IST687

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Homework 4 - Samples HW

Assignment Due: 8/10/2021

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Step 1: Write a summarizing function to understand the distribution of a vector

1. The function, call it 'printVecInfo' should take a vector as input

2. The function should print the following information:

```
a. Mean
b. Median
c. Min   &   max
d. Standard   deviation
e. Quantiles  (at 0.05    and 0.95)
f. Skewness

Note  for skewness,   you can use the function    in  the 'moments'   library
```

```
#if Moments Package is not installed
#install.packages(("moments"))
library(moments)

printVecInfo <- function(vec){
  #mean
  print( paste("Mean: ", mean(vec), sep=" "))

  #Median
  print(paste("Median: ", median(vec, na.rm=FALSE), sep=" "))

  #Min & Max
  print(paste("Min: ", min(vec), sep=" "))
  print(paste("Max: ", max(vec), sep=" "))

  #standard Deviation
  print(paste("Standard Deviation: ", sd(vec), sep=" "))
  #(0.05 & 0.95)
  print(paste("Quantile (0.05 - 0.95): ", quantile(vec, 0.05, 0.95), sep=" "))

  #skewness
  print(paste("Skewness: ", skewness(vec), sep=" "))
}
```

3. Test the function with a vector that has (1,2,3,4,5,6,7,8,9,10,50). You should see

something such as: [1] "mean: 9.545454545454545" [1] "median: 6" [1] "min: 1 max: 50" [1] "sd: 13.7212509368762" [1] "quantile (0.05 - 0.95): 1.5 – 30" [1] "skewness: 2.62039633563579"

```
test <- c(1,2,3,4,5,6,7,8,9,10,50)
printVecInfo(test)
```

```
## [1] "Mean:  9.54545454545454"
```

```
## [1] "Median:  6"
## [1] "Min:  1"
## [1] "Max:  50"
## [1] "Standard Deviation:  13.7212509368762"
## [1] "Quantile (0.05 - 0.95):  1.5"
## [1] "Skewness:  2.62039633563579"
```

Step 2: Creating Samples in a Jar

4. Create a variable 'jar' that has 50 red and 50 blue marbles (hint: the jar can have strings as objects, with some of the strings being 'red' and some of the strings being 'blue'

```r
#Create the Vector of the initial types of marbles
jar <- c("red","blue")
#Replicate the starting jar 50 times to arrive at 100 total marbles (50 red and 50  blue)
jar <- rep(jar,50)

length(jar)
```

```
## [1] 100
```

5. Confirm there are 50 reds by summing the samples that are red

```r
length(which(jar == "red"))
```

```
## [1] 50
```

6. Sample 10 'marbles' (really strings) from the jar. How many are red? What was the percentage of red marbles?

```r
#Create and Store Sample of 10 Marbles
redInSample <- length(which(sample(jar, size=10,replace = TRUE) == "red"))
# % of Red
print(paste("% of Red: ", redInSample/10, sep=" "))
```

