WIE2003 Alternative Assessment 2

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(a)

Find and get a dataset from the datasets available within R. Perform exploratory data analysis (EDA) and prepare a codebook on that dataset using a newer method in R. Label your work clearly on EDA and codebook.

The dataset chosen from the datasets library is "quakes". This data set shows the locations of 1000 seismic events (i.e. earthquakes) of Richter Magnitude of above 4.0 near Fiji since 1964.

```
'data.frame':
                    1000 obs. of 6 variables:
##
                     "1" "2" "3" "4" ...
    $ No.
              : chr
                     -20.4 -20.6 -26 -18 -20.4 ...
##
    $ lat
              : num
                     182 181 184 182 182 ...
    $ long
              : num
                     562 650 42 626 649 195 82 194 211 622 ...
    $ depth
                     4.8 4.2 5.4 4.1 4 4 4.8 4.4 4.7 4.3 ...
    $ mag
                     41 15 43 19 11 12 43 15 35 19 ...
    $ stations: int
```

The first few observations of this dataset are as below:

```
##
     No.
            lat
                   long depth mag stations
## 1
       1 -20.42 181.62
                          562 4.8
                                         41
       2 -20.62 181.03
                          650 4.2
                                         15
       3 -26.00 184.10
                           42 5.4
                                         43
       4 -17.97 181.66
                          626 4.1
                                         19
## 5
       5 -20.42 181.96
                          649 4.0
                                         11
       6 -19.68 184.31
                          195 4.0
                                         12
```

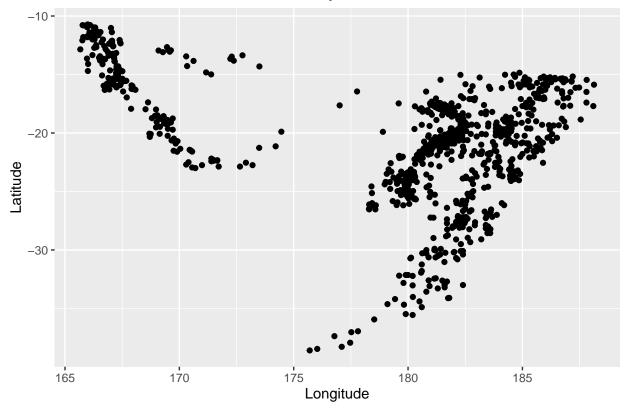
A summary of the dataset

```
##
        No.
                            lat
                                              long
                                                              depth
                                                         Min.
    Length: 1000
                               :-38.59
                                         Min.
                                                :165.7
                                                                : 40.0
##
                       Min.
##
    Class :character
                       1st Qu.:-23.47
                                         1st Qu.:179.6
                                                         1st Qu.: 99.0
   Mode :character
                       Median :-20.30
                                         Median :181.4
                                                         Median :247.0
##
                              :-20.64
                                               :179.5
##
                       Mean
                                         Mean
                                                         Mean
                                                                 :311.4
                       3rd Qu.:-17.64
##
                                         3rd Qu.:183.2
                                                         3rd Qu.:543.0
##
                       Max.
                               :-10.72
                                         Max.
                                                :188.1
                                                         Max.
                                                                 :680.0
##
                      stations
         mag
           :4.00
                         : 10.00
##
                   Min.
    Min.
                   1st Qu.: 18.00
    1st Qu.:4.30
##
##
   Median:4.60
                   Median : 27.00
                         : 33.42
           :4.62
    3rd Qu.:4.90
                   3rd Qu.: 42.00
##
    Max.
           :6.40
                   Max.
                           :132.00
```

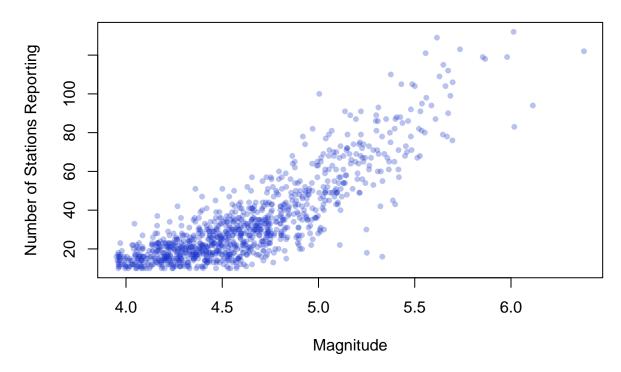
This plot shows the approximate location of those seismic events according to their longitude and latitude

```
## package 'tidyverse' successfully unpacked and MD5 sums checked
##
## The downloaded binary packages are in
## C:\Users\limzh\AppData\Local\Temp\RtmpshrVxN\downloaded_packages
```

