Assignment V2

R Markdown

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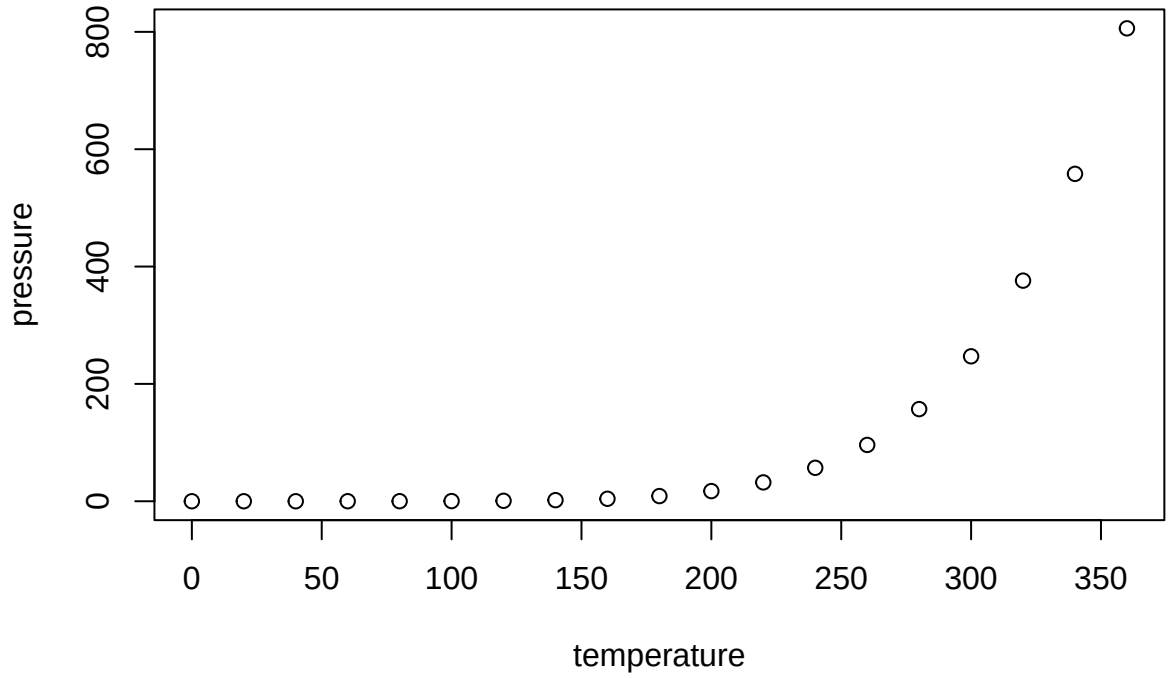
When you click the **Knit** button a document will be generated that includes both content as well as the output of any embedded R code chunks within the document. You can embed an R code chunk like this:

```
summary(cars)
```

```
##      speed           dist       
##  Min.   : 4.0   Min.   :  2.00  
##  1st Qu.:12.0   1st Qu.: 26.00  
##  Median :15.0   Median : 36.00  
##  Mean   :15.4   Mean   : 42.98  
##  3rd Qu.:19.0   3rd Qu.: 56.00  
##  Max.   :25.0   Max.   :120.00
```

```
plot(pressure)
```



Q1 - Introduction You own a supermarket mall and through membership cards , you have some basic data about your customers like Customer ID, age, gender, annual income and spending score. Spending Score is something you assign to the customer based on your defined parameters like customer behavior and purchasing data. You own the mall and want to understand the customers like who can be easily converge [Target Customers] so that the sense can be given to marketing team and plan the strategy accordingly.

```
##{r load-packages, include=FALSE}
library(dplyr)
```

```
##
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':
##
##     filter, lag

## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
library(magrittr)
library(knitr)
library(tidyr)
```

```
##
## Attaching package: 'tidyr'
```

```
## The following object is masked from 'package:magrittr':
##
##     extract
```

```
library(ggplot2)
Mall = read.csv("Mall_Customers.csv")
## Q2
str(Mall)
```

```
## 'data.frame':    200 obs. of  5 variables:
##  $ CustomerID            : int  1 2 3 4 5 6 7 8 9 10 ...
##  $ Gender                : chr  "Male" "Male" "Female" "Female" ...
##  $ Age                   : int  19 21 20 23 31 22 35 23 64 30 ...
##  $ Annual.Income..k..    : int  15 15 16 16 17 17 18 18 19 19 ...
##  $ Spending.Score..1.100.: int  39 81 6 77 40 76 6 94 3 72 ...
```

```
## Q3
names(Mall)
```

```
## [1] "CustomerID"             "Gender"                 "Age"
## [4] "Annual.Income..k.."     "Spending.Score..1.100."
```

```
## Q4
head(Mall, n=15)
```