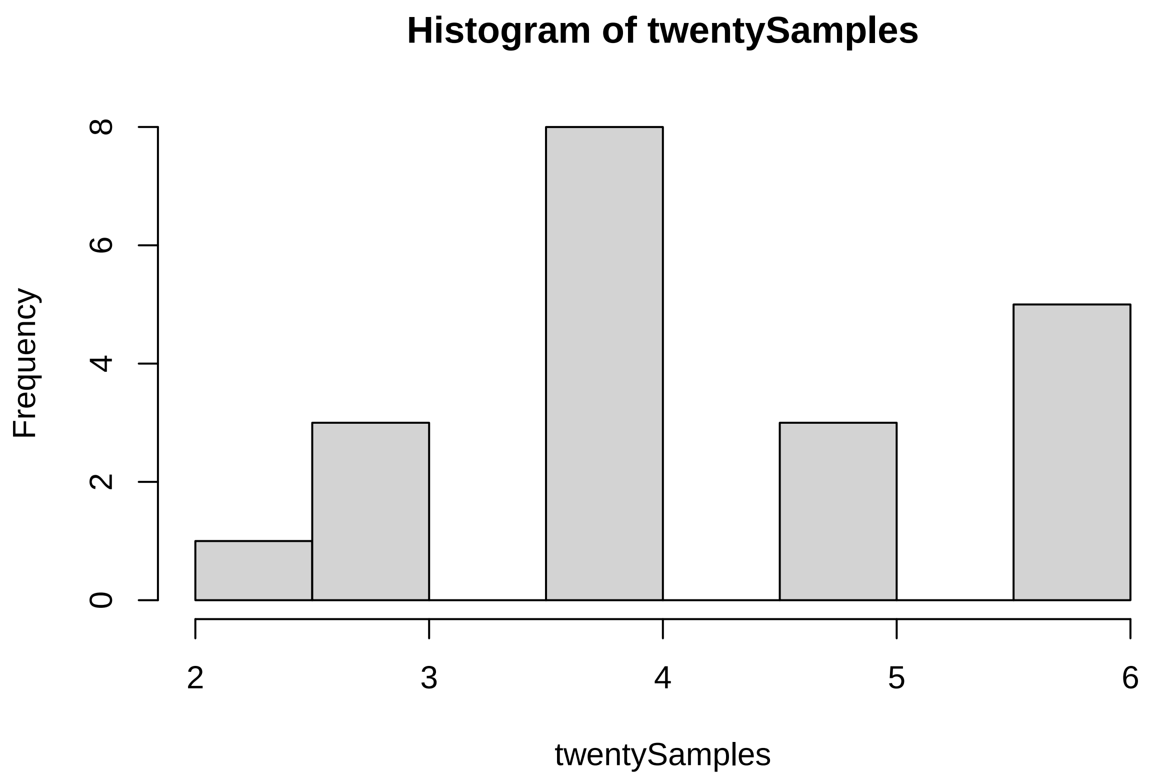
```
## [1] "% of Red:  0.7"
```

7. Do the sampling 20 times, using the 'replicate' command. This should generate a list of 20 numbers. Each number is the mean of how many reds there were in 10 samples. Use your printVecInfo to see information of the samples. Also generate a histogram of the samples.

```r
twentySamples <- replicate(20, length(which(sample(jar, size=10,replace = TRUE) == "red")))
printVecInfo(twentySamples)
```

```
## [1] "Mean:  4.4"
## [1] "Median:  4"
## [1] "Min:  2"
## [1] "Max:  6"
## [1] "Standard Deviation:  1.18765580695312"
## [1] "Quantile (0.05 - 0.95):  2.95"
## [1] "Skewness:  -0.0464168109267606"
```

```r
hist(twentySamples)
```

