 318156 1016851 116083 1354262 137530 320597 518907 234781
## [221] 685813 207448 322823 155465 1257229 796892 157493 84172 914094 7129
## [231] 304592 330826 423785 156801 260728 -99 167106 231364 213004 1105614
## [241] 857404 331639 440581 13296 299142 177333 9021 641755 472018 103470
## [251] 878447 1341738 14411 587339 540412 2286947 1660146 1066453 420233 15539
## [261] 1159813 834018 447412 751517 633279 119287 388902 459659 32072 1004360
## [271] 896994 546538 219612 576397 462086 -99 200674 310394 38467 104010
## [281] 1333577 2086292 1433111 9975 56510 86581 19830 25882 65987 38715
## [291] 55263 197375 87134 304680 191140 24489 9135 36230 199724 23735
## [301] 43314 227202 70672 86026 301977 96968 83681 334623 31693 40039
## [311] 57179 52259 -99 57853 70987 369965 14203 69405 327611 529835
## [321] 61019 483835 265443 86706 174673 244185 118352 95833 199098 106721
## [331] 100764 190553 11738 132208 299699 296242 190788 32 44962 56704
```

| | | | | | | | | | | | |
|----|-------|--------|--------|--------|--------|--------|--------|--------|--------|---------|--------|
| ## | [341] | 351885 | 138418 | 716542 | 637934 | 221232 | 4123 | 611336 | 105621 | 48839 | 300622 |
| ## | [351] | 79270 | 151242 | 59642 | 253330 | 161936 | -99 | 48280 | 138208 | 8679 | 96730 |
| ## | [361] | 45214 | 105538 | 77659 | 78739 | 108840 | 32976 | 49397 | 35851 | 85075 | 47071 |
| ## | [371] | 129216 | 17105 | 62983 | 27561 | 168861 | 15948 | 213943 | 166511 | 29213 | 113861 |
| ## | [381] | 17944 | 57074 | 82549 | 29451 | 21697 | 8518 | 5901 | 52651 | 33641 | 11559 |
| ## | [391] | 42678 | 4519 | 13563 | 10192 | 178861 | 198184 | 26984 | 72636 | 41972 | 37973 |
| ## | [401] | 109923 | 25802 | 19060 | 168593 | 3046 | 97215 | 156805 | 71135 | 8151 | 184137 |
| ## | [411] | 16362 | 43775 | 54233 | 123702 | 40608 | 15577 | 22212 | 73659 | 36260 | 74641 |
| ## | [421] | 21975 | 25376 | 28535 | 9681 | 73869 | 137637 | 46748 | 24239 | 36074 | 53944 |
| ## | [431] | 35387 | 31529 | 31037 | 58529 | 24242 | 45624 | 73417 | 135247 | 83074 | 60811 |
| ## | [441] | 72626 | 136082 | 77532 | 71379 | 31394 | 39712 | 40955 | 168051 | 104768 | 15583 |
| ## | [451] | 32657 | 11969 | 73023 | 23284 | 33785 | 8003 | 120839 | 61757 | 45448 | 68729 |
| ## | [461] | 121588 | 205573 | 44599 | 64901 | 93061 | 32950 | 4870 | 45845 | 51836 | 55310 |
| ## | [471] | 18644 | 44470 | 18254 | 80905 | 45450 | 46014 | 80396 | 34746 | 11559 | 12733 |
| ## | [481] | 95876 | 15974 | 12836 | 37923 | 138803 | 108967 | 24086 | 15521 | 49043 | 169989 |
| ## | [491] | 38313 | 19314 | 119873 | 54356 | 71097 | 142824 | 174020 | 114487 | 88811 | 9910 |
| ## | [501] | 32800 | 40783 | 98824 | 31161 | 21973 | 32865 | 88829 | 55779 | 53895 | 47000 |
| ## | [511] | 111801 | 54445 | 53291 | 48755 | 24127 | 38691 | 115516 | 93078 | 31838 | 200061 |
| ## | [521] | 926607 | 91998 | 214452 | 355786 | 328970 | 239800 | 321728 | 238609 | 268506 | 427215 |
| ## | [531] | 299502 | 330080 | 236668 | 333115 | 341923 | 315448 | 345567 | 359755 | 347353 | 338801 |
| ## | [541] | 308497 | 336254 | 274905 | 236409 | 314812 | 456954 | 368114 | 415104 | 312173 | 275319 |
| ## | [551] | 261494 | 336131 | 192467 | 202249 | 343870 | 224811 | 401625 | 287586 | 343367 | 302352 |
