CIA

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Question A:

```
df = read.csv("/Users/raghul/Downloads/Q2.csv")
```

Importing the dataset

```
head(df, 15)
```

Load the dataset and display the first 15 rows of the dataset

```
##                        Name.A1.S1 Manuf Type Calories Protein Fat Sodium Fiber Carbo
## 1                       100%_Bran     N    C       70       4   1    130  10.0   5.0
## 2               100%_Natural_Bran     Q    C      120       3   5     15   2.0   8.0
## 3                         All-Bran     K    C       70       4   1    260   9.0   7.0
## 4    All-Bran_with_Extra_Fiber     K    C       50       4   0    140  14.0   8.0
## 5                  Almond_Delight     R    C      110       2   2    200   1.0  14.0
## 6          Apple_Cinnamon_Cheerios    G    C      110       2   2    180   1.5  10.5
## 7                     Apple_Jacks     K    C      110       2   0    125   1.0  11.0
## 8                         Basic_4     G    C      130       3   2    210   2.0  18.0
## 9                       Bran_Chex     R    C       90       2   1    200   4.0  15.0
## 10                    Bran_Flakes     P    C       90       3   0    210   5.0  13.0
## 11                  Cap'n'Crunch     Q    C      120       1   2    220   0.0  12.0
## 12                       Cheerios     G    C      110       6   2    290   2.0  17.0
## 13          Cinnamon_Toast_Crunch    G    C      120       1   3    210   0.0  13.0
## 14                       Clusters     G    C      110       3   2    140   2.0  13.0
## 15                     Cocoa_Puffs     G    C      110       1   1    180   0.0  12.0
##     Sugars Potass Vitamins Shelf Weight Cups   Rating Cold Nabisco Quaker
## 1        6    280       25     3   1.00 0.33 68.40297    1       1      0
## 2        8    135        0     3   1.00 1.00 33.98368    1       0      1
## 3        5    320       25     3   1.00 0.33 59.42551    1       0      0
## 4        0    330       25     3   1.00 0.50 93.70491    1       0      0
## 5        8     NA       25     3   1.00 0.75 34.38484    1       0      0
## 6       10     70       25     1   1.00 0.75 29.50954    1       0      0
## 7       14     30       25     2   1.00 1.00 33.17409    1       0      0
## 8        8    100       25     3   1.33 0.75 37.03856    1       0      0
## 9        6    125       25     1   1.00 0.67 49.12025    1       0      0
```

```
## 10       5     190        25       3  1.00 0.67 53.31381     1         0       0
## 11      12      35        25       2  1.00 0.75 18.04285     1         0       1
## 12       1     105        25       1  1.00 1.25 50.76500     1         0       0
## 13       9      45        25       2  1.00 0.75 19.82357     1         0       0
## 14       7     105        25       3  1.00 0.50 40.40021     1         0       0
## 15      13      55        25       2  1.00 1.00 22.73645     1         0       0
##    Kelloggs GeneralMills Ralston AHFP
## 1         0            0       0    0
## 2         0            0       0    0
## 3         1            0       0    0
## 4         1            0       0    0
## 5         0            0       1    0
## 6         0            1       0    0
## 7         1            0       0    0
## 8         0            1       0    0
## 9         0            0       1    0
## 10        0            0       0    0
## 11        0            0       0    0
## 12        0            1       0    0
## 13        0            1       0    0
## 14        0            1       0    0
## 15        0            1       0    0
```

A. Exploratory Data Analysis (USe appropriate plots and summary to study the data)

```
summary(df)
```

Summarizing the data

```
##    Name.A1.S1           Manuf               Type              Calories
##  Length:77          Length:77          Length:77          Min.   : 50.0
##  Class :character   Class :character   Class :character   1st Qu.:100.0
##  Mode  :character   Mode  :character   Mode  :character   Median :110.0
##                                                           Mean   :106.9
##                                                           3rd Qu.:110.0
##                                                           Max.   :160.0
##
##     Protein          Fat            Sodium          Fiber
##  Min.   :1.000   Min.   :0.000   Min.   :  0.0   Min.   : 0.000
##  1st Qu.:2.000   1st Qu.:0.000   1st Qu.:130.0   1st Qu.: 1.000
##  Median :3.000   Median :1.000   Median :180.0   Median : 2.000
##  Mean   :2.545   Mean   :1.013   Mean   :159.7   Mean   : 2.152
##  3rd Qu.:3.000   3rd Qu.:2.000   3rd Qu.:210.0   3rd Qu.: 3.000
##  Max.   :6.000   Max.   :5.000   Max.   :320.0   Max.   :14.000
##
##      Carbo          Sugars          Potass          Vitamins
##  Min.   : 5.0   Min.   : 0.000   Min.   : 15.00   Min.   :  0.00
##  1st Qu.:12.0   1st Qu.: 3.000   1st Qu.: 42.50   1st Qu.: 25.00
##  Median :14.5   Median : 7.000   Median : 90.00   Median : 25.00
##  Mean   :14.8   Mean   : 7.026   Mean   : 98.67   Mean   : 28.25
```

2

```
##   3rd Qu.:17.0    3rd Qu.:11.000    3rd Qu.:120.00    3rd Qu.: 25.00
##   Max.   :23.0    Max.   :15.000    Max.   :330.00    Max.    :100.00
##   NA's   :1       NA's   :1         NA's   :2
##       Shelf          Weight          Cups            Rating          Cold
##   Min.   :1.000   Min.   :0.50    Min.   :0.250    Min.   :18.04   Min.   :0.000
##   1st Qu.:1.000   1st Qu.:1.00    1st Qu.:0.670    1st Qu.:33.17   1st Qu.:1.000
##   Median :2.000   Median :1.00    Median :0.750    Median :40.40   Median :1.000
##   Mean   :2.208   Mean   :1.03    Mean   :0.821    Mean   :42.67   Mean   :0.961
##   3rd Qu.:3.000   3rd Qu.:1.00    3rd Qu.:1.000    3rd Qu.:50.83   3rd Qu.:1.000
##   Max.   :3.000   Max.   :1.50    Max.   :1.500    Max.   :93.70   Max.   :1.000
##
##      Nabisco          Quaker           Kelloggs        GeneralMills
##   Min.   :0.00000   Min.   :0.0000   Min.   :0.0000   Min.   :0.0000
##   1st Qu.:0.00000   1st Qu.:0.0000   1st Qu.:0.0000   1st Qu.:0.0000
##   Median :0.00000   Median :0.0000   Median :0.0000   Median :0.0000
##   Mean   :0.07792   Mean   :0.1039   Mean   :0.2987   Mean   :0.2857
##   3rd Qu.:0.00000   3rd Qu.:0.0000   3rd Qu.:1.0000   3rd Qu.:1.0000
##   Max.   :1.00000   Max.   :1.0000   Max.   :1.0000   Max.   :1.0000
##
##      Ralston           AHFP
##   Min.   :0.0000   Min.   :0.00000
##   1st Qu.:0.0000   1st Qu.:0.00000
##   Median :0.0000   Median :0.00000
##   Mean   :0.1039   Mean   :0.01299
##   3rd Qu.:0.0000   3rd Qu.:0.00000
##   Max.   :1.0000   Max.   :1.00000
##
```

```
dim(df)
```