```
##    CustomerID Gender Age Annual.Income..k.. Spending.Score..1.100.
## 1           1   Male  19                 15                     39
## 2           2   Male  21                 15                     81
## 3           3 Female  20                 16                      6
## 4           4 Female  23                 16                     77
## 5           5 Female  31                 17                     40
## 6           6 Female  22                 17                     76
## 7           7 Female  35                 18                      6
## 8           8 Female  23                 18                     94
## 9           9   Male  64                 19                      3
## 10         10 Female  30                 19                     72
## 11         11   Male  67                 19                     14
## 12         12 Female  35                 19                     99
## 13         13 Female  58                 20                     15
## 14         14 Female  24                 20                     77
## 15         15   Male  37                 20                     13
```

```
##Q5
sum_of_square <- function(x,y) {x^2 + y^2}

sum_of_square(3,4)
```

```
## [1] 25
```

```
## Q6
as.data.frame(Mall %>% select(1:3))
```

```
##     CustomerID Gender Age
## 1            1   Male  19
## 2            2   Male  21
## 3            3 Female  20
## 4            4 Female  23
## 5            5 Female  31
## 6            6 Female  22
## 7            7 Female  35
## 8            8 Female  23
## 9            9   Male  64
## 10          10 Female  30
## 11          11   Male  67
## 12          12 Female  35
## 13          13 Female  58
## 14          14 Female  24
## 15          15   Male  37
## 16          16   Male  22
## 17          17 Female  35
## 18          18   Male  20
## 19          19   Male  52
## 20          20 Female  35
## 21          21   Male  35
## 22          22   Male  25
## 23          23 Female  46
## 24          24   Male  31
## 25          25 Female  54
## 26          26   Male  29
## 27          27 Female  45
## 28          28   Male  35
## 29          29 Female  40
## 30          30 Female  23
## 31          31   Male  60
## 32          32 Female  21
## 33          33   Male  53
## 34          34   Male  18
## 35          35 Female  49
## 36          36 Female  21
## 37          37 Female  42
## 38          38 Female  30
## 39          39 Female  36
## 40          40 Female  20
## 41          41 Female  65
## 42          42   Male  24
## 43          43   Male  48
## 44          44 Female  31
## 45          45 Female  49
## 46          46 Female  24
## 47          47 Female  50
## 48          48 Female  27
## 49          49 Female  29
```

```
## 50          50 Female  31
## 51          51 Female  49
## 52          52   Male  33
## 53          53 Female  31
## 54          54   Male  59
## 55          55 Female  50
## 56          56   Male  47
## 57          57 Female  51
## 58          58   Male  69
## 59          59 Female  27
## 60          60   Male  53
## 61          61   Male  70
## 62          62   Male  19
## 63          63 Female  67
## 64          64 Female  54
## 65          65   Male  63
## 66          66   Male  18
## 67          67 Female  43
## 68          68 Female  68
## 69          69   Male  19
## 70          70 Female  32
## 71          71   Male  70
## 72          72 Female  47
## 73          73 Female  60
## 74          74 Female  60
## 75          75   Male  59
## 76          76   Male  26
## 77          77 Female  45
## 78          78   Male  40
## 79          79 Female  23
## 80          80 Female  49
## 81          81   Male  57
## 82          82   Male  38
## 83          83   Male  67
## 84          84 Female  46
## 85          85 Female  21
## 86          86   Male  48
## 87          87 Female  55
## 88          88 Female  22
## 89          89 Female  34
## 90          90 Female  50
## 91          91 Female  68
## 92          92   Male  18
## 93          93   Male  48
## 94          94 Female  40
## 95          95 Female  32
## 96          96   Male  24
## 97          97 Female  47
## 98          98 Female  27
## 99          99   Male  48
## 100        100   Male  20
## 101        101 Female  23
## 102        102 Female  49
## 103        103   Male  67
```

```
## 104        104   Male  26
## 105        105   Male  49
## 106        106 Female  21
## 107        107 Female  66
## 108        108   Male  54
## 109        109   Male  68
## 110        110   Male  66
## 111        111   Male  65
## 112        112 Female  19
## 113        113 Female  38
## 114        114   Male  19
## 115        115 Female  18
## 116        116 Female  19
## 117        117 Female  63
## 118        118 Female  49
## 119        119 Female  51
## 120        120 Female  50
## 121        121   Male  27
## 122        122 Female  38
## 123        123 Female  40
## 124        124   Male  39
## 125        125 Female  23
## 126        126 Female  31
## 127        127   Male  43
## 128        128   Male  40
## 129        129   Male  59
## 130        130   Male  38
## 131        131   Male  47
## 132        132   Male  39
## 133        133 Female  25
## 134        134 Female  31
## 135        135   Male  20
## 136        136 Female  29
## 137        137 Female  44
## 138        138   Male  32
## 139        139   Male  19
## 140        140 Female  35
## 141        141 Female  57
## 142        142   Male  32
## 143        143 Female  28
## 144        144 Female  32
## 145        145   Male  25
## 146        146   Male  28
## 147        147   Male  48
## 148        148 Female  32
## 149        149 Female  34
## 150        150   Male  34
## 151        151   Male  43
## 152        152   Male  39
## 153        153 Female  44
## 154        154 Female  38
## 155        155 Female  47
## 156        156 Female  27
## 157        157   Male  37
```

```
## 158        158 Female  30
## 159        159   Male  34
## 160        160 Female  30
## 161        161 Female  56
## 162        162 Female  29
## 163        163   Male  19
## 164        164 Female  31
## 165        165   Male  50
## 166        166 Female  36
## 167        167   Male  42
## 168        168 Female  33
## 169        169 Female  36
## 170        170   Male  32
## 171        171   Male  40
## 172        172   Male  28
## 173        173   Male  36
## 174        174   Male  36
## 175        175 Female  52
## 176        176 Female  30
## 177        177   Male  58
## 178        178   Male  27
## 179        179   Male  59
## 180        180   Male  35
## 181        181 Female  37
## 182        182 Female  32
## 183        183   Male  46
## 184        184 Female  29
## 185        185 Female  41
## 186        186   Male  30
## 187        187 Female  54
## 188        188   Male  28
## 189        189 Female  41
## 190        190 Female  36
## 191        191 Female  34
## 192        192 Female  32
## 193        193   Male  33
## 194        194 Female  38
## 195        195 Female  47
## 196        196 Female  35
## 197        197 Female  45
## 198        198   Male  32
## 199        199   Male  32
## 200        200   Male  30
```

```
# Q8
Mall %>% drop_na()
```

```
##     CustomerID Gender Age Annual.Income..k.. Spending.Score..1.100.
## 1            1   Male  19                 15                     39
## 2            2   Male  21                 15                     81
## 3            3 Female  20                 16                      6
## 4            4 Female  23                 16                     77
## 5            5 Female  31                 17                     40
## 6            6 Female  22                 17                     76
```

```
## 7           7 Female  35              18               6
## 8           8 Female  23              18              94
## 9           9   Male  64              19               3
## 10         10 Female  30              19              72
## 11         11   Male  67              19              14
## 12         12 Female  35              19              99
## 13         13 Female  58              20              15
## 14         14 Female  24              20              77
## 15         15   Male  37              20              13
## 16         16   Male  22              20              79
## 17         17 Female  35              21              35
## 18         18   Male  20              21              66
## 19         19   Male  52              23              29
## 20         20 Female  35              23              98
## 21         21   Male  35              24              35
## 22         22   Male  25              24              73
## 23         23 Female  46              25               5
## 24         24   Male  31              25              73
## 25         25 Female  54              28              14
## 26         26   Male  29              28              82
## 27         27 Female  45              28              32
## 28         28   Male  35              28              61
## 29         29 Female  40              29              31
## 30         30 Female  23              29              87
## 31         31   Male  60              30               4
## 32         32 Female  21              30              73
## 33         33   Male  53              33               4
## 34         34   Male  18              33              92
## 35         35 Female  49              33              14
## 36         36 Female  21              33              81
## 37         37 Female  42              34              17
## 38         38 Female  30              34              73
## 39         39 Female  36              37              26
## 40         40 Female  20              37              75
## 41         41 Female  65              38              35
## 42         42   Male  24              38              92
## 43         43   Male  48              39              36
## 44         44 Female  31              39              61
## 45         45 Female  49              39              28
## 46         46 Female  24              39              65
## 47         47 Female  50              40              55
## 48         48 Female  27              40              47
## 49         49 Female  29              40              42
## 50         50 Female  31              40              42
## 51         51 Female  49              42              52
## 52         52   Male  33              42              60
## 53         53 Female  31              43              54
## 54         54   Male  59              43              60
## 55         55 Female  50              43              45
## 56         56   Male  47              43              41
## 57         57 Female  51              44              50
## 58         58   Male  69              44              46
## 59         59 Female  27              46              51
## 60         60   Male  53              46              46
```

