hw_03

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#1

```
set.seed(12) # to be reproducible
A = matrix(data = runif(n = 1:500), nrow = 50, ncol = 10)
colnames(A) = paste("lake", 1:10, sep = "_")

print(A)
```

```
##            lake_1    lake_2     lake_3     lake_4      lake_5     lake_6
##  [1,] 0.069360916 0.3945864 0.48297635 0.26309321 0.972992665 0.91974374
##  [2,] 0.817775199 0.3615131 0.84105533 0.79018964 0.217297403 0.15107525
##  [3,] 0.942621732 0.4210900 0.45514586 0.10185476 0.520508701 0.41318862
##  [4,] 0.269381876 0.3220115 0.86051731 0.08347121 0.827942824 0.17151413
##  [5,] 0.169348123 0.5521608 0.67610239 0.35050761 0.964111008 0.98351675
##  [6,] 0.033895622 0.9712655 0.72758309 0.69962838 0.631880122 0.90079074
##  [7,] 0.178785004 0.5579603 0.97832567 0.69733668 0.290659957 0.03336635
##  [8,] 0.641665366 0.5741449 0.19526768 0.06649924 0.050608752 0.99184787
##  [9,] 0.022877743 0.6413482 0.14665454 0.42937384 0.542628871 0.45600259
## [10,] 0.008324827 0.8239490 0.49812086 0.25003389 0.271975612 0.11192512
## [11,] 0.392697197 0.7498384 0.76872430 0.50169870 0.784980250 0.77807567
## [12,] 0.813880559 0.4346638 0.29007712 0.52981234 0.002853188 0.26152960
## [13,] 0.376248455 0.9808689 0.70514273 0.10132115 0.403516542 0.62684344
## [14,] 0.380812184 0.5558601 0.08334285 0.36711480 0.676390951 0.25991219
## [15,] 0.264918378 0.2942439 0.09437721 0.41991523 0.649577464 0.23105438
## [16,] 0.439334316 0.1595905 0.58617373 0.51471371 0.696269108 0.01448705
## [17,] 0.457607151 0.1421989 0.40127870 0.87788236 0.121154380 0.87404390
## [18,] 0.540707547 0.7520267 0.65096990 0.95301753 0.373090272 0.89443692
## [19,] 0.665679830 0.3547764 0.62331717 0.49067381 0.935527131 0.39041505
## [20,] 0.112698938 0.7639337 0.92483319 0.64740823 0.150234036 0.81593480
## [21,] 0.218367168 0.3137880 0.65782952 0.81518236 0.529089452 0.85470800
## [22,] 0.787836347 0.7147715 0.88407710 0.25974153 0.154715297 0.10749934
## [23,] 0.097853040 0.6082590 0.83999093 0.42986241 0.298862455 0.64338234
## [24,] 0.709830466 0.3836863 0.94216319 0.75783015 0.555308523 0.58579192
## [25,] 0.217823043 0.3157870 0.80393706 0.86729800 0.299956516 0.80164583
## [26,] 0.267943593 0.9533205 0.65829466 0.13762486 0.163138653 0.66150816
## [27,] 0.504767952 0.7875953 0.57813667 0.29394754 0.772438262 0.10332685
## [28,] 0.188586927 0.7017786 0.65519038 0.41227176 0.659717223 0.57905673
## [29,] 0.439429325 0.1575806 0.79795107 0.16767383 0.118520744 0.70133246
## [30,] 0.669819296 0.8155650 0.56903306 0.71708097 0.586387870 0.19689906
## [31,] 0.240883231 0.5418058 0.80144395 0.64670822 0.087755227 0.86201274
## [32,] 0.893264896 0.8777970 0.21448570 0.29685893 0.177032295 0.18491090
```

```