Dimension of the dataset (Total no.of.rows & Total no.of columns)

```
## [1] 77 23
```

```
str(df)
```

```
## 'data.frame':    77 obs. of  23 variables:
##  $ Name.A1.S1 : chr  "100%_Bran" "100%_Natural_Bran" "All-Bran" "All-Bran_with_Extra_Fiber" ...
##  $ Manuf      : chr  "N" "Q" "K" "K" ...
##  $ Type       : chr  "C" "C" "C" "C" ...
##  $ Calories   : int  70 120 70 50 110 110 110 130 90 90 ...
##  $ Protein    : int  4 3 4 4 2 2 2 3 2 3 ...
##  $ Fat        : int  1 5 1 0 2 2 0 2 1 0 ...
##  $ Sodium     : int  130 15 260 140 200 180 125 210 200 210 ...
##  $ Fiber      : num  10 2 9 14 1 1.5 1 2 4 5 ...
##  $ Carbo      : num  5 8 7 8 14 10.5 11 18 15 13 ...
##  $ Sugars     : int  6 8 5 0 8 10 14 8 6 5 ...
##  $ Potass     : int  280 135 320 330 NA 70 30 100 125 190 ...
##  $ Vitamins   : int  25 0 25 25 25 25 25 25 25 25 ...
##  $ Shelf      : int  3 3 3 3 3 1 2 3 1 3 ...
```

3

```
##  $ Weight       : num  1 1 1 1 1 1 1 1.33 1 1 ...
##  $ Cups         : num  0.33 1 0.33 0.5 0.75 0.75 1 0.75 0.67 0.67 ...
##  $ Rating       : num  68.4 34 59.4 93.7 34.4 ...
##  $ Cold         : int  1 1 1 1 1 1 1 1 1 1 ...
##  $ Nabisco      : int  1 0 0 0 0 0 0 0 0 0 ...
##  $ Quaker       : int  0 1 0 0 0 0 0 0 0 0 ...
##  $ Kelloggs     : int  0 0 1 1 0 0 1 0 0 0 ...
##  $ GeneralMills: int  0 0 0 0 0 1 0 1 0 0 ...
##  $ Ralston      : int  0 0 0 0 1 0 0 0 1 0 ...
##  $ AHFP         : int  0 0 0 0 0 0 0 0 0 0 ...
```

```
nrow(df)
```

```
## [1] 77
```

```
ncol(df)
```

```
## [1] 23
```

```
is.na(df)
```

```
##          Name.A1.S1 Manuf  Type Calories Protein   Fat Sodium Fiber Carbo Sugars
##  [1,]        FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE
##  [2,]        FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE
##  [3,]        FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE
##  [4,]        FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE
##  [5,]        FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE
##  [6,]        FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE
##  [7,]        FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE
##  [8,]        FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE
##  [9,]        FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE
## [10,]        FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE
## [11,]        FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE
## [12,]        FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE
## [13,]        FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE
## [14,]        FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE
## [15,]        FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE
## [16,]        FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE
## [17,]        FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE
## [18,]        FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE
## [19,]        FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE
## [20,]        FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE
## [21,]        FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE
## [22,]        FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE
## [23,]        FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE
## [24,]        FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE
## [25,]        FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE
## [26,]        FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE
## [27,]        FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE
## [28,]        FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE
## [29,]        FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE
## [30,]        FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE
```

```
## [31,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE FALSE    FALSE
## [32,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE FALSE    FALSE
## [33,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE FALSE    FALSE
## [34,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE FALSE    FALSE
## [35,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE FALSE    FALSE
## [36,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE FALSE    FALSE
## [37,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE FALSE    FALSE
## [38,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE FALSE    FALSE
## [39,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE FALSE    FALSE
## [40,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE FALSE    FALSE
## [41,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE FALSE    FALSE
## [42,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE FALSE    FALSE
## [43,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE FALSE    FALSE
## [44,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE FALSE    FALSE
## [45,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE FALSE    FALSE
## [46,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE FALSE    FALSE
## [47,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE FALSE    FALSE
## [48,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE FALSE    FALSE
## [49,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE FALSE    FALSE
## [50,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE FALSE    FALSE
## [51,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE FALSE    FALSE
## [52,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE FALSE    FALSE
## [53,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE FALSE    FALSE
## [54,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE FALSE    FALSE
## [55,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE FALSE    FALSE
## [56,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE FALSE    FALSE
## [57,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE FALSE    FALSE
## [58,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE  TRUE     TRUE
## [59,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE FALSE    FALSE
## [60,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE FALSE    FALSE
## [61,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE FALSE    FALSE
## [62,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE FALSE    FALSE
## [63,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE FALSE    FALSE
## [64,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE FALSE    FALSE
## [65,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE FALSE    FALSE
## [66,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE FALSE    FALSE
## [67,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE FALSE    FALSE
## [68,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE FALSE    FALSE
## [69,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE FALSE    FALSE
## [70,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE FALSE    FALSE
## [71,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE FALSE    FALSE
## [72,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE FALSE    FALSE
## [73,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE FALSE    FALSE
## [74,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE FALSE    FALSE
## [75,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE FALSE    FALSE
## [76,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE FALSE    FALSE
## [77,]         FALSE FALSE FALSE    FALSE    FALSE FALSE    FALSE FALSE FALSE    FALSE
##        Potass Vitamins Shelf Weight  Cups Rating  Cold Nabisco Quaker Kelloggs
## [1,] FALSE    FALSE FALSE  FALSE FALSE  FALSE FALSE    FALSE  FALSE    FALSE
## [2,] FALSE    FALSE FALSE  FALSE FALSE  FALSE FALSE    FALSE  FALSE    FALSE
## [3,] FALSE    FALSE FALSE  FALSE FALSE  FALSE FALSE    FALSE  FALSE    FALSE
## [4,] FALSE    FALSE FALSE  FALSE FALSE  FALSE FALSE    FALSE  FALSE    FALSE
## [5,]  TRUE    FALSE FALSE  FALSE FALSE  FALSE FALSE    FALSE  FALSE    FALSE
## [6,] FALSE    FALSE FALSE  FALSE FALSE  FALSE FALSE    FALSE  FALSE    FALSE
```