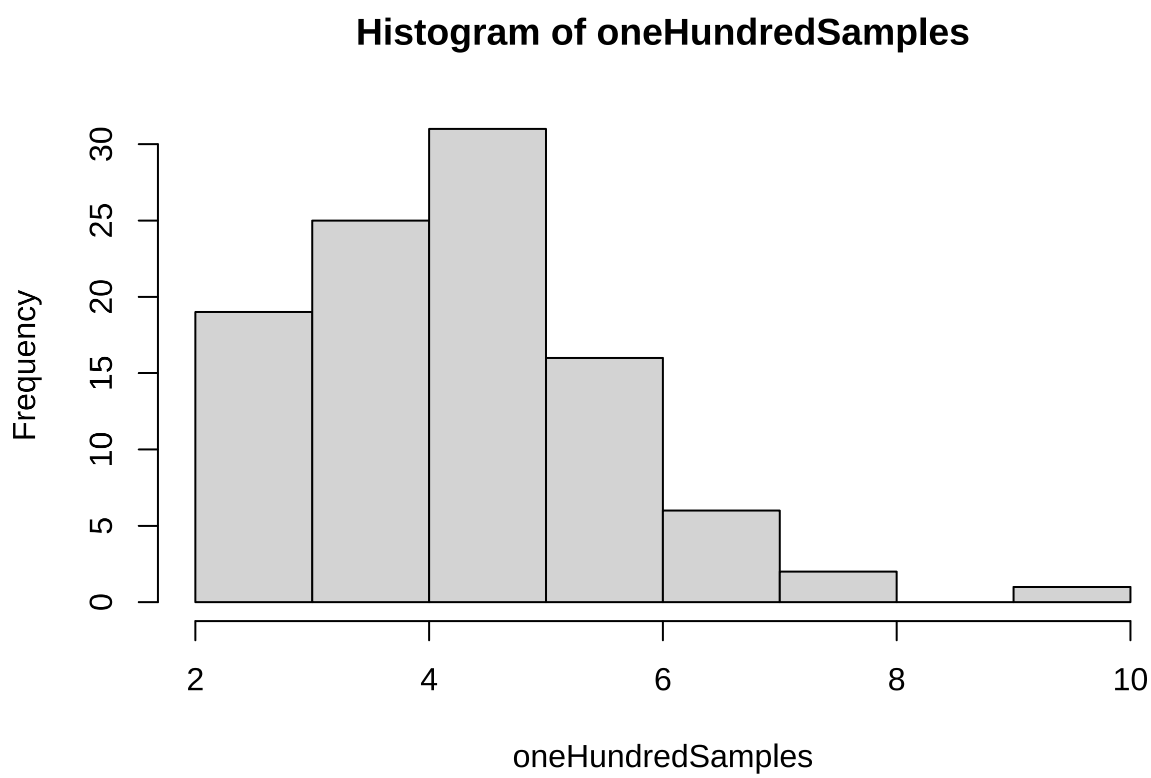


8. Repeat #7, but this time, sample the jar 100 times. You should get 20 numbers, this time each number represents the mean of how many reds there were in the 100 samples. Use your printVecInfo to see information of the samples. Also generate a histogram of the samples.

```r
oneHundredSamples <- replicate(100, length(which(sample(jar, size=10,replace = TRUE) == "red")))
printVecInfo(oneHundredSamples)
```

```
## [1] "Mean:  4.71"
## [1] "Median:  5"
## [1] "Min:  2"
## [1] "Max:  10"
## [1] "Standard Deviation:  1.42343303887525"
## [1] "Quantile (0.05 - 0.95):  2.95"
## [1] "Skewness:  0.520783852300048"
```

```
hist(oneHundredSamples)
```



