HW 1

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2/26/20

1.

1) $1/3 + 1/4 = 0.5833333$

2) $2^{10} + 1 = 1025$

3) When $f = 440$, $1127\ln(1+ f/700) = 549.6415$

4) When a = -2, b = 4, and c = -4, $\dfrac{-b \pm \sqrt{b^2-4ac}}{2a}$ = output: 0.7320508

R expressions are as below:

```
pressing    Ctrl+Shift+Enter .
9
10 ```{r}
11  # 1)
12  first <- (1/3 + 1/4)
13  print(first)
14
15  # 2)
16  second <- (2^10 + 1)
17  print(second)
18
19  # 3)
20  f <- 440
21  third <- 1127*log(1+f/700)
22  print(third)
23
24  # 4)
25  a <- 2
26  b <- 4
27  c <- -4
28  d <- b^2 - 4*a*c
29  forth <- (-b+sqrt(d)) / (2*a)
30  print(forth)
31
32  ```
```

```
[1] 0.5833333
[1] 1025
[1] 549.6415
[1] 0.7320508
```

2.

1) *R* in "fourth" was used in 6 times at Klein's, 13 times in Macy's, and 16 times in the emphatic condition. The sum of these numbers is 35. I used xtabs function and set up the conditions to earn the required data.

R expressions are as below:

```r
10  ```{r}
11  setwd("/Users/velos/Documents/r_project")
12  nyc_df <- read.csv('NYC.csv')
13
14  #Q2_1|
15  result <- ftable(xtabs(~store+word+emphasis, data=nyc_df, subset = r == "1",
    exclude = c("flooR", "normal")))
16  result
17  sum(result)
18
19  ```
```

```
                    emphasis emphatic
store    word
Klein's  fouRth                  6
Macy's   fouRth                 13
Saks     fouRth                 16
[1] 35
```

2) Regardless of use or *r*, "floor" was spoken 104 times by the employees at Klein's. Among this number, *r* was used 12 times. The percentage is approximately 11.5%.

R expressions are as below:

```r
2   {r}
3   setwd("/Users/velos/Documents/r_project")
4   nyc_df <- read.csv('NYC.csv')
5
6   #Q2_2
7
8   klns_flr <- ftable(xtabs(~word+store, data=nyc_df, exclude = c("Macy's",
    "Saks", "fouRth")))
9   klns_flr
0
1   r_flr <- ftable(xtabs(~word+store, data=nyc_df, subset = r == "1", exclude =
    c("Macy's", "Saks", "fouRth")))
2   r_flr
3
4   r_flr[1] / klns_flr[1] * 100
5
6   ```
```

```
       store Klein's
word
flooR          104
       store Klein's
word
flooR           12
[1] 11.53846
```

3) Regarding the stretch goal, I looked into the increase or decrease rate in use of r between normal and emphatic condition at each department store. I extracted table with xtabs function, and only included where the value or r equals to 1.

1. Macy's:

   "Fourth": Use of r decreased by approximately 60.61% in emphatic condition.

   "Floor": Use of r decreased by approximately 35.42% in emphatic condition.

2. Klein's:

   "Fourth": Use of r doubled in emphatic condition.

   "Floor": Use of r increased by 40% in emphatic condition.

3. Sacks:

   "Fourth": There was no change in use or r.

   "Floor": Use of r increased by approximately 32.26% in emphatic condition.