```
##  [7,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
##  [8,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
##  [9,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [10,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [11,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [12,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [13,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [14,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [15,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [16,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [17,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [18,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [19,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [20,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [21,]    TRUE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [22,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [23,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [24,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [25,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [26,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [27,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [28,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [29,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [30,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [31,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [32,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [33,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [34,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [35,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [36,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [37,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [38,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [39,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [40,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [41,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [42,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [43,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [44,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [45,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [46,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [47,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [48,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [49,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [50,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [51,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [52,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [53,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [54,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [55,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [56,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [57,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [58,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [59,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
## [60,]   FALSE    FALSE FALSE   FALSE FALSE   FALSE FALSE   FALSE   FALSE   FALSE
```

```
## [61,]  FALSE      FALSE FALSE    FALSE FALSE   FALSE FALSE    FALSE  FALSE     FALSE
## [62,]  FALSE      FALSE FALSE    FALSE FALSE   FALSE FALSE    FALSE  FALSE     FALSE
## [63,]  FALSE      FALSE FALSE    FALSE FALSE   FALSE FALSE    FALSE  FALSE     FALSE
## [64,]  FALSE      FALSE FALSE    FALSE FALSE   FALSE FALSE    FALSE  FALSE     FALSE
## [65,]  FALSE      FALSE FALSE    FALSE FALSE   FALSE FALSE    FALSE  FALSE     FALSE
## [66,]  FALSE      FALSE FALSE    FALSE FALSE   FALSE FALSE    FALSE  FALSE     FALSE
## [67,]  FALSE      FALSE FALSE    FALSE FALSE   FALSE FALSE    FALSE  FALSE     FALSE
## [68,]  FALSE      FALSE FALSE    FALSE FALSE   FALSE FALSE    FALSE  FALSE     FALSE
## [69,]  FALSE      FALSE FALSE    FALSE FALSE   FALSE FALSE    FALSE  FALSE     FALSE
## [70,]  FALSE      FALSE FALSE    FALSE FALSE   FALSE FALSE    FALSE  FALSE     FALSE
## [71,]  FALSE      FALSE FALSE    FALSE FALSE   FALSE FALSE    FALSE  FALSE     FALSE
## [72,]  FALSE      FALSE FALSE    FALSE FALSE   FALSE FALSE    FALSE  FALSE     FALSE
## [73,]  FALSE      FALSE FALSE    FALSE FALSE   FALSE FALSE    FALSE  FALSE     FALSE
## [74,]  FALSE      FALSE FALSE    FALSE FALSE   FALSE FALSE    FALSE  FALSE     FALSE
## [75,]  FALSE      FALSE FALSE    FALSE FALSE   FALSE FALSE    FALSE  FALSE     FALSE
## [76,]  FALSE      FALSE FALSE    FALSE FALSE   FALSE FALSE    FALSE  FALSE     FALSE
## [77,]  FALSE      FALSE FALSE    FALSE FALSE   FALSE FALSE    FALSE  FALSE     FALSE
##       GeneralMills Ralston  AHFP
##  [1,]        FALSE   FALSE FALSE
##  [2,]        FALSE   FALSE FALSE
##  [3,]        FALSE   FALSE FALSE
##  [4,]        FALSE   FALSE FALSE
##  [5,]        FALSE   FALSE FALSE
##  [6,]        FALSE   FALSE FALSE
##  [7,]        FALSE   FALSE FALSE
##  [8,]        FALSE   FALSE FALSE
##  [9,]        FALSE   FALSE FALSE
## [10,]        FALSE   FALSE FALSE
## [11,]        FALSE   FALSE FALSE
## [12,]        FALSE   FALSE FALSE
## [13,]        FALSE   FALSE FALSE
## [14,]        FALSE   FALSE FALSE
## [15,]        FALSE   FALSE FALSE
## [16,]        FALSE   FALSE FALSE
## [17,]        FALSE   FALSE FALSE
## [18,]        FALSE   FALSE FALSE
## [19,]        FALSE   FALSE FALSE
## [20,]        FALSE   FALSE FALSE
## [21,]        FALSE   FALSE FALSE
## [22,]        FALSE   FALSE FALSE
## [23,]        FALSE   FALSE FALSE
## [24,]        FALSE   FALSE FALSE
## [25,]        FALSE   FALSE FALSE
## [26,]        FALSE   FALSE FALSE
## [27,]        FALSE   FALSE FALSE
## [28,]        FALSE   FALSE FALSE
## [29,]        FALSE   FALSE FALSE
## [30,]        FALSE   FALSE FALSE
## [31,]        FALSE   FALSE FALSE
## [32,]        FALSE   FALSE FALSE
## [33,]        FALSE   FALSE FALSE
## [34,]        FALSE   FALSE FALSE
## [35,]        FALSE   FALSE FALSE
## [36,]        FALSE   FALSE FALSE
```

```
## [37,]         FALSE     FALSE FALSE
## [38,]         FALSE     FALSE FALSE
## [39,]         FALSE     FALSE FALSE
## [40,]         FALSE     FALSE FALSE
## [41,]         FALSE     FALSE FALSE
## [42,]         FALSE     FALSE FALSE
## [43,]         FALSE     FALSE FALSE
## [44,]         FALSE     FALSE FALSE
## [45,]         FALSE     FALSE FALSE
## [46,]         FALSE     FALSE FALSE
## [47,]         FALSE     FALSE FALSE
## [48,]         FALSE     FALSE FALSE
## [49,]         FALSE     FALSE FALSE
## [50,]         FALSE     FALSE FALSE
## [51,]         FALSE     FALSE FALSE
## [52,]         FALSE     FALSE FALSE
## [53,]         FALSE     FALSE FALSE
## [54,]         FALSE     FALSE FALSE
## [55,]         FALSE     FALSE FALSE
## [56,]         FALSE     FALSE FALSE
## [57,]         FALSE     FALSE FALSE
## [58,]         FALSE     FALSE FALSE
## [59,]         FALSE     FALSE FALSE
## [60,]         FALSE     FALSE FALSE
## [61,]         FALSE     FALSE FALSE
## [62,]         FALSE     FALSE FALSE
## [63,]         FALSE     FALSE FALSE
## [64,]         FALSE     FALSE FALSE
## [65,]         FALSE     FALSE FALSE
## [66,]         FALSE     FALSE FALSE
## [67,]         FALSE     FALSE FALSE
## [68,]         FALSE     FALSE FALSE
## [69,]         FALSE     FALSE FALSE
## [70,]         FALSE     FALSE FALSE
## [71,]         FALSE     FALSE FALSE
## [72,]         FALSE     FALSE FALSE
## [73,]         FALSE     FALSE FALSE
## [74,]         FALSE     FALSE FALSE
## [75,]         FALSE     FALSE FALSE
## [76,]         FALSE     FALSE FALSE
## [77,]         FALSE     FALSE FALSE
```