## [33,] 0.882756387 0.1238420 0.97465562 0.16239217 0.415942150 0.24212657
## [34,] 0.814063255 0.2427686 0.17368538 0.28150910 0.346883422 0.42426296
## [35,] 0.633264608 0.7184134 0.01580690 0.81528976 0.464349629 0.92234542
## [36,] 0.941087545 0.2621347 0.88949841 0.51025564 0.315424124 0.23778947
## [37,] 0.693911424 0.0552862 0.83425580 0.55142504 0.601423161 0.92492781
## [38,] 0.843702239 0.8778423 0.64058502 0.25858069 0.482563291 0.17299551
## [39,] 0.384644460 0.3788496 0.87390817 0.84936248 0.885760628 0.09760643
## [40,] 0.391129946 0.1017813 0.59467854 0.36246745 0.803995445 0.79734125
## [41,] 0.588481830 0.6734522 0.29965236 0.36606660 0.430920520 0.18484348
## [42,] 0.530477510 0.1543972 0.84011628 0.81896148 0.083449374 0.76337069
## [43,] 0.977635891 0.1642714 0.59883009 0.67446681 0.754971068 0.02973003
## [44,] 0.197649595 0.3664409 0.71031208 0.04843978 0.344942840 0.80501907
## [45,] 0.844225987 0.5753446 0.33381367 0.24360977 0.660337567 0.51096869
## [46,] 0.095027919 0.4951412 0.58215147 0.21918676 0.747920496 0.26512489
## [47,] 0.381151003 0.7677489 0.42758748 0.40554752 0.076289787 0.18209325
## [48,] 0.045884121 0.3717329 0.86829426 0.99876388 0.962292008 0.73767262
## [49,] 0.152623839 0.3111479 0.45885828 0.15689557 0.096857203 0.04972132
## [50,] 0.774718187 0.3437159 0.42597642 0.24158364 0.636447901 0.91636372
##          lake_7     lake_8      lake_9    lake_10
##  [1,] 0.59961088 0.78766411 0.001411161 0.34609925
##  [2,] 0.83063844 0.24475149 0.276647039 0.10532999
##  [3,] 0.73966542 0.21191214 0.479843133 0.34836140
##  [4,] 0.56440358 0.14961886 0.510342157 0.27566743
##  [5,] 0.36431966 0.59081045 0.903116010 0.64935267
##  [6,] 0.99021938 0.09066136 0.155371382 0.35064309
##  [7,] 0.30318455 0.95482439 0.088283494 0.95183080
##  [8,] 0.70650333 0.29176287 0.045262166 0.12537339
##  [9,] 0.65474716 0.22110372 0.171107218 0.12963056
## [10,] 0.78190770 0.36107904 0.449553979 0.69628122
## [11,] 0.82984609 0.06139686 0.954111899 0.44785804
## [12,] 0.63123977 0.40056140 0.955441925 0.41378208
## [13,] 0.60263713 0.09331723 0.596499033 0.33838821
## [14,] 0.02205591 0.29366746 0.704113190 0.25445047
## [15,] 0.02017566 0.24957699 0.082556393 0.74291594
## [16,] 0.21816264 0.53177575 0.695794061 0.40816075
## [17,] 0.61331542 0.35680749 0.812492639 0.04969535
## [18,] 0.64781480 0.01564539 0.564982841 0.78531057
## [19,] 0.64130359 0.30367068 0.511237722 0.24935089
## [20,] 0.93679924 0.61870822 0.536619272 0.12612705
## [21,] 0.04582658 0.16871541 0.609911157 0.09586675
## [22,] 0.45598128 0.09835010 0.666361634 0.47829921
## [23,] 0.89383238 0.45158269 0.469881424 0.34259918
## [24,] 0.05882060 0.97058429 0.789966852 0.84241955
## [25,] 0.03834751 0.74727437 0.548962459 0.91294204
## [26,] 0.31032616 0.26275114 0.845207684 0.45001725
## [27,] 0.58816837 0.89227536 0.151174217 0.25422623
## [28,] 0.76281430 0.80934363 0.908673808 0.93164177
## [29,] 0.28756225 0.88178174 0.535738481 0.18020560
## [30,] 0.28410039 0.74909058 0.949577743 0.71168321
## [31,] 0.30568124 0.93298033 0.906912372 0.55102760
## [32,] 0.83222851 0.10323138 0.199960540 0.40149313
## [33,] 0.17390822 0.38625076 0.379165186 0.41082006
## [34,] 0.68619331 0.49631852 0.672023717 0.46051019
## [35,] 0.94904351 0.97280310 0.930373177 0.74860210
```

```