R expressions are as below:

```r
#Q2_stretch
setwd("/Users/velos/Documents/r_project")
nyc_df <- read.csv('NYC.csv')

dep_m_r <- xtabs(~store+word+r+emphasis, data=nyc_df, subset = r == "1", exclude = c("Klein's", "Saks"))
print(m_r <- ftable(dep_m_r))

print(m_r_frth <- ((m_r[4] - m_r[2]) / m_r[4]) * 100)
print(m_r_flr <- ((m_r[3] - m_r[1]) / m_r[3]) * 100 )

dep_k_r <- xtabs(~store+word+r+emphasis, data=nyc_df, subset = r == "1", exclude = c("Macy's", "Saks"))
print(k_r <- ftable(dep_k_r))

print(k_r_frth <- ((k_r[4] - k_r[2]) / k_r[4]) * 100)
print(k_r_flr <- ((k_r[3] - k_r[1]) / k_r[3]) * 100 )

dep_s_r <- xtabs(~store+word+r+emphasis, data=nyc_df, subset = r == "1", exclude = c("Macy's", "Klein's"))
print(s_r <- ftable(dep_s_r))

print(s_r_frth <- ((s_r[4] - s_r[2]) / s_r[4]) * 100)
print(s_r_flr <- ((s_r[3] - s_r[1]) / s_r[3]) * 100 )
```

```
                  emphasis emphatic normal
store   word   r
Macy's flooR   1                31     48
       fouRth 1                13     33
[1] 60.60606
[1] 35.41667
                  emphasis emphatic normal
store    word   r
Klein's flooR  1                 7      5
        fouRth 1                 6      3
[1] -100
[1] -40
                 emphasis emphatic normal
store word    r
Saks  flooR  1                21     31
      fouRth 1                16     16
[1] 0
[1] 32.25806
```

The highest *r*-lessness was shown at Macy's when the employees were saying "fourth" between both conditions. In terms of the lowest *r*-lessness, "fourth" at Klein's seems to correspond to the condition since it showed increase of use of *r* unlike other cases. Also, there are certain gaps between the output of each word, however it is difficult to find the coherent tendency.

3.

1) I read VOT.tsv file through read.table function and used quantile function to get the sample quartile of entire VOTs. Q1 = -17,975, Q2 (median) = 13.825, and Q3 = 27.365

2) I assigned a variable to for the VOTs of Spanish speaker and used mean function to get the mean. The output is -24.31306.

3) As in 2, I assigned a variable for the VOTs of English speaker and used sd function to get the standard deviation. The output is 19.86479. For the stretch goal, I used the given formula, and the output here is the same as in previous result.

R expressions are as below:

```
setwd("/Users/velos/Documents/r_project")

#Q3_1
vot_df <- read.table(file='VOT.tsv', sep = '\t', header = TRUE, fill = TRUE)
quantile(vot_df[, "vot"])

#Q3_2
vot_df_sp <- vot_df[vot_df$language == "spanish",]
mean(vot_df_sp[, "vot"])

#Q3_3
vot_df_en <- vot_df[vot_df$language == "english",]
sd(vot_df_en[, "vot"])

#Q3_stretch
val <- vot_df_en[, "vot"]

n <- length(val)
sd_stretch <- sqrt(sum((val - mean(val))^2 / (n - 1)))
sd_stretch
```

```
       0%      25%      50%      75%     100%
  -85.290  -17.975   13.825   27.365   82.860
  [1] -24.31306
  [1] 19.86479
  [1] 19.86479
```