| ## | [561] | 366927 | 317205 | 328885 | 332377 | 329151 | 332358 | 399155 | 225835 | 260781 | 280797 |
| ## | [571] | 272831 | 321285 | 346569 | 431185 | 227073 | 284537 | 321950 | 322401 | 615034 | 266083 |
| ## | [581] | 349252 | 191291 | 219370 | 347599 | 305685 | 314887 | 268520 | 312858 | 237862 | 263047 |
| ## | [591] | 392835 | 223638 | 240100 | 219832 | 362109 | 260780 | 318778 | 338730 | 518247 | 359442 |
| ## | [601] | 229818 | 542855 | 340982 | 293266 | 364172 | 233217 | 353570 | 495769 | 331211 | 401858 |
| ## | [611] | 278922 | 236265 | 241422 | 195021 | 302487 | 309508 | 282723 | 408462 | 231977 | 357684 |
| ## | [621] | 442247 | 224632 | 353683 | 232879 | 221209 | 325338 | 269435 | 111510 | 1371605 | 266293 |
| ## | [631] | 80333 | 150021 | 453647 | 72664 | 159358 | 129490 | 391050 | 587693 | 666342 | 286711 |
| ## | [641] | 103246 | 140701 | 353528 | 230086 | 380928 | 197176 | 227114 | 744295 | 311296 | 207552 |
| ## | [651] | 131281 | 347293 | 193908 | 211039 | 132429 | 224369 | 208161 | 477839 | 271143 | 752032 |
| ## | [661] | 148776 | 435069 | 4428 | 134788 | 489993 | 78813 | 556131 | 464834 | 69354 | 182572 |
| ## | [671] | 135163 | 144435 | 482169 | 99675 | 238906 | 209437 | 571807 | 390149 | 259923 | 223764 |
| ## | [681] | 229120 | 263425 | 40917 | 223561 | 176012 | 377512 | 206271 | 259498 | 18206 | 354480 |
| ## | [691] | 116312 | 257761 | 341274 | 300127 | 160533 | 431415 | 171938 | 303715 | 225506 | 201567 |
| ## | [701] | 433246 | 37976 | 203974 | 453944 | 662629 | 186425 | 258014 | 217191 | 180675 | 290454 |
| ## | [711] | 94681 | 203590 | 358920 | 178222 | 385560 | 73142 | 612112 | 169292 | 414442 | 637551 |
| ## | [721] | 369952 | 344649 | 249240 | 709106 | 310518 | 402310 | 299709 | 253916 | 203749 | 282222 |
| ## | [731] | 98838 | 164158 | 312128 | 187039 | 371936 | 311266 | 184599 | 392639 | 261482 | 167602 |
| ## | [741] | 251277 | 443475 | 67998 | 82426 | 78081 | 270598 | 188999 | 175847 | 264140 | 141703 |
| ## | [751] | 446750 | 207388 | 128867 | 402212 | 169622 | 314886 | 336450 | 119370 | 488215 | 115517 |
| ## | [761] | 317467 | 297003 | 333238 | 234973 | 399312 | 325227 | 89591 | 203428 | 295844 | 197724 |
| ## | [771] | 285730 | 165091 | 270618 | 87329 | 223429 | 22555 | 220057 | 227711 | 105658 | 162433 |
| ## | [781] | 236073 | 59734 | 222435 | 86236 | 202429 | 153213 | 169265 | 193381 | 192311 | 111500 |
| ## | [791] | 29837 | 229097 | 148662 | 194312 | 241049 | 196537 | 207766 | 162670 | 163248 | 161745 |
| ## | [801] | 187079 | 190798 | 148609 | 187955 | 202896 | 301962 | 182836 | 130826 | 124694 | 139638 |
| ## | [811] | 305634 | 251603 | 187549 | 144305 | 267695 | 158788 | 223328 | 38783 | 219402 | 71596 |
| ## | [821] | 188843 | 59282 | 282764 | 139523 | 206885 | 184118 | 32318 | 116068 | 113129 | 181653 |
| ## | [831] | 80078 | 85366 | 142482 | 220959 | 242777 | 204165 | 236436 | 164025 | 233183 | 172348 |
| ## | [841] | 63332 | 217288 | 175124 | 134960 | 121710 | 181020 | 79235 | 257351 | 160930 | 80069 |
| ## | [851] | 80958 | 119318 | 144722 | 197947 | 201739 | 96219 | 189136 | 189467 | 198680 | 285169 |
| ## | [861] | 162244 | 282862 | 378517 | 245099 | 639327 | 580199 | 337300 | 339138 | 765688 | 351941 |
| ## | [871] | 386881 | 271015 | 592207 | 565274 | 380969 | 407464 | 353371 | 486997 | 627612 | 302849 |