Importing required Libraries

```
library(ggplot2)
library(tidyverse)
```

```
## -- Attaching packages --------------------------------------- tidyverse 1.3.1 --
```

```
## v tibble  3.1.4      v dplyr   1.0.7
## v tidyr   1.1.3      v stringr 1.4.0
## v readr   2.0.1      v forcats 0.5.1
```

```
## v purrr   0.3.4
```

```
## -- Conflicts --------------------------------------------- tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

```
ggplot(df) +
  aes(x = Manuf, y = as.integer(Sugars)) +
  geom_bar(stat = "identity", alpha = 0.8) +
  labs(title = "Sugars per Manufacturer",
       y = "Average Sugars",
       x = "Manufacturer") +
  theme_minimal()
```

```
## Warning: Removed 1 rows containing missing values (position_stack).
```
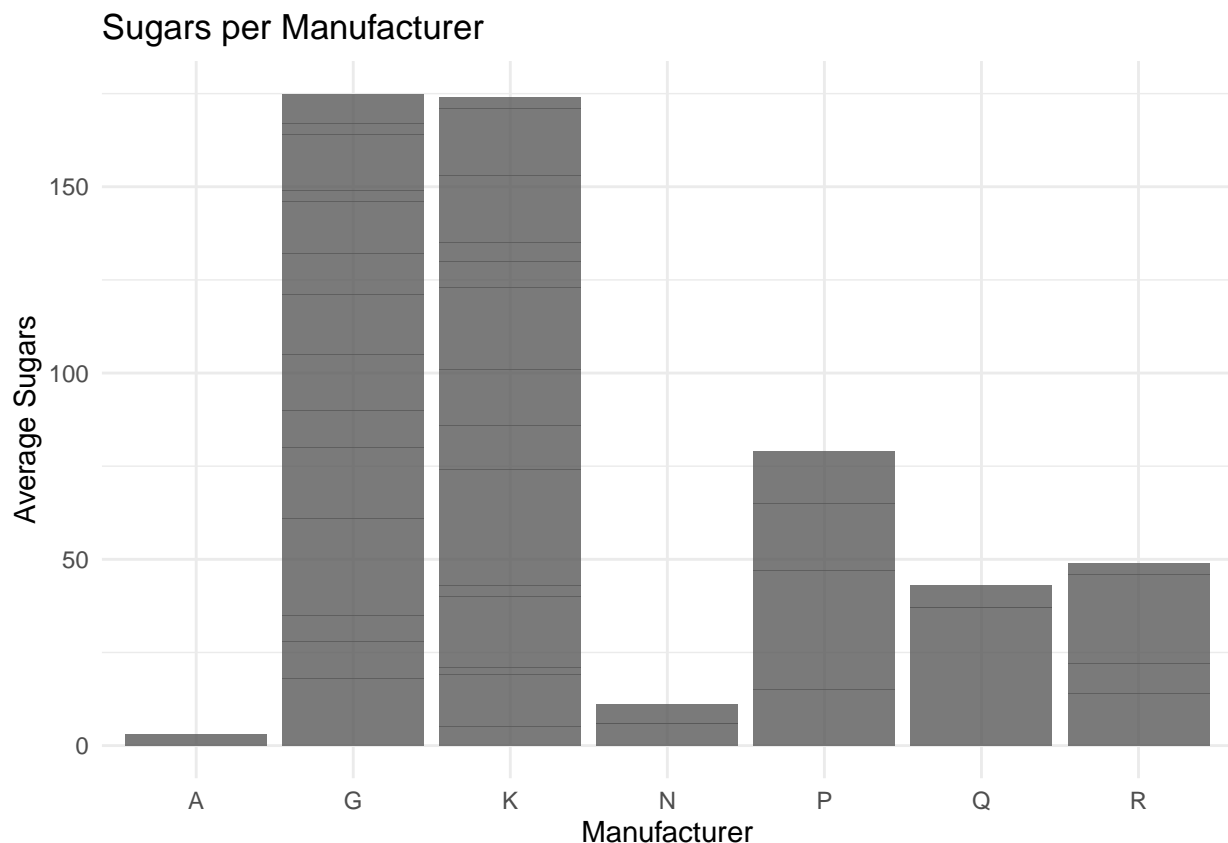


```
ggplot(df, mapping = aes(x = Name.A1.S1 , y = as.numeric(Sugars), fill = "Sugar")) +
  geom_bar( stat = "identity", alpha = .8, color = "red") +
  theme_classic() +
    theme(text = element_text(size=7)) +
  labs(title = "Sugars by Cereal",
       x = "Name of Cereal",
       y = "Sugars per Serving" ) +
  coord_flip(xlim = NULL, ylim = NULL, expand = FALSE, clip = "on")
```

```
## Warning: Removed 1 rows containing missing values (position_stack).
```

Sugars by Cereal
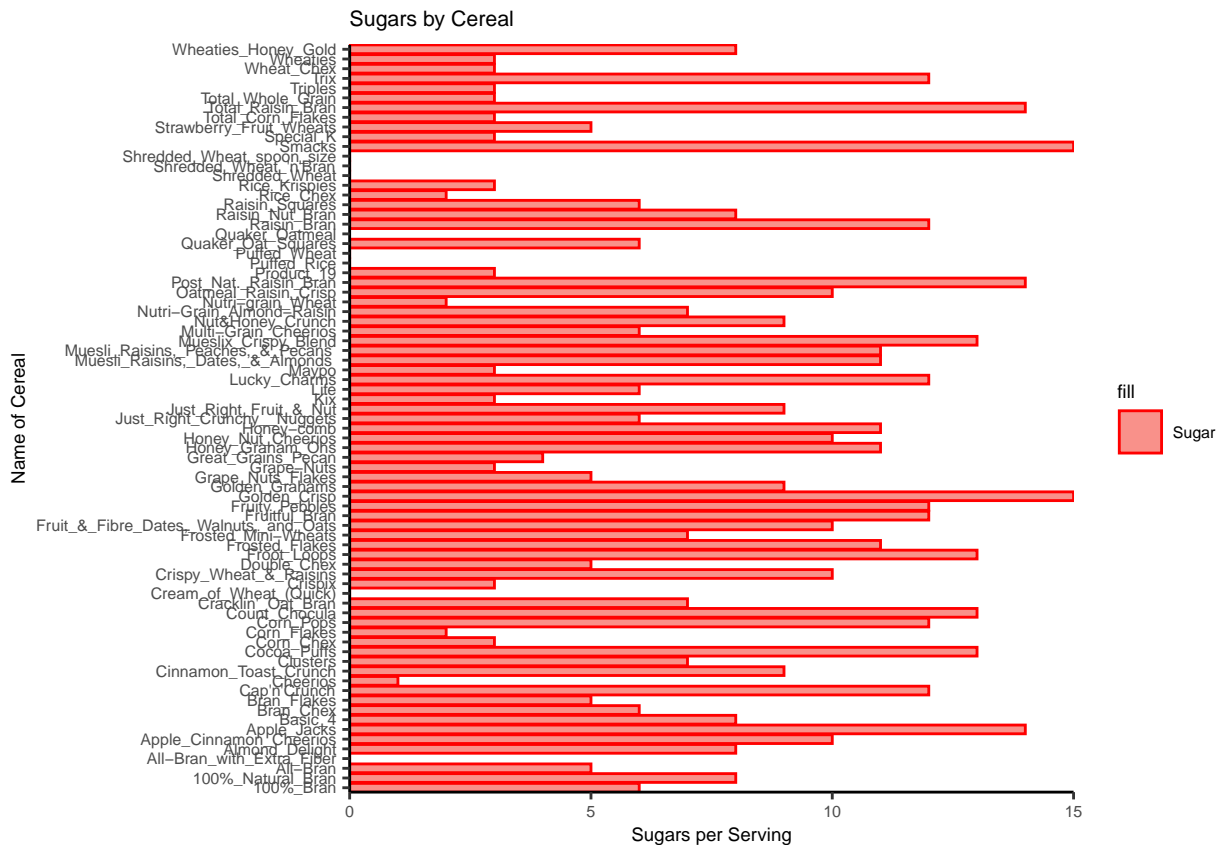
We can observe that "Smacks" and "Golden crisp" are the products with high sugar content.

Sugar Per Serving