Locations of Seismic Events near Fiji



The below figure shows the correlation between the magnitude of earthquakes and the number of stations reporting those events



Fiji Earthquakes Magnitude and Reporting

The above figures show that:

- Most seismic activity occurs at locations with approximate latitude of -10 to -20, longitude of 165 to 170 and latitude of -15 to -25, longitude of 180 to 185.
- The higher the magnitude of the earthquakes, the higher number of stations are able to report those earthquakes.
- As the magnitude of seismic activity increases, the number of seismic activity decreases.

(b)

Demonstrate these FIVE (5) functions of dplyr for data manipulation:

filter ()arrange ()mutate ()select ()summarise ()

You can create your own sensible dataset in certain context for this question with at least 15 observations (rows) and 4 features (columns) or you can get any suitable dataset online. Show the R code and provide a short explanation on what each function does for each produced output.

Lawyers' Ratings of State Judges in the US Superior Court

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CONT INTG DMNR DILG CFMG DECI PREP FAMI ORAL WRIT PHYS RTEN
## AARONSON, L.H.
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   ALEXANDER, J.M.
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## ARMENTANO, A.J.
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## BERDON, R.I.
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## BRACKEN, J.J.
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  BURNS, E.B.
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   CALLAHAN, R.J.
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  COHEN, S.S.
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  DALY, J.J.
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## DANNEHY, J.F.
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## DEAN, H.H.
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## DEVITA, H.J.
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  DRISCOLL, P.J.
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  GRILLO, A.E.
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## HADDEN, W.L.JR.
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## HAMILL, E.C.
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## HEALEY.A.H.
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## HULL, T.C.
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## LEVINE, I.
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## LEVISTER, R.L.
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## MARTIN, L.F.
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## MCGRATH, J.F.
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## MIGNONE, A.F.
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## MISSAL, H.M.
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## MULVEY, H.M.
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## NARUK, H.J.
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## O'BRIEN, F.J.
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## O'SULLIVAN, T.J.
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## PASKEY, L.
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## RUBINOW, J.E.
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  SADEN.G.A.
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   SATANIELLO.A.G.
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## SHEA, D.M.
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## SHEA, J.F.JR.
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## SIDOR, W.J.
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  SPEZIALE, J.A.
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## SPONZO,M.J.
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## STAPLETON, J.F.
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## TESTO,R.J.
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## TIERNEY, W.L.JR.
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## WALL, R.A.
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## WRIGHT, D.B.
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## ZARRILLI,K.J.
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```

[,1] CONT Number of contacts of lawyer with judge. [,2] INTG Judicial integrity. [,3] DMNR Demeanor. [,4] DILG Diligence. [,5] CFMG Case flow managing. [,6] DECI Prompt decisions. [,7] PREP Preparation for trial. [,8] FAMI Familiarity with law. [,9] ORAL Sound oral rulings. [,10] WRIT Sound written rulings. [,11] PHYS Physical ability. [,12] RTEN Worthy of retention.

i. filter()

The filter() function allows us to choose data from the dataset which satisfy the provided conditions.

```
# When passed in the condition of DILG >= 8.0, only Judges
# with a diligence rating of 8.0 and above are shown
us %>% filter(DILG >= 8.0)
```

```
CONT INTG DMNR DILG CFMG DECI PREP FAMI ORAL WRIT PHYS RTEN
##
## ALEXANDER, J.M.
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## BERDON, R.I.
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## BURNS, E.B.
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## CALLAHAN, R.J.
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## DALY, J.J.
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## DANNEHY, J.F.
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## HADDEN, W.L.JR.
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## MULVEY, H.M.
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## NARUK,H.J.
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## O'BRIEN, F.J.
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## O'SULLIVAN, T.J.
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## PASKEY, L.
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## RUBINOW, J.E.
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## SADEN.G.A.
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## SHEA, D.M.
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## SHEA, J.F.JR.
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## SPEZIALE, J.A.
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## SPONZO,M.J.
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## TIERNEY, W.L.JR.
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```

we can separate multiple conditions using a comma which functions as an AND operator us %% filter(PHYS <= 7.5, RTEN >= 6.5)