```
## 61          61   Male  70                46                    56
## 62          62   Male  19                46                    55
## 63          63 Female  67                47                    52
## 64          64 Female  54                47                    59
## 65          65   Male  63                48                    51
## 66          66   Male  18                48                    59
## 67          67 Female  43                48                    50
## 68          68 Female  68                48                    48
## 69          69   Male  19                48                    59
## 70          70 Female  32                48                    47
## 71          71   Male  70                49                    55
## 72          72 Female  47                49                    42
## 73          73 Female  60                50                    49
## 74          74 Female  60                50                    56
## 75          75   Male  59                54                    47
## 76          76   Male  26                54                    54
## 77          77 Female  45                54                    53
## 78          78   Male  40                54                    48
## 79          79 Female  23                54                    52
## 80          80 Female  49                54                    42
## 81          81   Male  57                54                    51
## 82          82   Male  38                54                    55
## 83          83   Male  67                54                    41
## 84          84 Female  46                54                    44
## 85          85 Female  21                54                    57
## 86          86   Male  48                54                    46
## 87          87 Female  55                57                    58
## 88          88 Female  22                57                    55
## 89          89 Female  34                58                    60
## 90          90 Female  50                58                    46
## 91          91 Female  68                59                    55
## 92          92   Male  18                59                    41
## 93          93   Male  48                60                    49
## 94          94 Female  40                60                    40
## 95          95 Female  32                60                    42
## 96          96   Male  24                60                    52
## 97          97 Female  47                60                    47
## 98          98 Female  27                60                    50
## 99          99   Male  48                61                    42
## 100        100   Male  20                61                    49
## 101        101 Female  23                62                    41
## 102        102 Female  49                62                    48
## 103        103   Male  67                62                    59
## 104        104   Male  26                62                    55
## 105        105   Male  49                62                    56
## 106        106 Female  21                62                    42
## 107        107 Female  66                63                    50
## 108        108   Male  54                63                    46
## 109        109   Male  68                63                    43
## 110        110   Male  66                63                    48
## 111        111   Male  65                63                    52
## 112        112 Female  19                63                    54
## 113        113 Female  38                64                    42
## 114        114   Male  19                64                    46
```

```
## 115        115 Female  18                65                48
## 116        116 Female  19                65                50
## 117        117 Female  63                65                43
## 118        118 Female  49                65                59
## 119        119 Female  51                67                43
## 120        120 Female  50                67                57
## 121        121   Male  27                67                56
## 122        122 Female  38                67                40
## 123        123 Female  40                69                58
## 124        124   Male  39                69                91
## 125        125 Female  23                70                29
## 126        126 Female  31                70                77
## 127        127   Male  43                71                35
## 128        128   Male  40                71                95
## 129        129   Male  59                71                11
## 130        130   Male  38                71                75
## 131        131   Male  47                71                 9
## 132        132   Male  39                71                75
## 133        133 Female  25                72                34
## 134        134 Female  31                72                71
## 135        135   Male  20                73                 5
## 136        136 Female  29                73                88
## 137        137 Female  44                73                 7
## 138        138   Male  32                73                73
## 139        139   Male  19                74                10
## 140        140 Female  35                74                72
## 141        141 Female  57                75                 5
## 142        142   Male  32                75                93
## 143        143 Female  28                76                40
## 144        144 Female  32                76                87
## 145        145   Male  25                77                12
## 146        146   Male  28                77                97
## 147        147   Male  48                77                36
## 148        148 Female  32                77                74
## 149        149 Female  34                78                22
## 150        150   Male  34                78                90
## 151        151   Male  43                78                17
## 152        152   Male  39                78                88
## 153        153 Female  44                78                20
## 154        154 Female  38                78                76
## 155        155 Female  47                78                16
## 156        156 Female  27                78                89
## 157        157   Male  37                78                 1
## 158        158 Female  30                78                78
## 159        159   Male  34                78                 1
## 160        160 Female  30                78                73
## 161        161 Female  56                79                35
## 162        162 Female  29                79                83
## 163        163   Male  19                81                 5
## 164        164 Female  31                81                93
## 165        165   Male  50                85                26
## 166        166 Female  36                85                75
## 167        167   Male  42                86                20
## 168        168 Female  33                86                95
```

```
## 169        169 Female  36                  87                       27
## 170        170   Male  32                  87                       63
## 171        171   Male  40                  87                       13
## 172        172   Male  28                  87                       75
## 173        173   Male  36                  87                       10
## 174        174   Male  36                  87                       92
## 175        175 Female  52                  88                       13
## 176        176 Female  30                  88                       86
## 177        177   Male  58                  88                       15
## 178        178   Male  27                  88                       69
## 179        179   Male  59                  93                       14
## 180        180   Male  35                  93                       90
## 181        181 Female  37                  97                       32
## 182        182 Female  32                  97                       86
## 183        183   Male  46                  98                       15
## 184        184 Female  29                  98                       88
## 185        185 Female  41                  99                       39
## 186        186   Male  30                  99                       97
## 187        187 Female  54                 101                       24
## 188        188   Male  28                 101                       68
## 189        189 Female  41                 103                       17
## 190        190 Female  36                 103                       85
## 191        191 Female  34                 103                       23
## 192        192 Female  32                 103                       69
## 193        193   Male  33                 113                        8
## 194        194 Female  38                 113                       91
## 195        195 Female  47                 120                       16
## 196        196 Female  35                 120                       79
## 197        197 Female  45                 126                       28
## 198        198   Male  32                 126                       74
## 199        199   Male  32                 137                       18
## 200        200   Male  30                 137                       83
```

```
# Q9
Mall %>% distinct()
```