## [36,] 0.11791112 0.79939187 0.663942100 0.37740178
## [37,] 0.25693717 0.69794961 0.319343241 0.70464161
## [38,] 0.82173960 0.21477230 0.096991079 0.50235767
## [39,] 0.79932528 0.68317329 0.193287922 0.47796291
## [40,] 0.61471509 0.52695210 0.722659972 0.01933873
## [41,] 0.27040278 0.61890408 0.841170830 0.69220222
## [42,] 0.36487730 0.19690843 0.379501251 0.70941460
## [43,] 0.35505179 0.79424314 0.137445597 0.26100388
## [44,] 0.09349608 0.18442963 0.126876531 0.35426429
## [45,] 0.30319477 0.65268487 0.803344557 0.96429531
## [46,] 0.30152004 0.34420359 0.012899390 0.60842649
## [47,] 0.36626252 0.07486993 0.265304568 0.84103436
## [48,] 0.88374681 0.24432591 0.944616717 0.49235703
## [49,] 0.75298677 0.19245160 0.663007361 0.80995429
## [50,] 0.87912951 0.91176997 0.738048498 0.90044481
```

```
#using for loop to find mean value for each column

for(i in 1:ncol(A)){
  print(mean(A[, i]))
}
```

```
## [1] 0.4601492
## [1] 0.4992815
## [1] 0.5987037
## [1] 0.4580486
## [1] 0.4719578
## [1] 0.4965216
## [1] 0.5110536
## [1] 0.4577936
## [1] 0.5193423
## [1] 0.4856413
```

```
#using a vectorized function

colMeans(A)
```

```
##    lake_1    lake_2    lake_3    lake_4    lake_5    lake_6    lake_7    lake_8
## 0.4601492 0.4992815 0.5987037 0.4580486 0.4719578 0.4965216 0.5110536 0.4577936
##    lake_9   lake_10
## 0.5193423 0.4856413
```

#2

```
x = array(1:27, dim = c(3, 3, 3))
apply(X = x, MARGIN = c(1, 2),
      FUN = paste, collapse = ", ")
```

```
##      [,1]        [,2]        [,3]
## [1,] "1, 10, 19" "4, 13, 22" "7, 16, 25"
## [2,] "2, 11, 20" "5, 14, 23" "8, 17, 26"
## [3,] "3, 12, 21" "6, 15, 24" "9, 18, 27"
```

```r
# with for loop

y = matrix(0, nrow = 3, ncol = 3)
y
```

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

```r
for(i in 1:nrow(x)){
  for(j in 1:ncol(x)){
    y[i,j] <-paste(x[i, j, ], collapse = ", ")
  }
}
y
```

```
##      [,1]         [,2]         [,3]
## [1,] "1, 10, 19" "4, 13, 22" "7, 16, 25"
## [2,] "2, 11, 20" "5, 14, 23" "8, 17, 26"
## [3,] "3, 12, 21" "6, 15, 24" "9, 18, 27"
```

#3 Fibonacci Sequence using for loop

```r
Fibonacci <- numeric(30)
Fibonacci[1] <- Fibonacci[0] <- 1
for (i in 3:30) Fibonacci[i] <- Fibonacci[i - 2] + Fibonacci[i - 1]
print("First 30 Fibonacci numbers:")
```

```
## [1] "First 30 Fibonacci numbers:"
```

```r
print(Fibonacci)
```

```
##  [1]      1      0      1      1      2      3      5      8     13     21
## [11]     34     55     89    144    233    377    610    987   1597   2584
## [21]   4181   6765  10946  17711  28657  46368  75025 121393 196418 317811
```

#4

```r
top105 = readLines("http://www.textfiles.com/music/ktop100.txt")
top105 = top105[-c(64, 65)] # missing No. 54 and 55
top105
```

```
##   [1] "From: ed@wente.llnl.gov (Ed Suranyi)"
##   [2] "Date: 12 Jan 92 21:23:55 GMT"
##   [3] "Newsgroups: rec.music.misc"
##   [4] "Subject: KITS' year end countdown"
##   [5] ""
##   [6] ""
##   [7] "On Jan. 1, 1992, the \"Modern Rock\" station KITS San Francisco (\"Live-105\")"
```

```