```
##
                CONT INTG DMNR DILG CFMG DECI PREP FAMI ORAL WRIT PHYS RTEN
## DEVITA, H.J.
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## GRILLO, A.E.
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## HEALEY.A.H.
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## MARTIN, L.F.
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## MCGRATH, J.F.
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```

ii. arrange()

The arrange() function takes in column names as parameters and orders the data accordingly.

```
# CONT attribute is passed in as a parameter.

# Hence the data will arrange according to the value of CONT.

us %>% arrange(CONT)
```

```
##
                     CONT INTG DMNR DILG CFMG DECI PREP FAMI ORAL WRIT PHYS RTEN
## AARONSON, L.H.
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## BURNS, E.B.
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## MISSAL, H.M.
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## DEVITA, H.J.
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## HADDEN, W.L.JR.
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## STAPLETON, J.F.
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## MIGNONE, A.F.
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## SADEN.G.A.
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## DRISCOLL, P.J.
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## ALEXANDER, J.M.
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## BERDON, R.I.
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## SHEA, D.M.
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## SPONZO,M.J.
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## COHEN,S.S.
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## DEAN, H.H.
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## GRILLO, A.E.
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## MARTIN, L.F.
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## O'BRIEN, F.J.
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## RUBINOW, J.E.
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## WRIGHT, D.B.
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## ARMENTANO, A.J.
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## BRACKEN, J.J.
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## DALY, J.J.
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## HAMILL, E.C.
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## SHEA, J.F.JR.
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## MULVEY, H.M.
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## O'SULLIVAN, T.J.
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## PASKEY, L.
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## MCGRATH, J.F.
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## HULL, T.C.
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## SIDOR, W.J.
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## NARUK, H.J.
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## HEALEY.A.H.
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## DANNEHY, J.F.
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## LEVINE, I.
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## TESTO, R.J.
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## TIERNEY, W.L.JR.
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## SATANIELLO, A.G.
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## SPEZIALE, J.A.
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## ZARRILLI, K.J.
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## WALL, R.A.
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## LEVISTER, R.L.
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## CALLAHAN, R.J.
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##
                     CONT INTG DMNR DILG CFMG DECI PREP FAMI ORAL WRIT PHYS RTEN
## COHEN.S.S.
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## SIDOR, W.J.
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## BRACKEN, J.J.
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## LEVISTER, R.L.
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## WALL, R.A.
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## MCGRATH, J.F.
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## TESTO, R.J.
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## MIGNONE, A.F.
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## SADEN.G.A.
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## ZARRILLI, K.J.
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## GRILLO, A.E.
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## HEALEY.A.H.
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## HULL, T.C.
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## DANNEHY, J.F.
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## AARONSON, L.H.
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## HAMILL, E.C.
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## DEAN, H.H.
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## DEVITA.H.J.
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## SATANIELLO, A.G.
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## PASKEY, L.
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## ARMENTANO, A.J.
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## HADDEN, W.L.JR.
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## LEVINE, I.
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## MARTIN, L.F.
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## STAPLETON, J.F.
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## TIERNEY, W.L.JR.
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## SPONZO,M.J.
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## MISSAL, H.M.
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## SPEZIALE, J.A.
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## WRIGHT, D.B.
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## SHEA, D.M.
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## O'BRIEN, F.J.
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## DRISCOLL, P.J.
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## MULVEY, H.M.
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## BERDON, R.I.
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                                                      8.7
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                                                                  8.4
                                                                       8.5
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## BURNS, E.B.
                     6.2
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                                           7.9
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## NARUK.H.J.
                     7.8
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                                      8.9
                                           8.7
                                                 8.8
                                                      8.9
                                                            9.0
                                                                  8.8
                                                                       8.9
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## ALEXANDER, J.M.
                     6.8
                           8.9
                                 8.8
                                      8.5
                                           7.8
                                                 8.1
                                                      8.0
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## SHEA, J.F. JR.
                     7.3
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                                      8.7
                                           8.4
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                                                      8.5
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## DALY, J.J.
                                                      8.4
                     7.3
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                                      8.7
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                                                 8.5
                                                            8.4
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## CALLAHAN, R.J.
                     10.6
                           9.0
                                8.9
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                                                      8.5
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                                                                  8.6
                                                                       8.4
                                                                            9.1
                                                                                  9.0
## O'SULLIVAN,T.J.
                     7.5
                           9.0
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                                                      8.4
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                                                                       8.3
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                     7.1
## RUBINOW, J.E.
                           9.2
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                                           8.4
                                                 8.6
                                                      9.1 9.1
                                                                  8.9
                                                                       9.0
                                                                            8.9
```