```
## [881] 526064 514436 201798 222028 403375 324063 547483 442362 745371 671223
## [891] 316317 164081 671506 512728 341608 517623 424104 603755 532890 499112
## [901] 319686 366764 479903 340035 271713 484823 141386 517376 544071 399835
## [911] 346519 419423 206530 482434 273841 603177 485656 537914 588061 572989
## [921] 596103 286989 479310 323769 409839 427403 441417 326716 668420 465527
## [931] 349293 547369 380403 449151 582053 451362 432326 641109 700869 443290
## [941] 432701 228178 578283 427459 463690 403276 484415 510319 328094 227349
## [951] 535359 620144 537457 436242 411785 450829 687593 702549 484093 423064
## [961] 471658 521110 443802 312717 265978 22553 177858 156590 90033 111913
## [971] 248634 132979 5419 80864 206881 27836 108291 99009 42602 266730
## [981] 60911 140810 128807 137337 43447 78966 60812 112831 192189 299321
## [991] 144904 68373 75409 125133 108777 250128 92487 60294 69310 147154
## [ reached getOption("max.print") -- omitted 2078 entries ]
```

```
agpop$largef92
```

```
## [1] 14 9 25 0 9 25 24 40 6 9 29 18 4 22 24 8 9 13 4 5
## [21] 29 37 15 3 22 21 5 30 71 13 15 15 6 4 12 34 41 38 50 38
## [41] 33 3 4 37 27 10 49 56 30 59 48 7 7 19 18 61 14 29 18 45
## [61] 10 25 6 8 41 18 9 20 6 13 34 0 164 53 12 21 31 1 0 33
## [81] 91 15 96 7 2 6 22 94 25 123 104 0 96 36 23 27 29 1 3 62
## [101] 30 7 13 52 15 124 105 9 31 74 98 53 26 21 116 27 22 47 186 87
## [121] 4 6 5 2 6 108 6 136 7 20 112 30 53 107 2 11 32 14 11 21
## [141] 15 1 11 29 50 92 26 101 241 75 21 64 8 31 127 76 92 88 140 42
## [161] 106 63 39 2 32 72 56 98 37 3 13 351 104 114 151 17 346 97 35 85
## [181] 26 139 67 48 118 180 129 16 223 48 14 8 34 26 83 90 108 33 65 0
## [201] 165 252 14 156 52 10 81 16 124 81 110 139 70 124 11 244 32 60 116 34
## [221] 150 47 73 33 305 90 34 18 