```
R version 3.4.1 (2017-06-30) -- "Single Candle"
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Platform: x86_64-w64-mingw32/x64 (64-bit)

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> #Script Name: dilip.k.lalwani_HW04_Script.R
> #Location: D:\STAT_604_FA17
> #Created by Dilip Lalwani
> #Creation Date: 09/13/17
> #Purpose: Practice working with vectors, matrices, and data frames.
> #Last executed: 09/13/17
>
> Sys.time()
[1] "2017-09-13 23:20:46 CDT"
>
```

```
> #1 housekeeping
>
> objects()
character(0)
> ls()
character(0)
> rm(list=ls())
>
> #2 Send output to the console and to a text files
> sink("D:/STAT_604_FA17/HW04.txt", split=TRUE)
>
> #3 Create and display a vector of numeric values from 4 to 100 with an increment of 4
> (V1 <- seq(4,100,4))
 [1]   4   8  12  16  20  24  28  32  36  40  44  48  52  56  60  64  68  72  76
[20]  80  84  88  92  96 100
> # show the type of data contained in the vector
> mode(V1)
[1] "numeric"
>
> #4 Create and display a vector of numeric values from .8 to 40 with an increment of .8
> (V2 <- seq(0.8,40,0.8))
 [1]  0.8  1.6  2.4  3.2  4.0  4.8  5.6  6.4  7.2  8.0  8.8  9.6 10.4 11.2 12.0
[16] 12.8 13.6 14.4 15.2 16.0 16.8 17.6 18.4 19.2 20.0 20.8 21.6 22.4 23.2 24.0
[31] 24.8 25.6 26.4 27.2 28.0 28.8 29.6 30.4 31.2 32.0 32.8 33.6 34.4 35.2 36.0
[46] 36.8 37.6 38.4 39.2 40.0
> # show the type of data contained in the vector
> mode(V2)
[1] "numeric"
>
```

```
> #5 Use the second vector to create and display a matrix by columns that is 5 columns wide
> m1 <- matrix(data = V2, ncol = 5, byrow = FALSE, dimnames = NULL)
> m1
      [,1] [,2] [,3] [,4] [,5]
 [1,]  0.8  8.8 16.8 24.8 32.8
 [2,]  1.6  9.6 17.6 25.6 33.6
 [3,]  2.4 10.4 18.4 26.4 34.4
 [4,]  3.2 11.2 19.2 27.2 35.2
 [5,]  4.0 12.0 20.0 28.0 36.0
 [6,]  4.8 12.8 20.8 28.8 36.8
 [7,]  5.6 13.6 21.6 29.6 37.6
 [8,]  6.4 14.4 22.4 30.4 38.4
 [9,]  7.2 15.2 23.2 31.2 39.2
[10,]  8.0 16.0 24.0 32.0 40.0
>
> #6 Combine the two vectors as columns to create and display a new matrix
> # When two vectors are combined to create a new matrix, values in shorter arguments are
transformed to
> # achieve the length of new matrix. Similarly, first vector values are repeated twice to match length of
> # second vector
> (m2 <- cbind(V1,V2))
      V1   V2
 [1,]   4  0.8
 [2,]   8  1.6
 [3,]  12  2.4
 [4,]  16  3.2
 [5,]  20  4.0
 [6,]  24  4.8
 [7,]  28  5.6
```