```
##     CustomerID Gender Age Annual.Income..k.. Spending.Score..1.100.
## 1            1   Male  19                  15                       39
## 2            2   Male  21                  15                       81
## 3            3 Female  20                  16                        6
## 4            4 Female  23                  16                       77
## 5            5 Female  31                  17                       40
## 6            6 Female  22                  17                       76
## 7            7 Female  35                  18                        6
## 8            8 Female  23                  18                       94
## 9            9   Male  64                  19                        3
## 10          10 Female  30                  19                       72
## 11          11   Male  67                  19                       14
## 12          12 Female  35                  19                       99
## 13          13 Female  58                  20                       15
## 14          14 Female  24                  20                       77
## 15          15   Male  37                  20                       13
## 16          16   Male  22                  20                       79
## 17          17 Female  35                  21                       35
```

```
## 18          18   Male  20              21                  66
## 19          19   Male  52              23                  29
## 20          20 Female  35              23                  98
## 21          21   Male  35              24                  35
## 22          22   Male  25              24                  73
## 23          23 Female  46              25                   5
## 24          24   Male  31              25                  73
## 25          25 Female  54              28                  14
## 26          26   Male  29              28                  82
## 27          27 Female  45              28                  32
## 28          28   Male  35              28                  61
## 29          29 Female  40              29                  31
## 30          30 Female  23              29                  87
## 31          31   Male  60              30                   4
## 32          32 Female  21              30                  73
## 33          33   Male  53              33                   4
## 34          34   Male  18              33                  92
## 35          35 Female  49              33                  14
## 36          36 Female  21              33                  81
## 37          37 Female  42              34                  17
## 38          38 Female  30              34                  73
## 39          39 Female  36              37                  26
## 40          40 Female  20              37                  75
## 41          41 Female  65              38                  35
## 42          42   Male  24              38                  92
## 43          43   Male  48              39                  36
## 44          44 Female  31              39                  61
## 45          45 Female  49              39                  28
## 46          46 Female  24              39                  65
## 47          47 Female  50              40                  55
## 48          48 Female  27              40                  47
## 49          49 Female  29              40                  42
## 50          50 Female  31              40                  42
## 51          51 Female  49              42                  52
## 52          52   Male  33              42                  60
## 53          53 Female  31              43                  54
## 54          54   Male  59              43                  60
## 55          55 Female  50              43                  45
## 56          56   Male  47              43                  41
## 57          57 Female  51              44                  50
## 58          58   Male  69              44                  46
## 59          59 Female  27              46                  51
## 60          60   Male  53              46                  46
## 61          61   Male  70              46                  56
## 62          62   Male  19              46                  55
## 63          63 Female  67              47                  52
## 64          64 Female  54              47                  59
## 65          65   Male  63              48                  51
## 66          66   Male  18              48                  59
## 67          67 Female  43              48                  50
## 68          68 Female  68              48                  48
## 69          69   Male  19              48                  59
## 70          70 Female  32              48                  47
## 71          71   Male  70              49                  55
```

```
## 72          72 Female  47                49                42
## 73          73 Female  60                50                49
## 74          74 Female  60                50                56
## 75          75   Male  59                54                47
## 76          76   Male  26                54                54
## 77          77 Female  45                54                53
## 78          78   Male  40                54                48
## 79          79 Female  23                54                52
## 80          80 Female  49                54                42
## 81          81   Male  57                54                51
## 82          82   Male  38                54                55
## 83          83   Male  67                54                41
## 84          84 Female  46                54                44
## 85          85 Female  21                54                57
## 86          86   Male  48                54                46
## 87          87 Female  55                57                58
## 88          88 Female  22                57                55
## 89          89 Female  34                58                60
## 90          90 Female  50                58                46
## 91          91 Female  68                59                55
## 92          92   Male  18                59                41
## 93          93   Male  48                60                49
## 94          94 Female  40                60                40
## 95          95 Female  32                60                42
## 96          96   Male  24                60                52
## 97          97 Female  47                60                47
## 98          98 Female  27                60                50
## 99          99   Male  48                61                42
## 100        100   Male  20                61                49
## 101        101 Female  23                62                41
## 102        102 Female  49                62                48
## 103        103   Male  67                62                59
## 104        104   Male  26                62                55
## 105        105   Male  49                62                56
## 106        106 Female  21                62                42
## 107        107 Female  66                63                50
## 108        108   Male  54                63                46
## 109        109   Male  68                63                43
## 110        110   Male  66                63                48
## 111        111   Male  65                63                52
## 112        112 Female  19                63                54
## 113        113 Female  38                64                42
## 114        114   Male  19                64                46
## 115        115 Female  18                65                48
## 116        116 Female  19                65                50
## 117        117 Female  63                65                43
## 118        118 Female  49                65                59
## 119        119 Female  51                67                43
## 120        120 Female  50                67                57
## 121        121   Male  27                67                56
## 122        122 Female  38                67                40
## 123        123 Female  40                69                58
## 124        124   Male  39                69                91
## 125        125 Female  23                70                29
```

```
## 126        126 Female  31                70                77
## 127        127   Male  43                71                35
## 128        128   Male  40                71                95
## 129        129   Male  59                71                11
## 130        130   Male  38                71                75
## 131        131   Male  47                71                 9
## 132        132   Male  39                71                75
## 133        133 Female  25                72                34
## 134        134 Female  31                72                71
## 135        135   Male  20                73                 5
## 136        136 Female  29                73                88
## 137        137 Female  44                73                 7
## 138        138   Male  32                73                73
## 139        139   Male  19                74                10
## 140        140 Female  35                74                72
## 141        141 Female  57                75                 5
## 142        142   Male  32                75                93
## 143        143 Female  28                76                40
## 144        144 Female  32                76                87
## 145        145   Male  25                77                12
## 146        146   Male  28                77                97
## 147        147   Male  48                77                36
## 148        148 Female  32                77                74
## 149        149 Female  34                78                22
## 150        150   Male  34                78                90
## 151        151   Male  43                78                17
## 152        152   Male  39                78                88
## 153        153 Female  44                78                20
## 154        154 Female  38                78                76
## 155        155 Female  47                78                16
## 156        156 Female  27                78                89
## 157        157   Male  37                78                 1
## 158        158 Female  30                78                78
## 159        159   Male  34                78                 1
## 160        160 Female  30                78                73
## 161        161 Female  56                79                35
## 162        162 Female  29                79                83
## 163        163   Male  19                81                 5
## 164        164 Female  31                81                93
## 165        165   Male  50                85                26
## 166        166 Female  36                85                75
## 167        167   Male  42                86                20
## 168        168 Female  33                86                95
## 169        169 Female  36                87                27
## 170        170   Male  32                87                63
## 171        171   Male  40                87                13
## 172        172   Male  28                87                75
## 173        173   Male  36                87                10
## 174        174   Male  36                87                92
## 175        175 Female  52                88                13
## 176        176 Female  30                88                86
## 177        177   Male  58                88                15
## 178        178   Male  27                88                69
## 179        179   Male  59                93                14
```

```
## 180        180   Male  35                 93                      90
## 181        181 Female  37                 97                      32
## 182        182 Female  32                 97                      86
## 183        183   Male  46                 98                      15
## 184        184 Female  29                 98                      88
## 185        185 Female  41                 99                      39
## 186        186   Male  30                 99                      97
## 187        187 Female  54                101                      24
## 188        188   Male  28                101                      68
## 189        189 Female  41                103                      17
## 190        190 Female  36                103                      85
## 191        191 Female  34                103                      23
## 192        192 Female  32                103                      69
## 193        193   Male  33                113                       8
## 194        194 Female  38                113                      91
## 195        195 Female  47                120                      16
## 196        196 Female  35                120                      79
## 197        197 Female  45                126                      28
## 198        198   Male  32                126                      74
## 199        199   Male  32                137                      18
## 200        200   Male  30                137                      83
```

```
##Q10
Mall %>% arrange(desc(Age))
```