vot_df[, "vot"] (720 values)

```
  [1] -61.56 -67.00 -56.95 -61.16 -54.46 -47.44 -72.13 -72.54 -44.53   5.78  21.63  12.75  10.72  10.02  25.46  19.07  17.96  12.99
 [19] -58.73 -61.60 -65.47 -58.28 -61.76 -68.09 -71.94 -49.73 -59.35  16.91  14.42   3.92   9.44   2.83  23.26  17.82  24.75  21.24
 [37] -52.93 -58.50 -62.50 -85.29 -62.25 -63.30 -62.05 -74.49 -59.59  11.27  13.01   6.59  16.86  20.54  23.11  15.76  17.71   3.40
 [55] -53.22 -60.86 -81.76 -65.05 -43.02 -45.63 -63.67 -75.14 -67.14   0.48  18.32  14.64  12.02  24.71   8.70   2.45  12.09  -2.56
 [73] -32.86 -70.53 -48.50 -69.61 -51.13 -69.36 -59.38 -52.38 -61.26   3.61  19.11   8.66   6.74  10.01  12.49  11.96  12.47  15.95
 [91] -62.38 -47.11 -41.69 -78.33 -62.60 -67.28 -60.26 -61.03 -68.58   6.21  15.12  17.52  11.47   4.09   1.80  20.11  15.79   9.94
[109] -62.58 -67.98 -58.55 -55.86 -61.15 -59.80 -67.93 -66.85 -79.03  13.36  17.62  39.54  16.35   8.92   4.42   4.11  19.37   7.79
[127] -52.78 -62.40 -62.51 -50.07 -70.01 -54.99 -72.20 -39.72 -62.31  10.79  12.22  25.91  21.88   8.27   2.11  18.90  10.60  18.90
[145] -47.25 -70.78 -63.00 -60.17 -58.26 -59.80 -38.90 -55.10 -66.58   2.45  -0.53   5.78   6.08   8.55   7.72  11.54   6.27  17.92
[163] -69.83 -60.67 -67.74 -56.84 -71.69 -66.30 -64.88 -67.47 -45.60  10.53  17.32   6.59  10.00  12.44  13.87  17.00  13.73  15.53
[181]  23.95  24.08  22.51  14.05  12.34  20.05  17.56  24.19  27.03  35.68  50.72  68.25  71.40  29.85  66.69  61.22  55.20  47.55
[199]   4.88  -0.95  11.36  18.18  16.66  18.07  11.06  17.27  10.27  82.86  53.69  48.69  61.73  53.87  50.49  53.25  38.53  57.76
[217]  22.36  14.76  12.97  15.36  20.56  10.63  29.21   7.91  19.82  58.75  65.61  47.95  56.67  58.43  55.26  62.25  46.39  38.32
[235]  23.79  22.50  24.14  16.57  17.20  23.98  17.01   0.68   0.53  50.26  71.56  47.67  42.64  59.14  56.34  42.64  66.42  50.27
[253]  11.37  14.99  15.99   1.94  20.82  20.94  16.04  30.93  12.88  59.01  45.33  55.35  60.71  55.28  49.57  53.21  55.42  49.18
[271]  14.18  15.11  18.97  12.33   7.70  20.83   6.50  18.98  24.50  74.80  49.46  62.58  55.50  57.71  42.99  49.69  63.78  58.45
[289]  14.30  20.11  15.61  20.80   9.71  16.40   9.42  11.83   8.83  65.19  56.59  46.14  49.33  68.72  34.00  60.38  52.54  36.88
[307]  15.89  16.79  19.90  17.58   8.85  17.96  19.37  16.45   6.75  62.68  69.93  60.18  49.76  58.66  64.99  44.50  50.77  51.79
[325]  15.30   0.56  13.16  14.89   6.42  23.86  15.31  26.29  11.16  52.59  50.15  53.65  37.48  31.71  58.82  46.94  57.23  56.26
[343]  14.71  23.80  12.63  17.87  20.57  -2.53  18.47  13.31  10.27  76.57  46.72  57.85  49.90  44.52  67.15  45.83  66.33  50.25