Step 3: Explore the airquality dataset

10. Store the 'airquality' dataset into a temporary variable

```
airQual <- airquality
airQual
```

```
##     Ozone Solar.R Wind Temp Month Day
## 1      41     190  7.4   67     5   1
## 2      36     118  8.0   72     5   2
## 3      12     149 12.6   74     5   3
## 4      18     313 11.5   62     5   4
```

```
## 5       NA       NA 14.3   56      5   5
## 6       28       NA 14.9   66      5   6
## 7       23      299  8.6   65      5   7
## 8       19       99 13.8   59      5   8
## 9        8       19 20.1   61      5   9
## 10      NA      194  8.6   69      5  10
## 11       7       NA  6.9   74      5  11
## 12      16      256  9.7   69      5  12
## 13      11      290  9.2   66      5  13
## 14      14      274 10.9   68      5  14
## 15      18       65 13.2   58      5  15
## 16      14      334 11.5   64      5  16
## 17      34      307 12.0   66      5  17
## 18       6       78 18.4   57      5  18
## 19      30      322 11.5   68      5  19
## 20      11       44  9.7   62      5  20
## 21       1        8  9.7   59      5  21
## 22      11      320 16.6   73      5  22
## 23       4       25  9.7   61      5  23
## 24      32       92 12.0   61      5  24
## 25      NA       66 16.6   57      5  25
## 26      NA      266 14.9   58      5  26
## 27      NA       NA  8.0   57      5  27
## 28      23       13 12.0   67      5  28
## 29      45      252 14.9   81      5  29
## 30     115      223  5.7   79      5  30
## 31      37      279  7.4   76      5  31
## 32      NA      286  8.6   78      6   1
## 33      NA      287  9.7   74      6   2
## 34      NA      242 16.1   67      6   3
## 35      NA      186  9.2   84      6   4
## 36      NA      220  8.6   85      6   5
## 37      NA      264 14.3   79      6   6
## 38      29      127  9.7   82      6   7
## 39      NA      273  6.9   87      6   8
## 40      71      291 13.8   90      6   9
## 41      39      323 11.5   87      6  10
## 42      NA      259 10.9   93      6  11
## 43      NA      250  9.2   92      6  12
## 44      23      148  8.0   82      6  13
## 45      NA      332 13.8   80      6  14
## 46      NA      322 11.5   79      6  15
## 47      21      191 14.9   77      6  16
## 48      37      284 20.7   72      6  17
## 49      20       37  9.2   65      6  18
## 50      12      120 11.5   73      6  19
## 51      13      137 10.3   76      6  20
## 52      NA      150  6.3   77      6  21
## 53      NA       59  1.7   76      6  22
## 54      NA       91  4.6   76      6  23
## 55      NA      250  6.3   76      6  24
## 56      NA      135  8.0   75      6  25
## 57      NA      127  8.0   78      6  26
## 58      NA       47 10.3   73      6  27
```

```
## 59     NA      98 11.5   80     6  28
## 60     NA      31 14.9   77     6  29
## 61     NA     138  8.0   83     6  30
## 62    135     269  4.1   84     7   1
## 63     49     248  9.2   85     7   2
## 64     32     236  9.2   81     7   3
## 65     NA     101 10.9   84     7   4
## 66     64     175  4.6   83     7   5
## 67     40     314 10.9   83     7   6
## 68     77     276  5.1   88     7   7
## 69     97     267  6.3   92     7   8
## 70     97     272  5.7   92     7   9
## 71     85     175  7.4   89     7  10
## 72     NA     139  8.6   82     7  11
## 73     10     264 14.3   73     7  12
## 74     27     175 14.9   81     7  13
## 75     NA     291 14.9   91     7  14
## 76      7      48 14.3   80     7  15
## 77     48     260  6.9   81     7  16
## 78     35     274 10.3   82     7  17
## 79     61     285  6.3   84     7  18
## 80     79     187  5.1   87     7  19
## 81     63     220 11.5   85     7  20
## 82     16       7  6.9   74     7  21
## 83     NA     258  9.7   81     7  22
## 84     NA     295 11.5   82     7  23
## 85     80     294  8.6   86     7  24
## 86    108     223  8.0   85     7  25
## 87     20      81  8.6   82     7  26
## 88     52      82 12.0   86     7  27
## 89     82     213  7.4   88     7  28
## 90     50     275  7.4   86     7  29
## 91     64     253  7.4   83     7  30
## 92     59     254  9.2   81     7  31
## 93     39      83  6.9   81     8   1
## 94      9      24 13.8   81     8   2
## 95     16      77  7.4   82     8   3
## 96     78      NA  6.9   86     8   4
## 97     35      NA  7.4   85     8   5
## 98     66      NA  4.6   87     8   6
## 99    122     255  4.0   89     8   7
## 100    89     229 10.3   90     8   8
## 101   110     207  8.0   90     8   9
## 102    NA     222  8.6   92     8  10
## 103    NA     137 11.5   86     8  11
## 104    44     192 11.5   86     8  12
## 105    28     273 11.5   82     8  13
## 106    65     157  9.7   80     8  14
## 107    NA      64 11.5   79     8  15
## 108    22      71 10.3   77     8  16
## 109    59      51  6.3   79     8  17
## 110    23     115  7.4   76     8  18
## 111    31     244 10.9   78     8  19
## 112    44     190 10.3   78     8  20
```

```
## 113    21     259 15.5   77     8  21
## 114     9      36 14.3   72     8  22
## 115    NA     255 12.6   75     8  23
## 116    45     212  9.7   79     8  24
## 117   168     238  3.4   81     8  25
## 118    73     215  8.0   86     8  26
## 119    NA     153  5.7   88     8  27
## 120    76     203  9.7   97     8  28
## 121   118     225  2.3   94     8  29
## 122    84     237  6.3   96     8  30
## 123    85     188  6.3   94     8  31
## 124    96     167  6.9   91     9   1
## 125    78     197  5.1   92     9   2
## 126    73     183  2.8   93     9   3
## 127    91     189  4.6   93     9   4
## 128    47      95  7.4   87     9   5
## 129    32      92 15.5   84     9   6
## 130    20     252 10.9   80     9   7
## 131    23     220 10.3   78     9   8
## 132    21     230 10.9   75     9   9
## 133    24     259  9.7   73     9  10
## 134    44     236 14.9   81     9  11
## 135    21     259 15.5   76     9  12
## 136    28     238  6.3   77     9  13
## 137     9      24 10.9   71     9  14
## 138    13     112 11.5   71     9  15
## 139    46     237  6.9   78     9  16
## 140    18     224 13.8   67     9  17
## 141    13      27 10.3   76     9  18
## 142    24     238 10.3   68     9  19
## 143    16     201  8.0   82     9  20
## 144    13     238 12.6   64     9  21
## 145    23      14  9.2   71     9  22
## 146    36     139 10.3   81     9  23
## 147     7      49 10.3   69     9  24
## 148    14      20 16.6   63     9  25
## 149    30     193  6.9   70     9  26
## 150    NA     145 13.2   77     9  27
## 151    14     191 14.3   75     9  28
## 152    18     131  8.0   76     9  29
## 153    20     223 11.5   68     9  30
```