```
##     CustomerID Gender Age Annual.Income..k.. Spending.Score..1.100.
## 1           61   Male  70                 46                      56
## 2           71   Male  70                 49                      55
## 3           58   Male  69                 44                      46
## 4           68 Female  68                 48                      48
## 5           91 Female  68                 59                      55
## 6          109   Male  68                 63                      43
## 7           11   Male  67                 19                      14
## 8           63 Female  67                 47                      52
## 9           83   Male  67                 54                      41
## 10         103   Male  67                 62                      59
## 11         107 Female  66                 63                      50
## 12         110   Male  66                 63                      48
## 13          41 Female  65                 38                      35
## 14         111   Male  65                 63                      52
## 15           9   Male  64                 19                       3
## 16          65   Male  63                 48                      51
## 17         117 Female  63                 65                      43
## 18          31   Male  60                 30                       4
## 19          73 Female  60                 50                      49
## 20          74 Female  60                 50                      56
## 21          54   Male  59                 43                      60
## 22          75   Male  59                 54                      47
## 23         129   Male  59                 71                      11
## 24         179   Male  59                 93                      14
## 25          13 Female  58                 20                      15
## 26         177   Male  58                 88                      15
## 27          81   Male  57                 54                      51
## 28         141 Female  57                 75                       5
```

```
## 29         161 Female  56              79                35
## 30          87 Female  55              57                58
## 31          25 Female  54              28                14
## 32          64 Female  54              47                59
## 33         108   Male  54              63                46
## 34         187 Female  54             101                24
## 35          33   Male  53              33                 4
## 36          60   Male  53              46                46
## 37          19   Male  52              23                29
## 38         175 Female  52              88                13
## 39          57 Female  51              44                50
## 40         119 Female  51              67                43
## 41          47 Female  50              40                55
## 42          55 Female  50              43                45
## 43          90 Female  50              58                46
## 44         120 Female  50              67                57
## 45         165   Male  50              85                26
## 46          35 Female  49              33                14
## 47          45 Female  49              39                28
## 48          51 Female  49              42                52
## 49          80 Female  49              54                42
## 50         102 Female  49              62                48
## 51         105   Male  49              62                56
## 52         118 Female  49              65                59
## 53          43   Male  48              39                36
## 54          86   Male  48              54                46
## 55          93   Male  48              60                49
## 56          99   Male  48              61                42
## 57         147   Male  48              77                36
## 58          56   Male  47              43                41
## 59          72 Female  47              49                42
## 60          97 Female  47              60                47
## 61         131   Male  47              71                 9
## 62         155 Female  47              78                16
## 63         195 Female  47             120                16
## 64          23 Female  46              25                 5
## 65          84 Female  46              54                44
## 66         183   Male  46              98                15
## 67          27 Female  45              28                32
## 68          77 Female  45              54                53
## 69         197 Female  45             126                28
## 70         137 Female  44              73                 7
## 71         153 Female  44              78                20
## 72          67 Female  43              48                50
## 73         127   Male  43              71                35
## 74         151   Male  43              78                17
## 75          37 Female  42              34                17
## 76         167   Male  42              86                20
## 77         185 Female  41              99                39
## 78         189 Female  41             103                17
## 79          29 Female  40              29                31
## 80          78   Male  40              54                48
## 81          94 Female  40              60                40
## 82         123 Female  40              69                58
```

```
## 83         128   Male  40                71                95
## 84         171   Male  40                87                13
## 85         124   Male  39                69                91
## 86         132   Male  39                71                75
## 87         152   Male  39                78                88
## 88          82   Male  38                54                55
## 89         113 Female  38                64                42
## 90         122 Female  38                67                40
## 91         130   Male  38                71                75
## 92         154 Female  38                78                76
## 93         194 Female  38               113                91
## 94          15   Male  37                20                13
## 95         157   Male  37                78                 1
## 96         181 Female  37                97                32
## 97          39 Female  36                37                26
## 98         166 Female  36                85                75
## 99         169 Female  36                87                27
## 100        173   Male  36                87                10
## 101        174   Male  36                87                92
## 102        190 Female  36               103                85
## 103          7 Female  35                18                 6
## 104         12 Female  35                19                99
## 105         17 Female  35                21                35
## 106         20 Female  35                23                98
## 107         21   Male  35                24                35
## 108         28   Male  35                28                61
## 109        140 Female  35                74                72
## 110        180   Male  35                93                90
## 111        196 Female  35               120                79
## 112         89 Female  34                58                60
## 113        149 Female  34                78                22
## 114        150   Male  34                78                90
## 115        159   Male  34                78                 1
## 116        191 Female  34               103                23
## 117         52   Male  33                42                60
## 118        168 Female  33                86                95
## 119        193   Male  33               113                 8
## 120         70 Female  32                48                47
## 121         95 Female  32                60                42
## 122        138   Male  32                73                73
## 123        142   Male  32                75                93
## 124        144 Female  32                76                87
## 125        148 Female  32                77                74
## 126        170   Male  32                87                63
## 127        182 Female  32                97                86
## 128        192 Female  32               103                69
## 129        198   Male  32               126                74
## 130        199   Male  32               137                18
## 131          5 Female  31                17                40
## 132         24   Male  31                25                73
## 133         44 Female  31                39                61
## 134         50 Female  31                40                42
## 135         53 Female  31                43                54
## 136        126 Female  31                70                77
```

```
## 137        134 Female  31                72                  71
## 138        164 Female  31                81                  93
## 139         10 Female  30                19                  72
## 140         38 Female  30                34                  73
## 141        158 Female  30                78                  78
## 142        160 Female  30                78                  73
## 143        176 Female  30                88                  86
## 144        186   Male  30                99                  97
## 145        200   Male  30               137                  83
## 146         26   Male  29                28                  82
## 147         49 Female  29                40                  42
## 148        136 Female  29                73                  88
## 149        162 Female  29                79                  83
## 150        184 Female  29                98                  88
## 151        143 Female  28                76                  40
## 152        146   Male  28                77                  97
## 153        172   Male  28                87                  75
## 154        188   Male  28               101                  68
## 155         48 Female  27                40                  47
## 156         59 Female  27                46                  51
## 157         98 Female  27                60                  50
## 158        121   Male  27                67                  56
## 159        156 Female  27                78                  89
## 160        178   Male  27                88                  69
## 161         76   Male  26                54                  54
## 162        104   Male  26                62                  55
## 163         22   Male  25                24                  73
## 164        133 Female  25                72                  34
## 165        145   Male  25                77                  12
## 166         14 Female  24                20                  77
## 167         42   Male  24                38                  92
## 168         46 Female  24                39                  65
## 169         96   Male  24                60                  52
## 170          4 Female  23                16                  77
## 171          8 Female  23                18                  94
## 172         30 Female  23                29                  87
## 173         79 Female  23                54                  52
## 174        101 Female  23                62                  41
## 175        125 Female  23                70                  29
## 176          6 Female  22                17                  76
## 177         16   Male  22                20                  79
## 178         88 Female  22                57                  55
## 179          2   Male  21                15                  81
## 180         32 Female  21                30                  73
## 181         36 Female  21                33                  81
## 182         85 Female  21                54                  57
## 183        106 Female  21                62                  42
## 184          3 Female  20                16                   6
## 185         18   Male  20                21                  66
## 186         40 Female  20                37                  75
## 187        100   Male  20                61                  49
## 188        135   Male  20                73                   5
## 189          1   Male  19                15                  39
## 190         62   Male  19                46                  55
```

```
## 191         69   Male  19                48                      59
## 192        112 Female  19                63                      54
## 193        114   Male  19                64                      46
## 194        116 Female  19                65                      50
## 195        139   Male  19                74                      10
## 196        163   Male  19                81                       5
## 197         34   Male  18                33                      92
## 198         66   Male  18                48                      59
## 199         92   Male  18                59                      41
## 200        115 Female  18                65                      48
```

```
Mall %>% arrange(desc(CustomerID))
```