220 3 66 21 71 40 60 1 50 54 29 237
## [241] 170 67 81 4 56 48 2 107 76 26 180 394 4 67 91 214 294 314 73 5
## [261] 134 70 76 164 78 28 55 166 11 187 131 87 51 127 87 1 30 90 7 19
## [281] 402 411 421 0 3 8 1 1 1 6 6 41 25 65 43 3 2 4 31 5
## [301] 13 22 11 12 50 12 13 55 3 8 5 14 0 7 10 31 2 13 59 57
## [321] 11 79 45 8 24 50 22 10 43 26 11 35 1 20 62 46 46 0 7 5
## [341] 75 30 59 67 46 1 110 17 13 46 11 23 10 33 17 12 5 22 1 10
## [361] 4 13 12 8 28 6 1 2 10 10 23 1 15 0 35 3 61 57 4 39
## [381] 5 5 4 1 2 4 0 4 1 1 14 0 1 0 26 47 5 16 2 7
## [401] 41 3 2 47 0 17 51 17 0 56 4 10 5 31 9 0 0 9 5 2
## [421] 3 1 6 1 6 31 6 1 1 1 9 1 4 4 2 4 17 35 8 10
## [441] 9 25 26 11 1 5 9 35 30 3 5 2 9 1 4 2 39 1 9 13
## [461] 36 64 5 13 16 5 1 9 8 9 1 11 0 15 7 3 21 5 4 2
## [481] 36 2 2 10 41 27 2 0 11 44 6 2 20 12 13 50 40 28 17 0
## [501] 5 3 29 9 0 4 7 5 10 7 26 11 18 6 1 1 31 17 5 63
## [521] 55 10 13 26 56 38 46 28 45 56 49 69 25 50 38 32 58 39 70 40
## [541] 53 41 36 42 58 35 34 61 67 49 52 25 33 30 13 31 48 49 51 91
## [561] 78 55 60 58 44 56 88 31 40 44 48 43 28 82 38 27 34 55 82 42
## [581] 44 30 35 32 47 32 34 55 58 36 104 31 40 31 38 44 46 48 72 52
## [601] 48 99 56 67 56 31 41 38 56 52 50 31 35 26 54 32 49 76 38 16
## [621] 85 44 73 35 41 79 65 39 162 54 14 18 115 20 44 43 51 120 164 35
## [641] 24 36 58 57 79 38 41 176 82 43 29 115 52 79 26 69 37 102 77 91
## [661] 19 133 0 44 76 18 100 85 20 28 17 40 95 15 48 64 110 117 74 45
## [681] 20 74 10 66 29 73 45 74 7 104 30 23 67 85 40 88 52 71 51 51
## [701] 98 4 48 76 141 36 41 40 40 43 15 46 82 42 93 19 97 59 82 119
## [721] 88 89 46 176 94 80 54 45 41 77 23 54 72 45 64 70 54 73 53 28
## [741] 67 116 8 23 12 50 44 31 55 31 132 64 37 73 44 42 70 21 132 36
## [761] 64 57 84 81 77 75 13 46 44 25 46 33 74 23 58 1 61 50 12 34
```