```r
ggplot(df) +
  aes(x = Cups, fill = Sugars) +
  geom_bar() +
  facet_grid(Manuf~.) +
  labs(title = "Sugars per Serving",
       subtitle = "By Manufacturer",
       x = "Serving Size (Cups)",
       y = "Sugars per Serving" )
```

Sugars per Serving
By Manufacturer
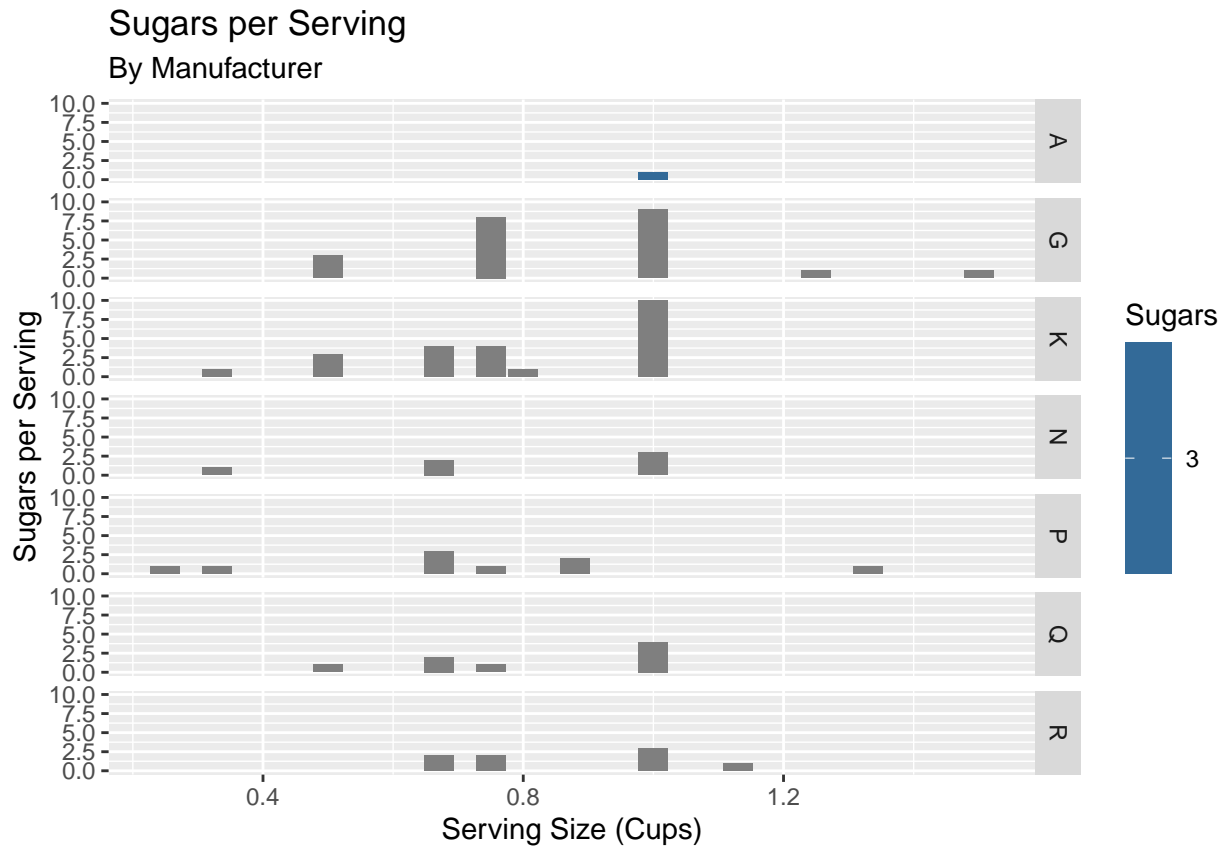
We can observe that then "Kellogg" and "General Mills" have the most amount of sugars in relation to their serving sizes.

Protien Per Serving

```
ggplot(df) +
  aes(x = Cups, fill = Protein) +
  geom_bar(position = 'dodge') +
  facet_grid(Manuf~.) +
  labs(title = "Protein per Serving",
       subtitle = "By Manufacturer",
       x = "Serving Size (Cups)",
       y = "Protein per Serving" )
```

Protein per Serving
By Manufacturer
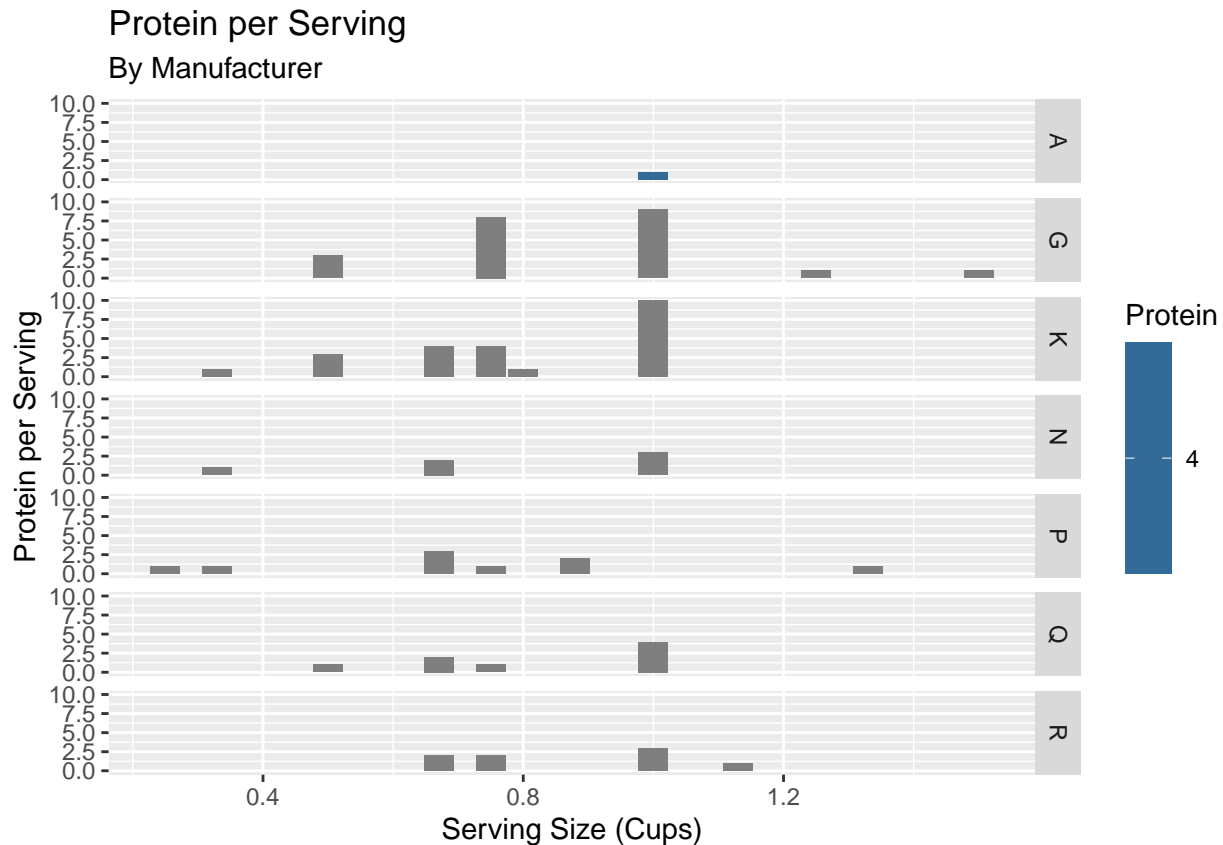
We can observe that General Mills has a wide variance in the protein content for their cereals.

Question B:

1. List the names of the items with maximum calories