```
##     CustomerID Gender Age Annual.Income..k.. Spending.Score..1.100.
## 1          200   Male  30                137                      83
## 2          199   Male  32                137                      18
## 3          198   Male  32                126                      74
## 4          197 Female  45                126                      28
## 5          196 Female  35                120                      79
## 6          195 Female  47                120                      16
## 7          194 Female  38                113                      91
## 8          193   Male  33                113                       8
## 9          192 Female  32                103                      69
## 10         191 Female  34                103                      23
## 11         190 Female  36                103                      85
## 12         189 Female  41                103                      17
## 13         188   Male  28                101                      68
## 14         187 Female  54                101                      24
## 15         186   Male  30                 99                      97
## 16         185 Female  41                 99                      39
## 17         184 Female  29                 98                      88
## 18         183   Male  46                 98                      15
## 19         182 Female  32                 97                      86
## 20         181 Female  37                 97                      32
## 21         180   Male  35                 93                      90
## 22         179   Male  59                 93                      14
## 23         178   Male  27                 88                      69
## 24         177   Male  58                 88                      15
## 25         176 Female  30                 88                      86
## 26         175 Female  52                 88                      13
## 27         174   Male  36                 87                      92
## 28         173   Male  36                 87                      10
## 29         172   Male  28                 87                      75
## 30         171   Male  40                 87                      13
## 31         170   Male  32                 87                      63
## 32         169 Female  36                 87                      27
## 33         168 Female  33                 86                      95
## 34         167   Male  42                 86                      20
## 35         166 Female  36                 85                      75
## 36         165   Male  50                 85                      26
## 37         164 Female  31                 81                      93
## 38         163   Male  19                 81                       5
## 39         162 Female  29                 79                      83
## 40         161 Female  56                 79                      35
```

```
## 41         160 Female  30                78                73
## 42         159   Male  34                78                 1
## 43         158 Female  30                78                78
## 44         157   Male  37                78                 1
## 45         156 Female  27                78                89
## 46         155 Female  47                78                16
## 47         154 Female  38                78                76
## 48         153 Female  44                78                20
## 49         152   Male  39                78                88
## 50         151   Male  43                78                17
## 51         150   Male  34                78                90
## 52         149 Female  34                78                22
## 53         148 Female  32                77                74
## 54         147   Male  48                77                36
## 55         146   Male  28                77                97
## 56         145   Male  25                77                12
## 57         144 Female  32                76                87
## 58         143 Female  28                76                40
## 59         142   Male  32                75                93
## 60         141 Female  57                75                 5
## 61         140 Female  35                74                72
## 62         139   Male  19                74                10
## 63         138   Male  32                73                73
## 64         137 Female  44                73                 7
## 65         136 Female  29                73                88
## 66         135   Male  20                73                 5
## 67         134 Female  31                72                71
## 68         133 Female  25                72                34
## 69         132   Male  39                71                75
## 70         131   Male  47                71                 9
## 71         130   Male  38                71                75
## 72         129   Male  59                71                11
## 73         128   Male  40                71                95
## 74         127   Male  43                71                35
## 75         126 Female  31                70                77
## 76         125 Female  23                70                29
## 77         124   Male  39                69                91
## 78         123 Female  40                69                58
## 79         122 Female  38                67                40
## 80         121   Male  27                67                56
## 81         120 Female  50                67                57
## 82         119 Female  51                67                43
## 83         118 Female  49                65                59
## 84         117 Female  63                65                43
## 85         116 Female  19                65                50
## 86         115 Female  18                65                48
## 87         114   Male  19                64                46
## 88         113 Female  38                64                42
## 89         112 Female  19                63                54
## 90         111   Male  65                63                52
## 91         110   Male  66                63                48
## 92         109   Male  68                63                43
## 93         108   Male  54                63                46
## 94         107 Female  66                63                50
```