[361]  13.11  16.57   8.26  19.27  29.28  24.22  10.75  16.95  21.88  33.90  44.82  35.30  22.87  20.32  58.95  26.52  27.35  36.54
[379] -41.93 -64.41 -44.48 -45.12 -63.25 -49.36 -73.28 -50.38 -79.97   8.91   5.81   9.47  -5.55   5.64   5.87  14.22   7.76   9.04
[397]   7.64  12.81   8.29  -2.25  16.49  13.39  18.78  19.35  19.45  40.74  30.95  50.07  38.43  62.99  15.24  69.94  27.41  47.98
[415] -61.49 -62.35 -64.53 -54.49 -48.42 -50.36 -58.83 -57.78 -57.16  14.69  -7.38  -6.39  -4.74  15.08   8.00  16.11  14.50  -0.90
[433]   7.24   9.79  23.68   5.54  15.83  14.86  12.47  21.93  19.39  43.03  33.92  27.47  33.61  20.98  28.12  30.95  40.53  47.73
[451] -60.07 -51.82 -38.56 -60.83 -64.89 -65.19 -58.16 -61.14 -62.35  16.61  -3.47   0.77  19.27  12.34  -0.34  -2.18  -3.37   3.27
[469]   8.32   5.86  16.31  21.04   2.38  19.69  24.79  21.42  12.74  39.99  63.41  73.64  42.19  16.60  23.57  40.17  36.66  40.43
[487] -52.77 -47.77 -43.64 -56.97 -61.07 -56.94 -63.48 -54.74 -59.02  18.05  12.95  32.95  12.96  12.07  24.17  34.33   1.56  14.97
[505]  11.57  11.77  14.88  13.93   9.69  12.71  20.21  16.73  29.45  56.32  36.60  52.49  48.12  34.77  48.55  23.20  54.64  60.86
[523] -47.43 -32.13 -62.39 -65.52 -70.63 -32.28 -63.84 -75.55 -31.55  -9.75   7.72  -2.17   5.43  -7.72  12.08  18.66  28.09  17.51
[541]  14.47  10.52  12.04  15.01  10.63  14.58   3.42  22.65  30.41  62.03  50.56  34.21  48.01  34.13  27.58  49.63  34.54  70.68
[559] -54.68 -74.98 -67.83 -67.11 -59.46 -52.95 -61.94 -49.28 -77.18   5.65  20.06   1.29   6.83  19.59  15.41   0.64   0.58  -9.66
[577]  14.19  20.66  23.02  10.59  15.60  11.02  13.77  20.73  25.18  33.64  58.76  80.16  63.03  54.24  54.41  42.30  54.79  42.20
[595] -51.14 -62.48 -62.60 -65.71 -46.84 -58.06 -54.78 -53.74 -57.03  22.54   4.77  23.19  -3.76  13.07 -14.12  10.10   1.08 -11.53
[613]  22.91  21.23  25.32  14.07  25.21   3.24  23.15  28.27  13.27  55.38  41.38  65.45  47.53  46.57  49.03  53.17  39.08  16.08
[631] -68.42 -57.72 -71.11 -68.51 -54.86 -74.31 -45.04 -38.19 -64.88  20.53  12.65   5.82  12.81  11.00  19.48  -0.41  15.22   1.39
[649]  16.31  23.07  13.11  23.51  13.78  24.18  19.65  10.34   7.25  21.71  57.13  50.28  51.73  53.42  77.16  54.51  40.54  49.75
[667] -53.85 -58.55 -46.89 -65.05 -66.94 -53.28 -57.54 -68.72 -77.49  -1.83   5.67  29.46  14.05  11.27  31.55  17.60   4.21  -6.66
[685]  15.82  13.05  15.14  10.20   9.62  20.43  28.33   7.94  16.64  34.85  70.66  22.34  49.94  50.37  52.64  36.87  26.64  50.56
[703] -69.52 -64.61 -59.98 -58.96 -29.54 -59.33 -59.57 -55.92 -35.68  17.22   6.65   1.74  15.84  18.41   0.57  10.48   1.52  22.99
```