```
cal=df[order(df$Calories, decreasing=TRUE), ]
cal
```

```
##                                 Name.A1.S1 Manuf Type Calories Protein Fat
## 47                    Mueslix_Crispy_Blend     K    C      160       3   2
## 45       Muesli_Raisins,_Dates,_&_Almonds     R    C      150       4   3
## 46      Muesli_Raisins,_Peaches,_&_Pecans     R    C      150       4   3
## 40                    Just_Right_Fruit_&_Nut   K    C      140       3   1
## 50                Nutri-Grain_Almond-Raisin   K    C      140       3   2
## 71                       Total_Raisin_Bran    G    C      140       3   1
## 8                                  Basic_4    G    C      130       3   2
## 52                    Oatmeal_Raisin_Crisp    G    C      130       3   2
## 2                        100%_Natural_Bran    Q    C      120       3   5
## 11                            Cap'n'Crunch    Q    C      120       1   2
## 13                    Cinnamon_Toast_Crunch   G    C      120       1   3
## 28 Fruit_&_Fibre_Dates,_Walnuts,_and_Oats    P    C      120       3   2
## 29                            Fruitful_Bran   K    C      120       3   0
## 35                       Great_Grains_Pecan   P    C      120       3   3
## 36                         Honey_Graham_Ohs   Q    C      120       1   2
```

```
## 49                     Nut&Honey_Crunch    K   C   120   2   1
## 53                Post_Nat._Raisin_Bran    P   C   120   3   1
## 59                          Raisin_Bran    K   C   120   3   1
## 5                        Almond_Delight    R   C   110   2   2
## 6                 Apple_Cinnamon_Cheerios   G   C   110   2   2
## 7                           Apple_Jacks    K   C   110   2   0
## 12                             Cheerios    G   C   110   6   2
## 14                             Clusters    G   C   110   3   2
## 15                          Cocoa_Puffs    G   C   110   1   1
## 16                            Corn_Chex    R   C   110   2   0
## 18                            Corn_Pops    K   C   110   1   0
## 19                        Count_Chocula    G   C   110   1   1
## 20                   Cracklin'_Oat_Bran    K   C   110   3   3
## 22                              Crispix    K   C   110   2   0
## 25                           Froot_Loops   K   C   110   2   1
## 26                       Frosted_Flakes    K   C   110   1   0
## 30                        Fruity_Pebbles    P   C   110   1   1
## 32                       Golden_Grahams    G   C   110   1   1
## 34                           Grape-Nuts    P   C   110   3   0
## 37                   Honey_Nut_Cheerios    G   C   110   3   1
## 38                           Honey-comb    P   C   110   1   0
## 39            Just_Right_Crunchy__Nuggets  K   C   110   2   1
## 41                                  Kix    G   C   110   2   1
## 43                          Lucky_Charms    G   C   110   2   1
## 62                            Rice_Chex    R   C   110   1   0
## 63                         Rice_Krispies   K   C   110   2   0
## 67                               Smacks    K   C   110   2   1
## 68                            Special_K    K   C   110   6   0
## 70                     Total_Corn_Flakes   G   C   110   2   1
## 73                              Triples    G   C   110   2   1
## 74                                 Trix    G   C   110   1   1
## 77                 Wheaties_Honey_Gold    G   C   110   2   1
## 17                          Corn_Flakes    K   C   100   2   0
## 21                Cream_of_Wheat_(Quick)   N   H   100   3   0
## 23               Crispy_Wheat_&_Raisins   G   C   100   2   1
## 24                          Double_Chex    R   C   100   2   0
## 27                  Frosted_Mini-Wheats    K   C   100   3   0
## 31                         Golden_Crisp    P   C   100   2   0
## 33                    Grape_Nuts_Flakes    P   C   100   3   1
## 42                                 Life    Q   C   100   4   2
## 44                                Maypo    A   H   100   4   1
## 48                  Multi-Grain_Cheerios   G   C   100   2   1
## 54                           Product_19    K   C   100   3   0
## 57                    Quaker_Oat_Squares   Q   C   100   4   1
## 58                       Quaker_Oatmeal    Q   H   100   5   2
## 60                       Raisin_Nut_Bran   G   C   100   3   2
## 72                     Total_Whole_Grain   G   C   100   3   1
## 75                           Wheat_Chex    R   C   100   3   1
## 76                             Wheaties    G   C   100   3   1
## 9                             Bran_Chex    R   C    90   2   1
## 10                           Bran_Flakes    P   C    90   3   0
## 51                    Nutri-grain_Wheat    K   C    90   3   0
## 61                       Raisin_Squares    K   C    90   2   0
## 65               Shredded_Wheat_'n'Bran    N   C    90   3   0
```

```
## 66                   Shredded_Wheat_spoon_size      N   C       90       3   0
## 69                    Strawberry_Fruit_Wheats       N   C       90       2   0
## 64                             Shredded_Wheat       N   C       80       2   0
## 1                                  100%_Bran       N   C       70       4   1
## 3                                   All-Bran       K   C       70       4   1
## 4                 All-Bran_with_Extra_Fiber        K   C       50       4   0
## 55                               Puffed_Rice       Q   C       50       1   0
## 56                              Puffed_Wheat       Q   C       50       2   0
##    Sodium Fiber Carbo Sugars Potass Vitamins Shelf Weight Cups   Rating Cold
## 47    150   3.0  17.0     13    160       25     3   1.50 0.67 30.31335    1
## 45     95   3.0  16.0     11    170       25     3   1.00 1.00 37.13686    1
## 46    150   3.0  16.0     11    170       25     3   1.00 1.00 34.13976    1
## 40    170   2.0  20.0      9     95      100     3   1.30 0.75 36.47151    1
## 50    220   3.0  21.0      7    130       25     3   1.33 0.67 40.69232    1
## 71    190   4.0  15.0     14    230      100     3   1.50 1.00 28.59278    1
## 8     210   2.0  18.0      8    100       25     3   1.33 0.75 37.03856    1
## 52    170   1.5  13.5     10    120       25     3   1.25 0.50 30.45084    1
## 2      15   2.0   8.0      8    135        0     3   1.00 1.00 33.98368    1
## 11    220   0.0  12.0     12     35       25     2   1.00 0.75 18.04285    1
## 13    210   0.0  13.0      9     45       25     2   1.00 0.75 19.82357    1
## 28    160   5.0  12.0     10    200       25     3   1.25 0.67 40.91705    1
## 29    240   5.0  14.0     12    190       25     3   1.33 0.67 41.01549    1
## 35     75   3.0  13.0      4    100       25     3   1.00 0.33 45.81172    1
## 36    220   1.0  12.0     11     45       25     2   1.00 1.00 21.87129    1
## 49    190   0.0  15.0      9     40       25     2   1.00 0.67 29.92429    1
## 53    200   6.0  11.0     14    260       25     3   1.33 0.67 37.84059    1
## 59    210   5.0  14.0     12    240       25     2   1.33 0.75 39.25920    1
## 5     200   1.0  14.0      8     NA       25     3   1.00 0.75 34.38484    1
## 6     180   1.5  10.5     10     70       25     1   1.00 0.75 29.50954    1
## 7     125   1.0  11.0     14     30       25     2   1.00 1.00 33.17409    1
## 12    290   2.0  17.0      1    105       25     1   1.00 1.25 50.76500    1
## 14    140   2.0  13.0      7    105       25     3   1.00 0.50 40.40021    1
## 15    180   0.0  12.0     13     55       25     2   1.00 1.00 22.73645    1
## 16    280   0.0  22.0      3     25       25     1   1.00 1.00 41.44502    1
## 18     90   1.0  13.0     12     20       25     2   1.00 1.00 35.78279    1
## 19    180   0.0  12.0     13     65       25     2   1.00 1.00 22.39651    1
## 20    140   4.0  10.0      7    160       25     3   1.00 0.50 40.44877    1
## 22    220   1.0  21.0      3     30       25     3   1.00 1.00 46.89564    1
## 25    125   1.0  11.0     13     30       25     2   1.00 1.00 32.20758    1
## 26    200   1.0  14.0     11     25       25     1   1.00 0.75 31.43597    1
## 30    135   0.0  13.0     12     25       25     2   1.00 0.75 28.02576    1
## 32    280   0.0  15.0      9     45       25     2   1.00 0.75 23.80404    1
## 34    170   3.0  17.0      3     90       25     3   1.00 0.25 53.37101    1
## 37    250   1.5  11.5     10     90       25     1   1.00 0.75 31.07222    1
## 38    180   0.0  14.0     11     35       25     1   1.00 1.33 28.74241    1
## 39    170   1.0  17.0      6     60      100     3   1.00 1.00 36.52368    1
## 41    260   0.0  21.0      3     40       25     2   1.00 1.50 39.24111    1
## 43    180   0.0  12.0     12     55       25     2   1.00 1.00 26.73451    1
## 62    240   0.0  23.0      2     30       25     1   1.00 1.13 41.99893    1
## 63    290   0.0  22.0      3     35       25     1   1.00 1.00 40.56016    1
## 67     70   1.0   9.0     15     40       25     2   1.00 0.75 31.23005    1
## 68    230   1.0  16.0      3     55       25     1   1.00 1.00 53.13132    1
## 70    200   0.0  21.0      3     35      100     3   1.00 1.00 38.83975    1
## 73    250   0.0  21.0      3     60       25     3   1.00 0.75 39.10617    1
```