```
## 95         106 Female  21              62              42
## 96         105   Male  49              62              56
## 97         104   Male  26              62              55
## 98         103   Male  67              62              59
## 99         102 Female  49              62              48
## 100        101 Female  23              62              41
## 101        100   Male  20              61              49
## 102         99   Male  48              61              42
## 103         98 Female  27              60              50
## 104         97 Female  47              60              47
## 105         96   Male  24              60              52
## 106         95 Female  32              60              42
## 107         94 Female  40              60              40
## 108         93   Male  48              60              49
## 109         92   Male  18              59              41
## 110         91 Female  68              59              55
## 111         90 Female  50              58              46
## 112         89 Female  34              58              60
## 113         88 Female  22              57              55
## 114         87 Female  55              57              58
## 115         86   Male  48              54              46
## 116         85 Female  21              54              57
## 117         84 Female  46              54              44
## 118         83   Male  67              54              41
## 119         82   Male  38              54              55
## 120         81   Male  57              54              51
## 121         80 Female  49              54              42
## 122         79 Female  23              54              52
## 123         78   Male  40              54              48
## 124         77 Female  45              54              53
## 125         76   Male  26              54              54
## 126         75   Male  59              54              47
## 127         74 Female  60              50              56
## 128         73 Female  60              50              49
## 129         72 Female  47              49              42
## 130         71   Male  70              49              55
## 131         70 Female  32              48              47
## 132         69   Male  19              48              59
## 133         68 Female  68              48              48
## 134         67 Female  43              48              50
## 135         66   Male  18              48              59
## 136         65   Male  63              48              51
## 137         64 Female  54              47              59
## 138         63 Female  67              47              52
## 139         62   Male  19              46              55
## 140         61   Male  70              46              56
## 141         60   Male  53              46              46
## 142         59 Female  27              46              51
## 143         58   Male  69              44              46
## 144         57 Female  51              44              50
## 145         56   Male  47              43              41
## 146         55 Female  50              43              45
## 147         54   Male  59              43              60
## 148         53 Female  31              43              54
```

```
## 149         52   Male  33              42                  60
## 150         51 Female  49              42                  52
## 151         50 Female  31              40                  42
## 152         49 Female  29              40                  42
## 153         48 Female  27              40                  47
## 154         47 Female  50              40                  55
## 155         46 Female  24              39                  65
## 156         45 Female  49              39                  28
## 157         44 Female  31              39                  61
## 158         43   Male  48              39                  36
## 159         42   Male  24              38                  92
## 160         41 Female  65              38                  35
## 161         40 Female  20              37                  75
## 162         39 Female  36              37                  26
## 163         38 Female  30              34                  73
## 164         37 Female  42              34                  17
## 165         36 Female  21              33                  81
## 166         35 Female  49              33                  14
## 167         34   Male  18              33                  92
## 168         33   Male  53              33                   4
## 169         32 Female  21              30                  73
## 170         31   Male  60              30                   4
## 171         30 Female  23              29                  87
## 172         29 Female  40              29                  31
## 173         28   Male  35              28                  61
## 174         27 Female  45              28                  32
## 175         26   Male  29              28                  82
## 176         25 Female  54              28                  14
## 177         24   Male  31              25                  73
## 178         23 Female  