[8,] 32 6.4

[9,] 36 7.2

[10,] 40 8.0

[11,] 44 8.8

[12,] 48 9.6

[13,] 52 10.4

[14,] 56 11.2

[15,] 60 12.0

[16,] 64 12.8

[17,] 68 13.6

[18,] 72 14.4

[19,] 76 15.2

[20,] 80 16.0

[21,] 84 16.8

[22,] 88 17.6

[23,] 92 18.4

[24,] 96 19.2

[25,] 100 20.0

[26,] 4 20.8

[27,] 8 21.6

[28,] 12 22.4

[29,] 16 23.2

[30,] 20 24.0

[31,] 24 24.8

[32,] 28 25.6

[33,] 32 26.4

[34,] 36 27.2

[35,] 40 28.0

[36,] 44 28.8

```
[37,]  48 29.6
[38,]  52 30.4
[39,]  56 31.2
[40,]  60 32.0
[41,]  64 32.8
[42,]  68 33.6
[43,]  72 34.4
[44,]  76 35.2
[45,]  80 36.0
[46,]  84 36.8
[47,]  88 37.6
[48,]  92 38.4
[49,]  96 39.2
[50,] 100 40.0
>
> #7 Combine the two vectors as rows to create and display a new matrix
> (m3 <- rbind(V1,V2))
   [,1] [,2] [,3] [,4] [,5] [,6] [,7] [,8] [,9] [,10] [,11] [,12] [,13] [,14]
V1  4.0  8.0 12.0 16.0   20 24.0 28.0 32.0 36.0    40  44.0  48.0  52.0  56.0
V2  0.8  1.6  2.4  3.2    4  4.8  5.6  6.4  7.2     8   8.8   9.6  10.4  11.2
   [,15] [,16] [,17] [,18] [,19] [,20] [,21] [,22] [,23] [,24] [,25] [,26]
V1    60  64.0  68.0  72.0  76.0    80  84.0  88.0  92.0  96.0   100   4.0
V2    12  12.8  13.6  14.4  15.2    16  16.8  17.6  18.4  19.2    20  20.8
   [,27] [,28] [,29] [,30] [,31] [,32] [,33] [,34] [,35] [,36] [,37] [,38]
V1   8.0  12.0  16.0    20  24.0  28.0  32.0  36.0    40  44.0  48.0  52.0
V2  21.6  22.4  23.2    24  24.8  25.6  26.4  27.2    28  28.8  29.6  30.4
   [,39] [,40] [,41] [,42] [,43] [,44] [,45] [,46] [,47] [,48] [,49] [,50]
V1  56.0    60  64.0  68.0  72.0  76.0    80  84.0  88.0  92.0  96.0   100
V2  31.2    32  32.8  33.6  34.4  35.2    36  36.8  37.6  38.4  39.2    40
```

```
>
> #8a show contents of workspace
> ls()
[1] "m1" "m2" "m3" "V1" "V2"
>
> #8b load previously saved workspace
> load("D:/STAT_604_FA17/HW04.RData")
>
> #8c show contents of workspace again
> ls()
[1] "m1"       "m2"       "m3"       "Oklahoma" "V1"       "V2"
>
> #9 Display the object type and the type of data contained in the object loaded in the workspace
> class(Oklahoma)
[1] "data.frame"
> mode(Oklahoma)
[1] "list"
>
> #10 Display the same information for column 1 from that object
> class(Oklahoma[,1])
[1] "factor"
> mode(Oklahoma[,1])
[1] "numeric"
>
> #11 Display the structure of the object loaded in the HW04 workspace
> str(Oklahoma)
'data.frame':   1785 obs. of  16 variables:
 $ School   : Factor w/ 1636 levels "7TH & 8TH GRADE CTR",..: 1 2 3 4 5 6 7 8 9 10 ...
 $ LocCity  : Factor w/ 442 levels "ACHILLE","ADA",..: 267 127 392 165 1 1 2 2 3 3 ...
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$ MailCity : Factor w/ 429 levels "ACHILLE","ADA",..: 262 125 380 163 1 1 2 2 3 3 ...
$ County   : Factor w/ 77 levels "ADAIR COUNTY",..: 51 5 57 70 7 7 62 62 46 46 ...
$ Teachers : num  47.2 31.4 21.5 27.5 15.2 7.6 40.5 46.9 19.6 14.5 ...
$ Grade7   : int  337 144 NA NA 29 NA NA 173 NA 81 ...
$ Grade8   : int  344 157 NA NA 26 NA NA 183 NA 77 ...
$ Grade9   : int  NA 145 NA NA NA 30 NA 183 82 NA ...
$ Grade10  : int  NA NA NA NA NA 31 168 NA 62 NA ...
$ Grade11  : int  NA NA NA NA NA 31 186 NA 65 NA ...
$ Grade12  : int  NA NA NA NA NA 34 148 NA 76 NA ...
$ Ungraded : int  2 4 38 NA NA NA NA NA NA NA ...
$ PreTotal : int  NA NA 64 NA 50 NA NA NA NA NA ...
$ ElemTotal: int  681 301 182 418 205 NA NA 356 NA 251 ...
$ HSTotal  : int  NA 145 NA NA NA 126 502 183 285 NA ...
$ PTRatio  : num  14.5 14.3 13.2 15.2 16.8 ...
>
> #12 Display a summary of the object loaded in the HW04 workspace
> summary(Oklahoma)
         School            LocCity            MailCity
 CENTRAL ES    :  10   OKLAHOMA CITY: 134   OKLAHOMA CITY: 151
 WASHINGTON ES :  10   TULSA        : 108   TULSA        : 104
 WILL ROGERS ES:   9   LAWTON       :  35   LAWTON       :  35
 LINCOLN ES    :   8   EDMOND       :  30   EDMOND       :  30
 WILSON ES     :   8   BROKEN ARROW :  29   BROKEN ARROW :  29