##   [8] "broadcast its list of the \"Top 105.3 of 1991.\"  Here is the countdown"
##   [9] "list:"
##  [10] ""
##  [11] "1. NIRVANA                      SMELLS LIKE TEEN SPIRIT"
##  [12] "2. EMF                          UNBELIEVABLE"
##  [13] "3. R.E.M.                       LOSING MY RELIGION"
##  [14] "4. SIOUXSIE & THE BANSHEES      KISS THEM FOR ME"
##  [15] "5. B.A.D. II                    RUSH"
##  [16] "6. RED HOT CHILI PEPPERS        GIVE IT AWAY"
##  [17] "7. ELECTRONIC                   GET THE MESSAGE"
##  [18] "8. ERASURE                      CHORUS"
##  [19] "9. SCHOOL OF FISH               3 STRANGE DAYS"
##  [20] "10. NORTHSIDE                   TAKE FIVE"
##  [21] "11. JESUS JONES                 INTERNATIONAL BRIGHT YOUNG THING"
##  [22] "12. DIVINYLS                    I TOUCH MYSELF"
##  [23] "13. SIMPLE MINDS                SEE THE LIGHTS"
##  [24] "14. OMD                         PANDORA'S BOX"
##  [25] "15. JAMES                       SIT DOWN"
##  [26] "16. U2                          MYSTERIOUS WAYS"
##  [27] "17. PSYCHEDELIC FURS            UNTIL SHE COMES"
##  [28] "18. MOTORCYCLE BOY              HERE SHE COMES"
##  [29] "19. MATERIAL ISSUE              VALERIE LOVES ME"
##  [30] "20. R.E.M.                      SHINY HAPPY PEOPLE"
##  [31] "21. B.A.D. II                   THE GLOBE"
##  [32] "22. NED'S ATOMIC DUSTBIN        HAPPY"
##  [33] "23. SEVEN RED SEVEN             THINKING OF YOU"
##  [34] "24. BILLY BRAGG                 SEXUALITY"
##  [35] "25. ALISON MOYET                IT WON'T BE LONG"
##  [36] "26. PRIMUS                      JERRY WAS A RACE CAR DRIVER"
##  [37] "27. VOICE OF THE BEEHIVE        MONSTERS & ANGELS"
##  [38] "28. BLUR                        THERE'S NO OTHER WAY"
##  [39] "29. HAVANA 3 A.M.               REACH THE ROCK"
##  [40] "30. THE FIXX                    HOW MUCH IS ENOUGH"
##  [41] "31. TOP                         NUMBER ONE DOMINATOR"
##  [42] "32. THE WONDER STUFF            CAUGHT IN MY ..."
##  [43] "33. TRANSVISION VAMP            B WITH U"
##  [44] "34. ROBYN HITCHCOCK             SO YOU THINK YOU'RE IN LOVE"
##  [45] "35. CHAPTERHOUSE                PEARL"
##  [46] "36. GARY CLAIL                  HUMAN NATURE"
##  [47] "37. MOODSWINGS                  SPIRITUAL HIGH"
##  [48] "38. THIS PICTURE                NAKED RAIN"
##  [49] "39. SHAMEN                      MOVE MOUNTAINS"
##  [50] "40. RATCAT                      THAT AIN'T BAD"
##  [51] "41. KITCHENS OF DISTINCTION     DRIVE ..."
##  [52] "42. STING                       ALL THIS TIME"
##  [53] "43. CANDY FLIP                  RED HILLS ROAD"
##  [54] "44. THE PIXIES                  LETTER TO MEMPHIS"
##  [55] "45. JUDYBATS                    NATIVE SON"
##  [56] "46. THE OCEAN BLUE              CERULEAN"
##  [57] "47. VOICE FARM                  FREE LOVE"
##  [58] "48. SIOUXSIE & THE BANSHEES     SHADOWTIME"
##  [59] "49. SEAL                        CRAZY"
##  [60] "50. RIGHT SAID FRED             I'M TOO SEXY"
##  [61] "51. MORRISSEY                   SING YOUR LIFE"
```