vod_df_sp[, "vot"] and vot_df_en[, "vot"] (360 values respectively)

```
  [1] -61.56 -67.00 -56.95 -61.16 -54.46 -47.44 -72.13 -72.54 -44.53   5.78  21.63  12.75  10.72  10.02  25.46  19.07  17.96  12.99
 [19] -58.73 -61.60 -65.47 -58.28 -61.76 -68.09 -71.94 -49.73 -59.35  16.91  14.42   3.92   9.44   2.83  23.26  17.82  24.75  21.24
 [37] -52.93 -58.50 -62.50 -85.29 -62.25 -63.30 -62.05 -74.49 -59.59  11.27  13.01   6.59  16.86  20.54  23.11  15.76  17.71   3.40
 [55] -53.22 -60.86 -81.76 -65.05 -43.02 -45.63 -63.67 -75.14 -67.14   0.48  18.32  14.64  12.02  24.71   8.70   2.45  12.09  -2.56
 [73] -32.86 -70.53 -48.50 -69.61 -51.13 -69.36 -59.38 -52.38 -61.26   3.61  19.11   8.66   6.74  10.01  12.49  11.96  12.47  15.95
 [91] -62.38 -47.11 -41.69 -78.33 -62.60 -67.28 -60.26 -61.03 -68.58   6.21  15.12  17.52  11.47   4.09   1.80  20.11  15.79   9.94
[109] -62.58 -67.98 -58.55 -55.86 -61.15 -59.80 -67.93 -66.85 -79.03  13.36  17.62  39.54  16.35   8.92   4.42   4.11  19.37   7.79
[127] -52.78 -62.40 -62.51 -50.07 -70.01 -54.99 -72.20 -39.72 -62.31  10.79  12.22  25.91  21.88   8.27   2.11  18.90  10.60  18.90
[145] -47.25 -70.78 -63.00 -60.17 -58.26 -59.80 -38.90 -55.10 -66.58   2.45  -0.53   5.78   6.08   8.55   7.72  11.54   6.27  17.92
[163] -69.83 -60.67 -67.74 -56.84 -71.69 -66.30 -64.88 -67.47 -45.60  10.53  17.32   6.59  10.00  12.44  13.87  17.00  13.73  15.53
[181] -41.93 -64.41 -44.48 -45.12 -63.25 -49.36 -73.28 -50.38 -79.97   8.91   5.81   9.47  -5.55   5.64   5.87  14.22   7.76   9.04
[199] -61.49 -62.35 -64.53 -54.49 -48.42 -50.36 -58.83 -57.78 -57.16  14.69  -7.38  -6.39  -4.74  15.08   8.00  16.11  14.50  -0.90
[217] -60.07 -51.82 -38.56 -60.83 -64.89 -65.19 -58.16 -61.14 -62.35  16.61  -3.47   0.77  19.27  12.34  -0.34  -2.18  -3.37   3.27
[235] -52.77 -47.77 -43.64 -56.97 -61.07 -56.94 -63.48 -54.74 -59.02  18.05  12.95  32.95  12.96  12.07  24.17  34.33   1.56  14.97
[253] -47.43 -32.13 -62.39 -65.52 -70.63 -32.28 -63.84 -75.55 -31.55  -9.75   7.72  -2.17   5.43  -7.72  12.08  18.66  28.09  17.51
[271] -54.68 -74.98 -67.83 -67.11 -59.46 -52.95 -61.94 -49.28 -77.18   5.65  20.06   1.29   6.83  19.59  15.41   0.64   0.58  -9.66
[289] -51.14 -62.48 -62.60 -65.71 -46.84 -58.06 -54.78 -53.74 -57.03  22.54   4.77  23.19  -3.76  13.07 -14.12  10.10   1.08 -11.53
[307] -68.42 -57.72 -71.11 -68.51 -54.86 -74.31 -45.04 -38.19 -64.88  20.53  12.65   5.82  12.81  11.00  19.48  -0.41  15.22   1.39
[325] -53.85 -58.55 -46.89 -65.05 -66.94 -53.28 -57.54 -68.72 -77.49  -1.83   5.67  29.46  14.05  11.27  31.55  17.60   4.21  -6.66
[343] -69.52 -64.61 -59.98 -58.96 -29.54 -59.33 -59.57 -55.92 -35.68  17.22   6.65   1.74  15.84  18.41   0.57  10.48   1.52  22.99