 ROOSEVELT ES  :   6   NORMAN       :  28   NORMAN       :  28
 (Other)       :1734   (Other)      :1421   (Other)      :1408
          County       Teachers         Grade7          Grade8
 OKLAHOMA COUNTY : 210   Min.   :  1.10   Min.   :   0.0   Min.   :   0.00
 TULSA COUNTY    : 176   1st Qu.: 11.70   1st Qu.:  19.0   1st Qu.:  18.00
 CLEVELAND COUNTY:  69   Median : 19.80   Median :  39.0   Median :  36.50
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```
COMANCHE COUNTY :  55   Mean   : 23.13   Mean   :  79.9   Mean   :  77.21
CANADIAN COUNTY :  44   3rd Qu.: 29.20   3rd Qu.: 104.0   3rd Qu.: 100.25
CREEK COUNTY    :  40   Max.   :129.30   Max.   :1120.0   Max.   :1102.00
(Other)         :1191   NA's   :5        NA's   :1192     NA's   :1193
    Grade9         Grade10         Grade11         Grade12
Min.   :  0.0   Min.   :  0.00   Min.   :  0.00   Min.   :  0.00
1st Qu.:  23.0   1st Qu.:  23.00   1st Qu.:  21.00   1st Qu.:  22.00
Median :  44.5   Median :  45.00   Median :  43.00   Median :  43.00
Mean   : 102.7   Mean   :  96.94   Mean   :  91.06   Mean   :  85.15
3rd Qu.: 112.0   3rd Qu.: 110.00   3rd Qu.: 100.50   3rd Qu.:  95.00
Max.   :1062.0   Max.   :1154.00   Max.   :1111.00   Max.   :1111.00
NA's   :1317     NA's   :1316      NA's   :1318      NA's   :1321
   Ungraded         PreTotal     ElemTotal        HSTotal
Min.   :  1.000   Min.   :  0   Min.   :   0.0   Min.   :   0.0
1st Qu.:  1.000   1st Qu.: 45   1st Qu.: 167.0   1st Qu.:  85.0
Median :  3.000   Median : 86   Median : 263.5   Median : 164.5
Mean   :  8.857   Mean   :103   Mean   : 303.6   Mean   : 349.8
3rd Qu.:  6.000   3rd Qu.:137   3rd Qu.: 385.0   3rd Qu.: 399.8
Max.   :169.000   Max.   :997   Max.   :2240.0   Max.   :2358.0
NA's   :1582      NA's   :884   NA's   :503      NA's   :1283
   PTRatio
Min.   :  0.00
1st Qu.: 13.52
Median : 15.53
Mean   : 15.45
3rd Qu.: 17.33
Max.   :155.00
NA's   :5
>
```

```
> #13 Display the first 10 rows and all but column 12 from the object
> Oklahoma[1:10,-(12)]
                        School  LocCity MailCity         County Teachers Grade7 Grade8
1  7TH & 8TH GRADE CTR MUSKOGEE MUSKOGEE MUSKOGEE COUNTY    47.2    337    344
2  8TH & 9TH GRADE CTR ELK CITY ELK CITY  BECKHAM COUNTY    31.4    144    157
3   ACADEMY CENTRAL ES    TULSA    TULSA    OSAGE COUNTY    21.5     NA     NA
4         ACADEMY ES   GUYMON   GUYMON    TEXAS COUNTY    27.5     NA     NA
5         ACHILLE ES  ACHILLE  ACHILLE    BRYAN COUNTY    15.2     29     26
6         ACHILLE HS  ACHILLE  ACHILLE    BRYAN COUNTY     7.6     NA     NA
7           ADA HS      ADA      ADA PONTOTOC COUNTY    40.5     NA     NA
8           ADA JHS     ADA      ADA PONTOTOC COUNTY    46.9    173    183
9          ADAIR HS    ADAIR    ADAIR    MAYES COUNTY    19.6     NA     NA
10         ADAIR MS    ADAIR    ADAIR    MAYES COUNTY    14.5     81     77
   Grade9 Grade10 Grade11 Grade12 PreTotal ElemTotal HSTotal PTRatio
1     NA     NA     NA     NA      NA      681      NA   14.47
2    145     NA     NA     NA      NA      301     145   14.33
3     NA     NA     NA     NA      64      182      NA   13.21
4     NA     NA     NA     NA      NA      418      NA   15.20
5     NA     NA     NA     NA      50      205      NA   16.78
6     30     31     31     34      NA      NA     126   16.58
7     NA    168    186    148      NA      NA     502   12.40
8    183     NA     NA     NA      NA      356     183   11.49
9     82     62     65     76      NA      NA     285   14.54
10    NA     NA     NA     NA      NA      251      NA   17.31
>
> #14 Create and display a new object from Oklahoma using the first 25 rows, the first 2 columns,
columns 4 and 5, and columns 13 through 15
> Oklahoma[1:25,c(1:2,4,5,13:15)]
                        School       LocCity          County Teachers PreTotal
```