iii. mutate()

The mutate() function adds a new column to the dataset which is based on existing column from the dataset. The provided parameter will be the name of the new column and the value of the parameter is the definition of it.

```
us %>% mutate(DECI_PCTG = (DECI / 10) * 100)
```

```
##
                     CONT INTG DMNR DILG CFMG DECI PREP FAMI ORAL WRIT PHYS
                                                                                    RTEN
  AARONSON, L.H.
                      5.7
                            7.9
                                  7.7
                                        7.3
                                             7.1
                                                   7.4
                                                         7.1
                                                               7.1
                                                                     7.1
                                                                          7.0
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                                                                                     7.8
                      6.8
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                                             7.8
                                                   8.1
                                                         8.0
                                                               8.0
                                                                    7.8
                                                                          7.9
                                                                                8.5
   ALEXANDER, J.M.
                                                                                     8.7
## ARMENTANO, A.J.
                      7.2
                            8.1
                                  7.8
                                        7.8
                                             7.5
                                                   7.6
                                                         7.5
                                                               7.5
                                                                     7.3
                                                                          7.4
                                                                                7.9
                                                                                      7.8
## BERDON, R.I.
                      6.8
                            8.8
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                                             8.3
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                                                         8.7
                                                               8.7
                                                                    8.4
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                                                                                     8.7
  BRACKEN, J.J.
                      7.3
                            6.4
                                  4.3
                                             6.0
                                                   6.2
                                                         5.7
                                                               5.7
                                                                          5.3
                                        6.5
                                                                    5.1
                                                                                5.5
                                                                                      4.8
                      6.2
                            8.8
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                                             7.9
                                                   8.0
                                                         8.1
                                                               8.0
                                                                    8.0
                                                                          8.0
## BURNS, E.B.
                                  8.7
                                                                                8.6
                                                                                     8.6
                            9.0
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                                                                          8.4
   CALLAHAN, R.J.
                     10.6
                                        8.7
                                             8.5
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                                                                    8.6
                                                                                9.1
  COHEN, S.S.
                      7.0
                            5.9
                                  4.9
                                        5.1
                                             5.4
                                                   5.9
                                                         4.8
                                                               5.1
                                                                     4.7
                                                                          4.9
                                                                                6.8
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## DALY, J.J.
                      7.3
                            8.9
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                                                   8.0
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                                                                          7.8
## DANNEHY, J.F.
                                        8.1
                                                                    7.7
                                                                                8.5
                                                                                     7.9
## DEAN, H.H.
                      7.0
                            8.0
                                  7.6
                                        7.4
                                             7.3
                                                   7.5
                                                         7.1
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                                             7.0
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## DEVITA, H.J.
                      6.5
                            8.0
                                        7.2
                                                   7.1
                                                                                6.9
## DRISCOLL, P.J.
                      6.7
                            8.6
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                                                   6.6
                                                         7.1
                                                               7.3
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                                                                          7.2
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## GRILLO, A.E.
                      7.0
                            7.5
                                  6.4
                                        6.8
                                             6.5
                                                   7.0
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## HADDEN, W.L.JR.
                      6.5
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  HAMILL, E.C.
                      7.3
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                      8.0
                            7.6
                                             6.5
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                                                               6.7
                                                                     6.4
                                                                          6.5
## HEALEY.A.H.
                                  6.6
                                        7.2
                                                         6.8
                                                                                6.9
                                                                                      6.7
## HULL, T.C.
                      7.7
                            7.7
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## LEVINE, I.
                      8.3
                            8.2
                                  7.4
                                        7.8
                                                   7.7
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                                                                          7.6
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## LEVISTER, R.L.
                      9.6
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                                                         6.2
                                                               6.0
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                                                                                7.2