```
## 74    140   0.0  13.0    12    25        25       2  1.00 1.00 27.75330    1
## 77    200   1.0  16.0     8    60        25       1  1.00 0.75 36.18756    1
## 17    290   1.0  21.0     2    35        25       1  1.00 1.00 45.86332    1
## 21     80   1.0  21.0     0    NA         0       2  1.00 1.00 64.53382    0
## 23    140   2.0  11.0    10   120        25       3  1.00 0.75 36.17620    1
## 24    190   1.0  18.0     5    80        25       3  1.00 0.75 44.33086    1
## 27      0   3.0  14.0     7   100        25       2  1.00 0.80 58.34514    1
## 31     45   0.0  11.0    15    40        25       1  1.00 0.88 35.25244    1
## 33    140   3.0  15.0     5    85        25       3  1.00 0.88 52.07690    1
## 42    150   2.0  12.0     6    95        25       2  1.00 0.67 45.32807    1
## 44      0   0.0  16.0     3    95        25       2  1.00 1.00 54.85092    0
## 48    220   2.0  15.0     6    90        25       1  1.00 1.00 40.10596    1
## 54    320   1.0  20.0     3    45       100       3  1.00 1.00 41.50354    1
## 57    135   2.0  14.0     6   110        25       3  1.00 0.50 49.51187    1
## 58      0   2.7    NA    NA   110         0       1  1.00 0.67 50.82839    0
## 60    140   2.5  10.5     8   140        25       3  1.00 0.50 39.70340    1
## 72    200   3.0  16.0     3   110       100       3  1.00 1.00 46.65884    1
## 75    230   3.0  17.0     3   115        25       1  1.00 0.67 49.78744    1
## 76    200   3.0  17.0     3   110        25       1  1.00 1.00 51.59219    1
## 9     200   4.0  15.0     6   125        25       1  1.00 0.67 49.12025    1
## 10    210   5.0  13.0     5   190        25       3  1.00 0.67 53.31381    1
## 51    170   3.0  18.0     2    90        25       3  1.00 1.00 59.64284    1
## 61      0   2.0  15.0     6   110        25       3  1.00 0.50 55.33314    1
## 65      0   4.0  19.0     0   140         0       1  1.00 0.67 74.47295    1
## 66      0   3.0  20.0     0   120         0       1  1.00 0.67 72.80179    1
## 69     15   3.0  15.0     5    90        25       2  1.00 1.00 59.36399    1
## 64      0   3.0  16.0     0    95         0       1  0.83 1.00 68.23588    1
## 1     130  10.0   5.0     6   280        25       3  1.00 0.33 68.40297    1
## 3     260   9.0   7.0     5   320        25       3  1.00 0.33 59.42551    1
## 4     140  14.0   8.0     0   330        25       3  1.00 0.50 93.70491    1
## 55      0   0.0  13.0     0    15         0       3  0.50 1.00 60.75611    1
## 56      0   1.0  10.0     0    50         0       3  0.50 1.00 63.00565    1
##     Nabisco Quaker Kelloggs GeneralMills Ralston AHFP
## 47        0      0        1            0       0    0
## 45        0      0        0            0       1    0
## 46        0      0        0            0       1    0
## 40        0      0        1            0       0    0
## 50        0      0        1            0       0    0
## 71        0      0        0            1       0    0
## 8         0      0        0            1       0    0
## 52        0      0        0            1       0    0
## 2         0      1        0            0       0    0
## 11        0      1        0            0       0    0
## 13        0      0        0            1       0    0
## 28        0      0        0            0       0    0
## 29        0      0        1            0       0    0
## 35        0      0        0            0       0    0
## 36        0      1        0            0       0    0
## 49        0      0        1            0       0    0
## 53        0      0        0            0       0    0
## 59        0      0        1            0       0    0
## 5         0      0        0            0       1    0
## 6         0      0        0            1       0    0
## 7         0      0        1            0       0    0
```

```
## 12          0        0        0        1        0        0
## 14          0        0        0        1        0        0
## 15          0        0        0        1        0        0
## 16          0        0        0        0        1        0
## 18          0        0        1        0        0        0
## 19          0        0        0        1        0        0
## 20          0        0        1        0        0        0
## 22          0        0        1        0        0        0
## 25          0        0        1        0        0        0
## 26          0        0        1        0        0        0
## 30          0        0        0        0        0        0
## 32          0        0        0        1        0        0
## 34          0        0        0        0        0        0
## 37          0        0        0        1        0        0
## 38          0        0        0        0        0        0
## 39          0        0        1        0        0        0
## 41          0        0        0        1        0        0
## 43          0        0        0        1        0        0
## 62          0        0        0        0        1        0
## 63          0        0        1        0        0        0
## 67          0        0        1        0        0        0
## 68          0        0        1        0        0        0
## 70          0        0        0        1        0        0
## 73          0        0        0        1        0        0
## 74          0        0        0        1        0        0
## 77          0        0        0        1        0        0
## 17          0        0        1        0        0        0
## 21          1        0        0        0        0        0
## 23          0        0        0        1        0        0
## 24          0        0        0        0        1        0
## 27          0        0        1        0        0        0
## 31          0        0        0        0        0        0
## 33          0        0        0        0        0        0
## 42          0        1        0        0        0        0
## 44          0        0        0        0        0        1
## 48          0        0        0        1        0        0
## 54          0        0        1        0        0        0
## 57          0        1        0        0        0        0
## 58          0        1        0        0        0        0
## 60          0        0        0        1        0        0
## 72          0        0        0        1        0        0
## 75          0        0        0        0        1        0
## 76          0        0        0        1        0        0
## 9           0        0        0        0        1        0
## 10          0        0        0        0        0        0
## 51          0        0        1        0        0        0
## 61          0        0        1        0        0        0
## 65          1        0        0        0        0        0
## 66          1        0        0        0        0        0
## 69          1        0        0        0        0        0
## 64          1        0        0        0        0        0
## 1           1        0        0        0        0        0
## 3           0        0        1        0        0        0
## 4           0        0        1        0        0        0
```

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```
## 55         0      1      0            0      0   0
## 56         0      1      0            0      0   0
```

```r
dfcal <-df[order(df$Calories, decreasing = TRUE),]
```

```r
head(dfcal)
```