1	7TH & 8TH GRADE CTR	MUSKOGEE	MUSKOGEE COUNTY	47.2	NA	
2	8TH & 9TH GRADE CTR	ELK CITY	BECKHAM COUNTY	31.4	NA	
3	ACADEMY CENTRAL ES	TULSA	OSAGE COUNTY	21.5	64	
4	ACADEMY ES	GUYMON	TEXAS COUNTY	27.5	NA	
5	ACHILLE ES	ACHILLE	BRYAN COUNTY	15.2	50	
6	ACHILLE HS	ACHILLE	BRYAN COUNTY	7.6	NA	
7	ADA HS	ADA	PONTOTOC COUNTY	40.5	NA	
8	ADA JHS	ADA	PONTOTOC COUNTY	46.9	NA	
9	ADAIR HS	ADAIR	MAYES COUNTY	19.6	NA	
10	ADAIR MS	ADAIR	MAYES COUNTY	14.5	NA	
11	ADAMS ES	ENID	GARFIELD COUNTY	23.1	105	
12	ADAMS ES	LAWTON	COMANCHE COUNTY	10.4	39	
13	ADAMS ES	NORMAN	CLEVELAND COUNTY	34.2	135	
14	ADAMS ES	OKLAHOMA CITY	OKLAHOMA COUNTY	32.8	130	
15	ADDAMS ES	TULSA	TULSA COUNTY	15.0	53	
16	AFTON ES	AFTON	OTTAWA COUNTY	21.7	60	
17	AFTON HS	AFTON	OTTAWA COUNTY	10.6	NA	
18	AGRA ES	AGRA	LINCOLN COUNTY	20.0	63	
19	AGRA HS	AGRA	LINCOLN COUNTY	9.0	NA	
20	ALBION PUBLIC SCHOOL	ALBION	PUSHMATAHA COUNTY	6.3	40	
21	ALCOTT ES	TULSA	TULSA COUNTY	18.0	60	
22	ALCOTT MS	NORMAN	CLEVELAND COUNTY	41.2	NA	
23	ALEX ES	ALEX	GRADY COUNTY	9.2	36	
24	ALEX HS	ALEX	GRADY COUNTY	7.6	NA	
25	ALEX MS	ALEX	GRADY COUNTY	3.3	NA	

	ElemTotal	HSTotal
1	681	NA
2	301	145
3	182	NA

```
4       418     NA
5       205     NA
6        NA    126
7        NA    502
8       356    183
9        NA    285
10      251     NA
11      220     NA
12      131     NA
13      356     NA
14      475     NA
15      147     NA
16      278     NA
17       NA    121
18      255     NA
19       NA     98
20       69     NA
21      205     NA
22      618     NA
23      123     NA
24       NA    106
25       71     NA
>
> #15 close output file
> sink()
>
```