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## MARTIN, L.F.
                      7.1
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                                                   6.6
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## MCGRATH, J.F.
                      7.6
                            7.3
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## MIGNONE, A.F.
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                            8.3
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                                                         7.3
## MISSAL.H.M.
                      6.2
                                  8.1
                                        7.7
                                                   7.3
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## MULVEY, H.M.
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## NARUK, H.J.
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## O'BRIEN, F.J.
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## O'SULLIVAN, T.J.
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## PASKEY, L.
                      7.5
                            8.1
                                        8.2
                                             8.0
                                                   8.1
                                                               8.4
                                                                    8.0
                                                                          8.1
                                                                                8.4
                                                                                     8.1
## RUBINOW, J.E.
                      7.1
                            9.2
                                  9.0
                                        9.0
                                             8.4
                                                   8.6
                                                         9.1
                                                               9.1
                                                                    8.9
                                                                          9.0
                                                                                8.9
                                                                                     9.2
                            7.4
                                  6.9
                                                                          7.9
                                                                                     7.5
## SADEN.G.A.
                      6.6
                                        8.4
                                             8.0
                                                   7.9
                                                         8.2
                                                               8.4
                                                                    7.7
                                                                                8.4
                                                                    7.4
   SATANIELLO, A.G.
                      8.4
                            8.0
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                                                   7.8
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                                                               7.4
                                                                          7.4
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## SHEA, D.M.
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                            8.5
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                                        8.5
                                             8.1
                                                   8.2
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                                                         8.5
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## SHEA, J.F.JR.
                      7.3
                                        8.7
                                                   8.5
                                                                    8.4
                                                                          8.4
                                                                                8.8
                                                                                     8.8
## SIDOR, W.J.
                      7.7
                            6.2
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                                             5.6
                                                   5.9
                                                         5.6
                                                               5.6
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                                             8.4
                                                   8.2
                                                         8.2
                                                               8.1
                                                                    7.9
                                                                          8.0
                                                                                8.0
## SPEZIALE, J.A.
                                                                                     8.2
  SPONZO,M.J.
                      6.9
                            8.3
                                  8.0
                                        8.1
                                             7.9
                                                   7.9
                                                         7.9
                                                               7.7
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                                                                          7.7
                                                                                8.1
## STAPLETON, J.F.
                      6.5
                            8.2
                                  7.7
                                        7.8
                                             7.6
                                                   7.7
                                                         7.7
                                                               7.7
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                                                                          7.6
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  TESTO, R.J.
                      8.3
                            7.3
                                  7.0
                                        6.8
                                             7.0
                                                   7.1
                                                         6.7
                                                               6.7
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                                                                    7.5
                                                                          7.7
                                                                                8.1
## TIERNEY, W.L.JR.
                            8.2
                                                         7.7
                                                                                     7.9
## WALL.R.A.
                      9.0
                            7.0
                                  5.9
                                        7.0
                                             7.0
                                                   7.2
                                                         6.9
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                                                                          6.6
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                      7.1
                                             7.5
                                                         7.8
## WRIGHT, D.B.
                            8.4
                                  8.4
                                        7.7
                                                   7.7
                                                               8.2
                                                                    8.0
                                                                          8.1
                                                                                8.3
                                                                                     8.1
                                                   7.7
                                                         7.4
## ZARRILLI,K.J.
                      8.6
                            7.4
                                 7.0
                                       7.5
                                             7.5
                                                              7.2
                                                                    6.9
                                                                          7.0
                                                                                7.8
                                                                                     7.1
```