  [1]  23.95  24.08  22.51  14.05  12.34  20.05  17.56  24.19  27.03  35.68  50.72  68.25  71.40  29.85  66.69  61.22  55.20  47.55   4.88  -0.95  11.36
 [22]  18.18  16.66  18.07  11.06  17.27  10.27  82.86  53.69  48.69  61.73  53.87  50.49  53.25  38.53  57.76  22.36  14.76  12.97  15.36  20.56  10.63
 [43]  29.21   7.91  19.82  58.75  65.61  47.95  56.67  58.43  55.26  62.25  46.39  38.32  23.79  22.50  24.14  16.57  17.20  23.98  17.01   0.68   0.53
 [64]  50.26  71.56  47.67  42.64  59.14  56.34  42.64  66.42  50.27  11.37  14.99  15.99   1.94  20.82  20.94  16.04  30.93  12.88  59.01  45.33  55.35
 [85]  60.71  55.28  49.57  53.21  55.42  49.18  14.18  15.11  18.97  12.33   7.70  20.83   6.50  18.98  24.50  74.80  49.46  62.58  55.50  57.71  42.99
[106]  49.69  63.78  58.45  14.30  20.11  15.61  20.80   9.71  16.40   9.42  11.83   8.83  65.19  56.59  46.14  49.33  68.72  34.00  60.38  52.54  36.88
[127]  15.89  16.79  19.90  17.58   8.85  17.96  19.37  16.45   6.75  62.68  69.93  60.18  49.76  58.66  64.99  44.50  50.77  51.79  15.30   0.56  13.16
[148]  14.89   6.42  23.86  15.31  26.29  11.16  52.59  50.15  53.65  37.48  31.71  58.82  46.94  57.23  56.26  14.71  23.80  12.63  17.87  20.57  -2.53
[169]  18.47  13.31  10.27  76.57  46.72  57.85  49.90  44.52  67.15  45.83  66.33  50.25  13.11  16.57   8.26  19.27  29.28  24.22  10.75  16.95  21.88
[190]  33.90  44.82  35.30  22.87  20.32  58.95  26.52  27.35  36.54   7.64  12.81   8.29  -2.25  16.49  13.39  18.78  19.35  19.45  40.74  30.95  50.07
[211]  38.43  62.99  15.24  69.94  27.41  47.98   7.24   9.79  23.68   5.54  15.83  14.86  12.47  21.93  19.39  43.03  33.92  27.47  33.61  20.98  28.12
[232]  30.95  40.53  47.73   8.32   5.86  16.31  21.04   2.38  19.69  24.79  21.42  12.74  39.99  63.41  73.64  42.19  16.60  23.57  40.17  36.66  40.43
[253]  11.57  11.77  14.88  13.93   9.69  12.71  20.21  16.73  29.45  56.32  36.60  52.49  48.12  34.77  48.55  23.20  54.64  60.86  14.47  10.52  12.04
[274]  15.01  10.63  14.58   3.42  22.65  30.41  62.03  50.56  34.21  48.01  34.13  27.58  49.63  34.54  70.68  14.19  20.66  23.02  10.59  15.60  11.02
[295]  13.77  20.73  25.18  33.64  58.76  80.16  63.03  54.24  54.41  42.30  54.79  42.20  22.91  21.23  25.32  14.07  25.21   3.24  23.15  28.27  13.27
[316]  55.38  41.38  65.45  47.53  46.57  49.03  53.17  39.08  16.08  16.31  23.07  13.11  23.51  13.78  24.18  19.65  10.34   7.25  21.71  57.13  50.28
[337]  51.73  53.42  77.16  54.51  40.54  49.75  15.82  13.05  15.14  10.20   9.62  20.43  28.33   7.94  16.64  34.85  70.66  22.34  49.94  50.37  52.64
[358]  36.87  26.64  50.56
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