46              25                   5
## 179         22   Male  25              24                  73
## 180         21   Male  35              24                  35
## 181         20 Female  35              23                  98
## 182         19   Male  52              23                  29
## 183         18   Male  20              21                  66
## 184         17 Female  35              21                  35
## 185         16   Male  22              20                  79
## 186         15   Male  37              20                  13
## 187         14 Female  24              20                  77
## 188         13 Female  58              20                  15
## 189         12 Female  35              19                  99
## 190         11   Male  67              19                  14
## 191         10 Female  30              19                  72
## 192          9   Male  64              19                   3
## 193          8 Female  23              18                  94
## 194          7 Female  35              18                   6
## 195          6 Female  22              17                  76
## 196          5 Female  31              17                  40
## 197          4 Female  23              16                  77
## 198          3 Female  20              16                   6
## 199          2   Male  21              15                  81
## 200          1   Male  19              15                  39
```

```r
#Q11
names(Mall)[names(Mall) == "Age"] <- "Years Alive"
names(Mall)[names(Mall) == "Annual.Income..k.."] <- "Income"
head(Mall, n=15)
```

```
##    CustomerID Gender Years Alive Income Spending.Score..1.100.
## 1           1   Male          19     15                     39
## 2           2   Male          21     15                     81
## 3           3 Female          20     16                      6
## 4           4 Female          23     16                     77
## 5           5 Female          31     17                     40
## 6           6 Female          22     17                     76
## 7           7 Female          35     18                      6
## 8           8 Female          23     18                     94
## 9           9   Male          64     19                      3
## 10         10 Female          30     19                     72
## 11         11   Male          67     19                     14
## 12         12 Female          35     19                     99
## 13         13 Female          58     20                     15
## 14         14 Female          24     20                     77
## 15         15   Male          37     20                     13
```

```r
#Q12

Mall$NewCol1 = Mall$Income / Mall$`Years Alive`
head(Mall, n=15)
```

```
##    CustomerID Gender Years Alive Income Spending.Score..1.100.   NewCol1
## 1           1   Male          19     15                     39 0.7894737
## 2           2   Male          21     15                     81 0.7142857
## 3           3 Female          20     16                      6 0.8000000
## 4           4 Female          23     16                     77 0.6956522
## 5           5 Female          31     17                     40 0.5483871
## 6           6 Female          22     17                     76 0.7727273
## 7           7 Female          35     18                      6 0.5142857
## 8           8 Female          23     18                     94 0.7826087
## 9           9   Male          64     19                      3 0.2968750
## 10         10 Female          30     19                     72 0.6333333
## 11         11   Male          67     19                     14 0.2835821
## 12         12 Female          35     19                     99 0.5428571
## 13         13 Female          58     20                     15 0.3448276
## 14         14 Female          24     20                     77 0.8333333
## 15         15   Male          37     20                     13 0.5405405
```

```r
#Q13
set.seed(5)
TrainingSet <- sort(sample.int(100, 50))
TrainingSet
```

```
##  [1]  3  8 10 12 13 15 16 18 19 20 21 23 25 26 27 33 35 36 38 41 42 46 47 50 51
## [26] 53 54 56 57 58 61 62 64 66 68 71 73 74 75 76 78 79 80 82 83 84 85 94 95 98
```

```r
#Q14
Mall %>% group_by(Mall$Age) %>% summarise(mean(Mall$Income))
```

```
## # A tibble: 1 x 1
##   `mean(Mall$Income)`
##                 <dbl>
## 1                60.6
```

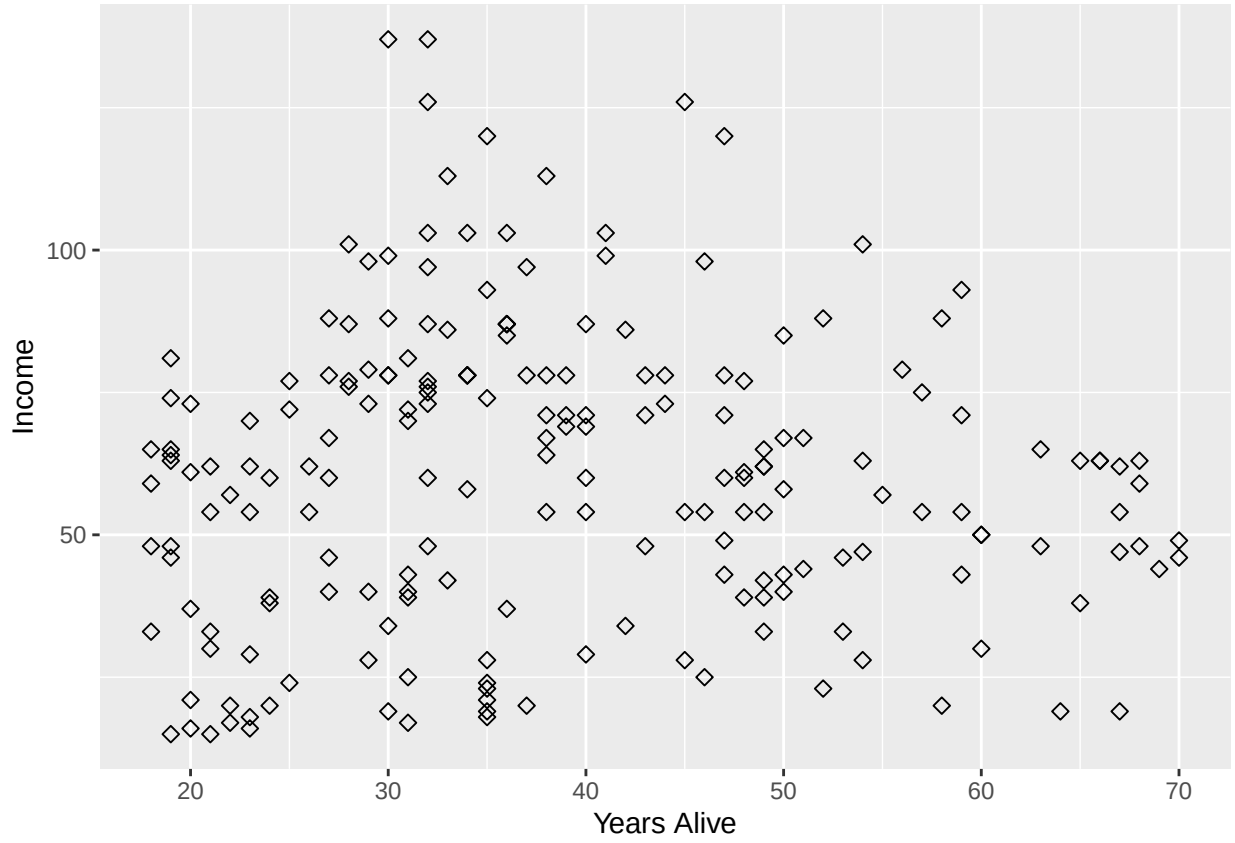
```r
head(Mall, n=10)
```

```
##    CustomerID Gender Years Alive Income Spending.Score..1.100.   NewCol1
## 1           1   Male          19     15                     39 0.7894737
## 2           2   Male          21     15                     81 0.7142857
## 3           3 Female          20     16                      6 0.8000000
## 4           4 Female          23     16                     77 0.6956522
## 5           5 Female          31     17                     40 0.5483871
## 6           6 Female          22     17                     76 0.7727273
## 7           7 Female          35     18                      6 0.5142857
## 8           8 Female          23     18                     94 0.7826087
## 9           9   Male          64     19                      3 0.2968750
## 10         10 Female          30     19                     72 0.6333333
```

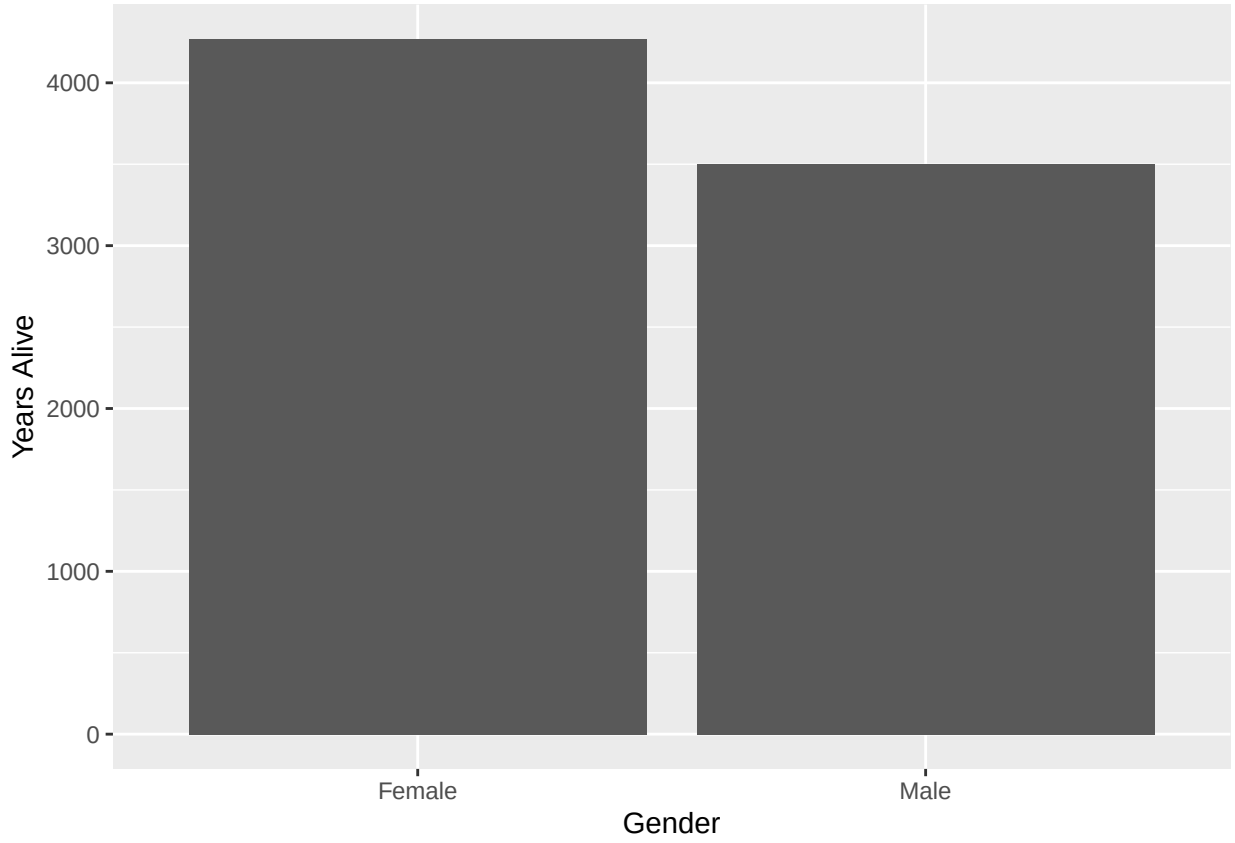
```r
#Q15
mean(Mall$Spending.Score..1.100.)
```

```
## [1] 50.2
```

```r
#Q16
ggplot(Mall, aes(`Years Alive`, y= `Income`)) +
  geom_point(size=2, shape=23)
```




```
# Q17
ggplot(data=Mall, aes(x=`Gender`, y=`Years Alive`)) +
  geom_bar(stat="identity")
```




```
# Q18

fit <- lm(Mall$NewCol1 ~ Mall$Income)
fit
```

```
##
## Call:
## lm(formula = Mall$NewCol1 ~ Mall$Income)
##
## Coefficients:
## (Intercept)  Mall$Income
##     0.05693      0.02798
```