```
## [781] 57 3 43 2 38 31 38 24 20 11 0 57 8 47 67 49 29 33 49 12
## [801] 38 39 21 39 29 78 36 12 14 26 86 47 28 36 66 23 58 5 46 7
## [821] 33 3 77 36 65 21 2 13 14 56 1 12 32 78 69 45 39 18 43 32
## [841] 10 54 34 39 19 52 4 70 47 8 15 32 40 37 61 21 21 32 36 84
## [861] 33 81 107 55 168 188 75 102 201 80 101 78 189 124 143 150 114 124 158 73
## [881] 188 158 51 48 129 92 162 163 235 235 71 61 227 179 123 181 115 132 163 166
## [901] 79 120 177 74 53 182 29 140 181 129 94 137 35 165 60 174 134 130 150 151
## [921] 177 59 191 74 119 112 77 75 238 154 84 208 124 165 197 129 157 236 232 140
## [941] 140 59 181 153 169 125 163 133 112 46 216 211 203 167 148 155 251 236 185 113
## [961] 142 184 161 96 82 4 7 8 6 28 9 11 0 3 31 3 14 3 2 21
## [981] 4 18 21 32 0 17 6 3 18 67 22 3 5 17 7 57 2 0 2 27
## [ reached getOption("max.print") -- omitted 2078 entries ]
```

```
# find mean of acres92
```

```
mean (agpop $acres92)
```

```
## [1] 306677
```

```
# find sd of acres92
```

```
sd (agpop $acres92)
```

```
## [1] 424686.7
```

```
agpop_AK <- agpop [agpop$state == "AK", ]
```

```
agpop_AK <- subset (agpop, state == "AK")
```

```
agpop_W <- subset (agpop, region == "W")
```

```
agpop_largefarm <- subset (agpop, largef92 > 10)
```

```
## simple analysis
```

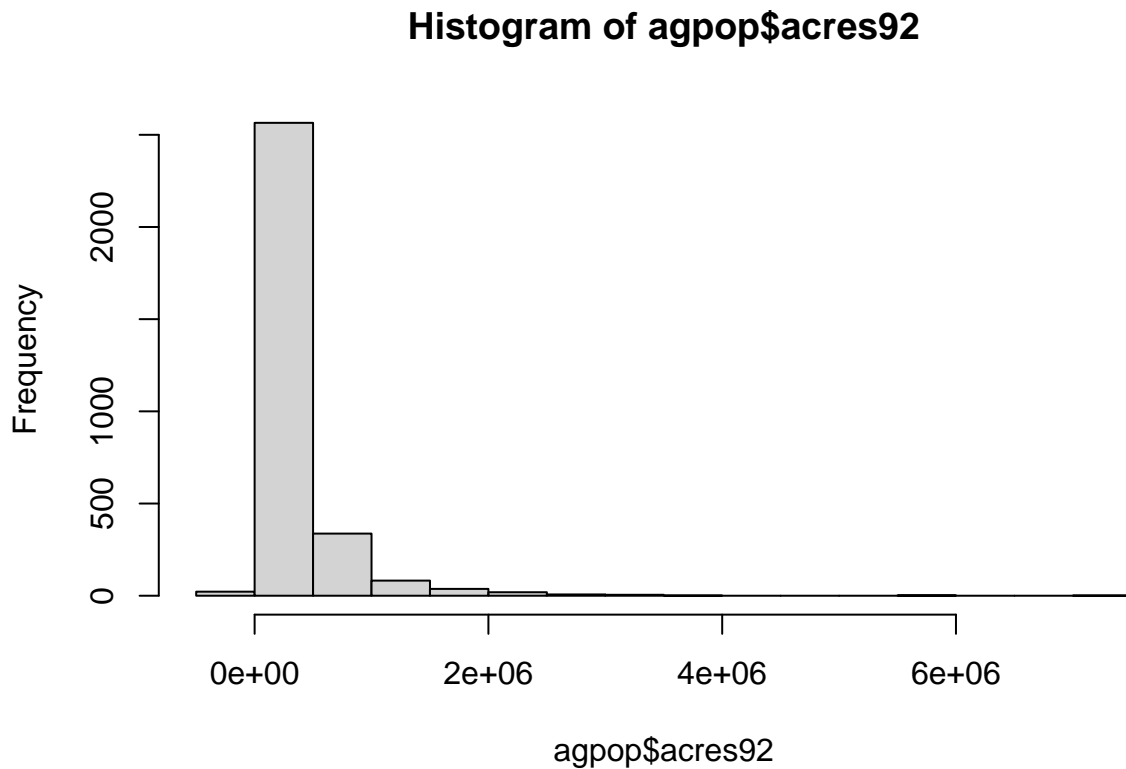
```
summary (agpop)
```