##		DECT DOTO
##	AADONGON I U	DECI_PCTG 74
##	AARONSON, L.H.	
	ALEXANDER, J.M.	81
## ##	ARMENTANO, A.J.	76 85
##	BERDON, R.I. BRACKEN, J.J.	62
##	•	80
##	BURNS, E.B. CALLAHAN, R.J.	85
##	COHEN,S.S.	59
##	DALY, J. J.	85
##	DANNEHY, J.F.	80
##	DEAN, H.H.	75
##	DEVITA, H.J.	71
##	DRISCOLL, P.J.	66
##	GRILLO, A.E.	70
##	HADDEN, W.L.JR.	80
##	HAMILL, E.C.	73
##	HEALEY.A.H.	65
##	HULL, T.C.	75
##	LEVINE,I.	77
##	LEVISTER, R.L.	66
##	MARTIN, L.F.	66
##	MCGRATH, J.F.	68
##	MIGNONE, A.F.	57
##	MISSAL,H.M.	73
##	MULVEY,H.M.	84
##	NARUK, H.J.	88
##	O'BRIEN, F.J.	79
##	O'SULLIVAN,T.J.	85
##	PASKEY,L.	81
##	RUBINOW, J.E.	86
##	SADEN.G.A.	79
##	SATANIELLO, A.G.	78
##	SHEA,D.M.	82
##	SHEA, J.F.JR.	85
##	SIDOR, W.J.	59
##	SPEZIALE, J.A.	82
##	SPONZO,M.J.	79
##	STAPLETON, J.F.	77
##	TESTO,R.J.	71
##	TIERNEY, W.L.JR.	83
##	WALL, R.A.	72
##	WRIGHT, D.B.	77
##	ZARRILLI,K.J.	77

iv. select()

The select() function chooses the columns that we have passed in as parameters to be outputted.

```
us %>% mutate(DECI_PCTG = (DECI / 10) * 100) %>% select(DECI_PCTG, DECI)
```

```
DECI_PCTG DECI
##
## AARONSON, L.H.
                            74
                                7.4
## ALEXANDER, J.M.
                            81
                                8.1
## ARMENTANO, A.J.
                            76
                                7.6
## BERDON, R.I.
                            85
                                8.5
## BRACKEN, J.J.
                            62
                                6.2
## BURNS, E.B.
                            80
                                8.0
## CALLAHAN, R.J.
                            85
                                8.5
## COHEN,S.S.
                            59
                                5.9
                            85
## DALY, J.J.
                                8.5
## DANNEHY, J.F.
                            80
                                8.0
## DEAN, H.H.
                                7.5
                            75
## DEVITA, H.J.
                            71
                                7.1
## DRISCOLL, P.J.
                            66
                                6.6
## GRILLO, A.E.
                            70
                                7.0
## HADDEN, W.L.JR.
                            80
                                8.0
                            73
                                7.3
## HAMILL, E.C.
## HEALEY.A.H.
                            65
                                6.5
                                7.5
## HULL,T.C.
                            75
## LEVINE, I.
                            77
                                7.7
## LEVISTER, R.L.
                            66
                                6.6
## MARTIN, L.F.
                            66
                                6.6
## MCGRATH, J.F.
                            68
                                6.8
## MIGNONE, A.F.
                            57
                                5.7
## MISSAL, H.M.
                            73
                                7.3
## MULVEY, H.M.
                            84
                                8.4
## NARUK, H.J.
                            88
                                8.8
## O'BRIEN, F.J.
                            79
                                7.9
## O'SULLIVAN, T.J.
                            85
                                8.5
## PASKEY, L.
                            81
                                8.1
## RUBINOW, J.E.
                            86
                                8.6
                                7.9
## SADEN.G.A.
                            79
## SATANIELLO, A.G.
                            78
                                7.8
## SHEA, D.M.
                                8.2
## SHEA, J.F.JR.
                            85
                                8.5
## SIDOR, W.J.
                            59
                                5.9
## SPEZIALE, J.A.
                            82
                                8.2
## SPONZO,M.J.
                            79
                                7.9
                            77
                                7.7
## STAPLETON, J.F.
## TESTO,R.J.
                            71
                                7.1
## TIERNEY, W.L.JR.
                            83
                               8.3
## WALL, R.A.
                            72 7.2
## WRIGHT, D.B.
                                7.7
## ZARRILLI,K.J.
                            77
                                7.7
```

```
v. summarise()
```

The summarise() function summarizes the whole dataset into one row based on the parameters provided.

```
# The parameters provided are individual of each other
# as it only provides the summary of its own column
us %>% summarise(FAMI=mean(FAMI, na.rm=TRUE), ORAL=max(ORAL, na.rm=TRUE))
```

FAMI ORAL ## 1 7.488372 8.9