```
##  [62] "52. ERASURE                    LOVE TO HATE YOU"
##  [63] "53. MANIC ST. PREACHERS        STAY BEAUTIFUL"
##  [64] "56. SISTERS OF MERCY           DETONATION"
##  [65] "57. KIRSTY MACCOLL             WALKING DOWN MADISON"
##  [66] "58. THE PRIMITIVES             THE WAY YOU ARE"
##  [67] "59. TEENAGE FANCLUB            STAR SIGN"
##  [68] "60. THE FARM                   ALL TOGETHER NOW"
##  [69] "61. THE DYLANS                 PLANET LOVE"
##  [70] "62. TOO MUCH JOY               CRUSH STORY"
##  [71] "63. MINISTRY                   JESUS BUILT MY HOTROD"
##  [72] "64. PRIMAL SCREAM              MOVIN' ON UP"
##  [73] "65. WIR                        SO AND SLOW IT GROWS"
##  [74] "66. THE MISSION U.K.           HANDS ACROSS ..."
##  [75] "67. INTERNATIONAL BEAT         ROCK STEADY"
##  [76] "68. SQUEEZE                    SATISFIED"
##  [77] "69. NITZER EBB                 FAMILY MAN"
##  [78] "70. I START COUNTING           STILL SMILING"
##  [79] "71. VIOLENT FEMMES             AMERICAN MUSIC"
##  [80] "72. THE MILLTOWN BROTHERS      WHICH WAY ..."
##  [81] "73. HAPPY MONDAYS              BOB'S YER UNCLE"
##  [82] "74. CAMOUFLAGE                 HEAVEN I WANT YOU"
##  [83] "75. MOCK TURTLES               CAN YOU DIG IT?"
##  [84] "76. CROWDED HOUSE              IT'S ONLY NATURAL"
##  [85] "77. POPINJAYS                  VOTE ELVIS"
##  [86] "78. CARTER U.S.M.              THIS IS HOW ..."
##  [87] "79. THE LA'S                   I CAN'T SLEEP"
##  [88] "80. ST. ETIENNE                ONLY LOVE CAN BREAK YOUR HEART"
##  [89] "81. ENYA                       CARRIBEAN BLUE"
##  [90] "82. PRESENCE                   IN WONDER"
##  [91] "83. PET SHOP BOYS              WHERE THE STREETS HAVE NO NAME   (tie)"
##  [92] "83. SPIREA-X                   SPEED REACTION                   (tie)"
##  [93] "84. THE WENDY'S                HALFPIE"
##  [94] "85. KATE BUSH                  ROCKET MAN"
##  [95] "86. CANDY SKINS                SHE BLEW ME AWAY"
##  [96] "87. ORB                        PERPETUAL DAWN"
##  [97] "88. BIRDLAND                   SHOOT YOU DOWN"
##  [98] "89. TIN MACHINE                BABY UNIVERSAL"
##  [99] "90. SINGLE GUN THEORY          FROM A MILLION"
## [100] "91. NED'S ATOMIC DUSTBIN       GREY CELL GREEEN                 (tie)"
## [101] "91. XYMOX                      PHOENIX OF MY HEART              (tie)"
## [102] "92. LUSH                       DE-LUXE                         "
## [103] "93. SCATTERBRAIN               DOWN WITH THE SHIP"
## [104] "94. EON                        SPICE"
## [105] "95. SMITHEREENS                TOP OF THE POPS"
## [106] "96. G. W. McLENNAN             EASY COME, EASY GO"
## [107] "97. KLF                        LAST TRAIN TO TRANSCENTRAL       (tie)"
## [108] "97. HOODOO GURUS               MISS FREELOVE '69                (tie)"
## [109] "98. ANTHRAX                    BRING THE NOISE   "
## [110] "99. MARY'S DANISH              JULIE'S BLANKET"
## [111] "100. MEAT PUPPETS              SAM"
## [112] "101. SMASHING PUMPKINS         SIVA"
## [113] "102. ELVIS COSTELLO            OTHER SIDE OF ..."
## [114] "103. SEERS                     PSYCHE OUT"
## [115] "104. THRILL KILL CULT          SEX ON WHEELZ"
```

```
## [116] "105. MATTHEW SWEET              I'VE BEEN WAITING"
## [117] "105.3  LATOUR                   PEOPLE ARE STILL HAVING SEX"
## [118] ""
## [119] "Ed"
## [120] "ed@wente.llnl.gov"
## [121] ""
```

```
x1 <-stringr::str_extract(top105, pattern = "^\\d+\\.\\d?")
na.omit(x1)
```

```
##   [1] "1."    "2."    "3."    "4."    "5."    "6."    "7."    "8."    "9."
##  [10] "10."   "11."   "12."   "13."   "14."   "15."   "16."   "17."   "18."
##  [19] "19."   "20."   "21."   "22."   "23."   "24."   "25."   "26."   "27."
##  [28] "28."   "29."   "30."   "31."   "32."   "33."   "34."   "35."   "36."
##  [37] "37."   "38."   "39."   "40."   "41."   "42."   "43."   "44."   "45."
##  [46] "46."   "47."   "48."   "49."   "50."   "51."   "52."   "53."   "56."
##  [55] "57."   "58."   "59."   "60."   "61."   "62."   "63."   "64."   "65."
##  [64] "66."   "67."   "68."   "69."   "70."   "71."   "72."   "73."   "74."
##  [73] "75."   "76."   "77."   "78."   "79."   "80."   "81."   "82."   "83."
##  [82] "83."   "84."   "85."   "86."   "87."   "88."   "89."   "90."   "91."
##  [91] "91."   "92."   "93."   "94."   "95."   "96."   "97."   "97."   "98."
## [100] "99."   "100."  "101."  "102."  "103."  "104."  "105."  "105.3"
## attr(,"na.action")
##  [1]   1   2   3   4   5   6   7   8   9  10 118 119 120 121
## attr(,"class")
## [1] "omit"
```

#5

```
x2 <- gsub(pattern = "[.]$", replacement = "", x1)
x2 <- as.numeric(x2)

## numbers that have duplications
x2[duplicated(x2)]
```

```
##  [1] NA NA NA NA NA NA NA NA NA 83 91 97 NA NA NA NA
```