```
##      county      state      acres92      acres87
## Length:3078    Length:3078    Min.   :   -99    Min.   :   -99
## Class :character Class :character 1st Qu.: 80903    1st Qu.: 86236
## Mode  :character Mode  :character Median : 191648    Median : 199864
##                                     Mean  : 306677    Mean   : 313016
##                                     3rd Qu.: 366886    3rd Qu.: 372224
##                                     Max.   :7229585    Max.   :7687460
##      acres82      farms92      farms87      farms82      largef92
## Min.   :   -99    Min.   :   0.0    Min.   :   0.0    Min.   :   0.0    Min.   :   0.00
## 1st Qu.: 96397    1st Qu.: 295.0    1st Qu.: 318.5    1st Qu.: 345.0    1st Qu.: 8.00
## Median : 207292    Median : 521.0    Median : 572.0    Median : 616.0    Median : 30.00
## Mean   : 320194    Mean   : 625.5    Mean   : 678.3    Mean   : 728.1    Mean   : 56.18
## 3rd Qu.: 377065    3rd Qu.: 838.0    3rd Qu.: 921.0    3rd Qu.: 991.0    3rd Qu.: 75.00
## Max.   :7313958    Max.   :7021.0    Max.   :7590.0    Max.   :7394.0    Max.   :579.00
##      largef87      largef82      smallf92      smallf87      smallf82
## Min.   :   0.00    Min.   :   0.00    Min.   :   0.00    Min.   :   0.00    Min.   :   0.00
## 1st Qu.: 8.00     1st Qu.: 8.00     1st Qu.: 13.00    1st Qu.: 17.00    1st Qu.: 16.00
## Median : 27.00     Median : 25.00     Median : 29.00     Median : 35.00     Median : 34.00
## Mean   : 54.86     Mean   : 52.62     Mean   : 54.09     Mean   : 59.54     Mean   : 60.97
## 3rd Qu.: 70.00     3rd Qu.: 65.00     3rd Qu.: 59.00     3rd Qu.: 67.00     3rd Qu.: 67.00
## Max.   :596.00     Max.   :546.00     Max.   :4298.00    Max.   :3654.00    Max.   :3522.00
##      region
```



```
## Length:3078
## Class :character
## Mode :character
##
##
##
```

```
hist (agpop$acres92)
```



```
# to save plot in a file
```

```
pdf ("hist_acres92.pdf")
hist (agpop$acres92)
dev.off()
```

```
## pdf
```

```
## 2
```

```
jpeg ("agpop_acres_87v92.jpg")
```

```
plot (agpop$acres87, agpop$acres92)
abline (a = 0, b = 1)
```

```
dev.off()
```

```
## pdf
```

```
## 2
```

```
## create your own function
```

```
## data is a matrix or data.frame
```

```
means_col <- function (data)
```

```
{
  n <- ncol (data)
  cmeans <- rep (NA, n)
  for (j in 1:n)
  {
    cmeans[j] <- mean (data[,j])
  }
  cmeans
}
```

apply function
means_col (agpop[, 3:13])

```
## [1] 306676.97141 313016.37817 320193.69298 625.50357 678.28428 728.06238
## [7] 56.17674 54.86160 52.62248 54.09227 59.53769
```

R built-in function
colMeans (agpop[, 3:13])

```
##      acres92      acres87      acres82      farms92      farms87      farms82
## 306676.97141 313016.37817 320193.69298 625.50357 678.28428 728.06238
##      largef92      largef87      largef82      smallf92      smallf87
##      56.17674      54.86160      52.62248      54.09227      59.53769
```