2. Arrange and sort the data in descending order of calories

```
##                              Name.A1.S1 Manuf Type Calories Protein Fat Sodium
## 47              Mueslix_Crispy_Blend     K    C      160       3   2    150
## 45  Muesli_Raisins,_Dates,_&_Almonds    R    C      150       4   3     95
## 46 Muesli_Raisins,_Peaches,_&_Pecans    R    C      150       4   3    150
## 40              Just_Right_Fruit_&_Nut   K    C      140       3   1    170
## 50            Nutri-Grain_Almond-Raisin  K    C      140       3   2    220
## 71                  Total_Raisin_Bran    G    C      140       3   1    190
##     Fiber Carbo Sugars Potass Vitamins Shelf Weight Cups   Rating Cold Nabisco
## 47     3    17     13    160       25     3   1.50 0.67 30.31335    1       0
## 45     3    16     11    170       25     3   1.00 1.00 37.13686    1       0
## 46     3    16     11    170       25     3   1.00 1.00 34.13976    1       0
## 40     2    20      9     95      100     3   1.30 0.75 36.47151    1       0
## 50     3    21      7    130       25     3   1.33 0.67 40.69232    1       0
## 71     4    15     14    230      100     3   1.50 1.00 28.59278    1       0
##     Quaker Kelloggs GeneralMills Ralston AHFP
## 47      0        1            0       0    0
## 45      0        0            0       1    0
## 46      0        0            0       1    0
## 40      0        1            0       0    0
## 50      0        1            0       0    0
## 71      0        0            1       0    0
```

```r
dflow<-tolower(df$Name.A1.S1)
```

```r
head(dflow, 18)
```

3. Rename all the column names with lowercase letter

```
##  [1] "100%_bran"               "100%_natural_bran"
##  [3] "all-bran"                "all-bran_with_extra_fiber"
##  [5] "almond_delight"          "apple_cinnamon_cheerios"
##  [7] "apple_jacks"             "basic_4"
##  [9] "bran_chex"               "bran_flakes"
## [11] "cap'n'crunch"            "cheerios"
## [13] "cinnamon_toast_crunch"   "clusters"
## [15] "cocoa_puffs"             "corn_chex"
## [17] "corn_flakes"             "corn_pops"
```

```r
dflof<-tolower(df[1:23])
```

```r
head(dflof)
```

```
## [1] "c(\"100%_bran\", \"100%_natural_bran\", \"all-bran\", \"all-bran_with_extra_fiber\", \"almond_d
## [2] "c(\"n\", \"q\", \"k\", \"k\", \"r\", \"g\", \"k\", \"g\", \"r\", \"p\", \"q\", \"g\", \"g\", \"g
## [3] "c(\"c\", \"c\", \"c\", \"c\", \"c\", \"c\", \"c\", \"c\", \"c\", \"c\", \"c\", \"c\", \"c\", \"c
## [4] "c(70, 120, 70, 50, 110, 110, 110, 130, 90, 90, 120, 110, 120, 110, 110, 110, 100, 110, 110, 110
## [5] "c(4, 3, 4, 4, 2, 2, 2, 3, 2, 3, 1, 6, 1, 3, 1, 2, 2, 1, 1, 3, 3, 2, 2, 2, 2, 1, 3, 3, 3, 1, 2,
## [6] "c(1, 5, 1, 0, 2, 2, 0, 2, 1, 0, 2, 2, 3, 2, 1, 0, 0, 0, 1, 3, 0, 0, 1, 0, 1, 0, 0, 2, 0, 1, 0,
```

```r
names(df)[2] <- "Manufacturer"
```

```r
head(df)
```

4. Rename the column 'manuf' to 'Manufacturer

```
##                          Name.A1.S1 Manufacturer Type Calories Protein Fat Sodium Fiber
## 1                         100%_Bran              N    C       70       4   1    130  10.0
## 2                 100%_Natural_Bran              Q    C      120       3   5     15   2.0
## 3                          All-Bran              K    C       70       4   1    260   9.0
## 4      All-Bran_with_Extra_Fiber              K    C       50       4   0    140  14.0
## 5                   Almond_Delight              R    C      110       2   2    200   1.0
## 6          Apple_Cinnamon_Cheerios              G    C      110       2   2    180   1.5
##    Carbo Sugars Potass Vitamins Shelf Weight Cups   Rating Cold Nabisco Quaker
## 1    5.0      6    280       25     3      1 0.33 68.40297    1       1      0
## 2    8.0      8    135        0     3      1 1.00 33.98368    1       0      1
## 3    7.0      5    320       25     3      1 0.33 59.42551    1       0      0
## 4    8.0      0    330       25     3      1 0.50 93.70491    1       0      0
## 5   14.0      8     NA       25     3      1 0.75 34.38484    1       0      0
## 6   10.5     10     70       25     1      1 0.75 29.50954    1       0      0
##    Kelloggs GeneralMills Ralston AHFP
## 1         0            0       0    0
## 2         0            0       0    0
## 3         1            0       0    0
## 4         1            0       0    0
## 5         0            0       1    0
## 6         0            1       0    0
```

```r
rating=mean(df$Rating)
rating
```

5. List the names and details of the product having calories more than 100

```
## [1] 42.6657
```

```r
df[df$calories<100,c(1:23),df$Rating<rating]
```

```
## Warning in if (drop) {: the condition has length > 1 and only the first element
## will be used
```

```
## Warning in if (!drop) {: the condition has length > 1 and only the first element
## will be used
```

```
##  [1] Name.A1.S1    Manufacturer Type         Calories     Protein
##  [6] Fat           Sodium       Fiber        Carbo        Sugars
## [11] Potass        Vitamins     Shelf        Weight       Cups
## [16] Rating        Cold         Nabisco      Quaker       Kelloggs
## [21] GeneralMills Ralston       AHFP
## <0 rows> (or 0-length row.names)
```

6. Display the details of product made by manufacturer 'k'

C. Create a list with 4 vectors named fruits, Evennos,Mat,Amount......

```r
fruits<-c("Apple", "Orange", "Banana", "Mango")
Evennos<-c(20, 22, 24, 26, 28, 30, 32, 34, 36, 38)
Mat<-matrix(5, 4, 4)
Amount<-c(43.5, 67.8, 78.4, 99.9)
```

```r
list1<-list(fruits, Evennos, Mat, Amount)
```

```r
print(list1)
```

```
## [[1]]
## [1] "Apple"  "Orange" "Banana" "Mango"
##
## [[2]]
##  [1] 20 22 24 26 28 30 32 34 36 38
##
## [[3]]
##      [,1] [,2] [,3] [,4]
## [1,]    5    5    5    5
## [2,]    5    5    5    5
## [3,]    5    5    5    5
## [4,]    5    5    5    5
##
## [[4]]
## [1] 43.5 67.8 78.4 99.9
```