11. Clean the dataset (i.e. remove the NAs)

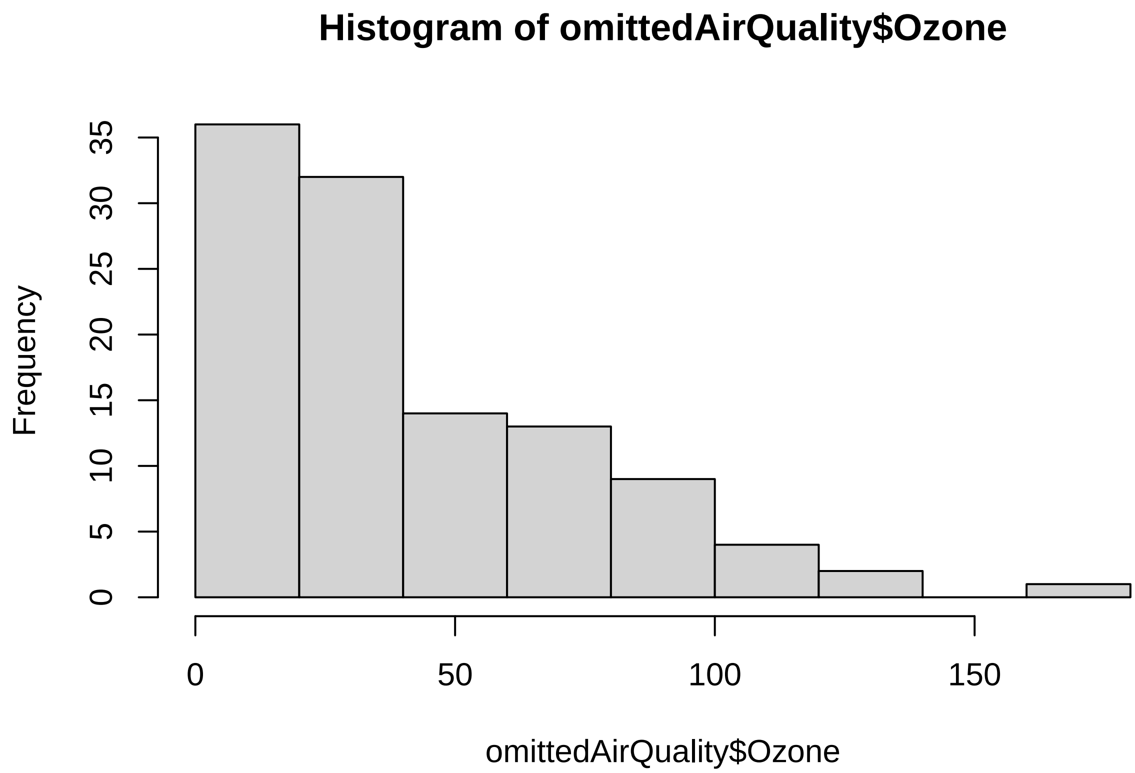
```r
omittedAirQuality <- na.omit(airQual)
```

12. Explore Ozone, Wind and Temp by doing a 'printVecInfo' on each as well as generating a histogram for each

```r
#Ozone
printVecInfo(omittedAirQuality$Ozone)
```

```
## [1] "Mean:  42.0990990990991"
## [1] "Median:  31"
## [1] "Min:  1"
## [1] "Max:  168"
## [1] "Standard Deviation:  33.2759686574274"
## [1] "Quantile (0.05 - 0.95):  8.5"
## [1] "Skewness:  1.24810370040404"
```

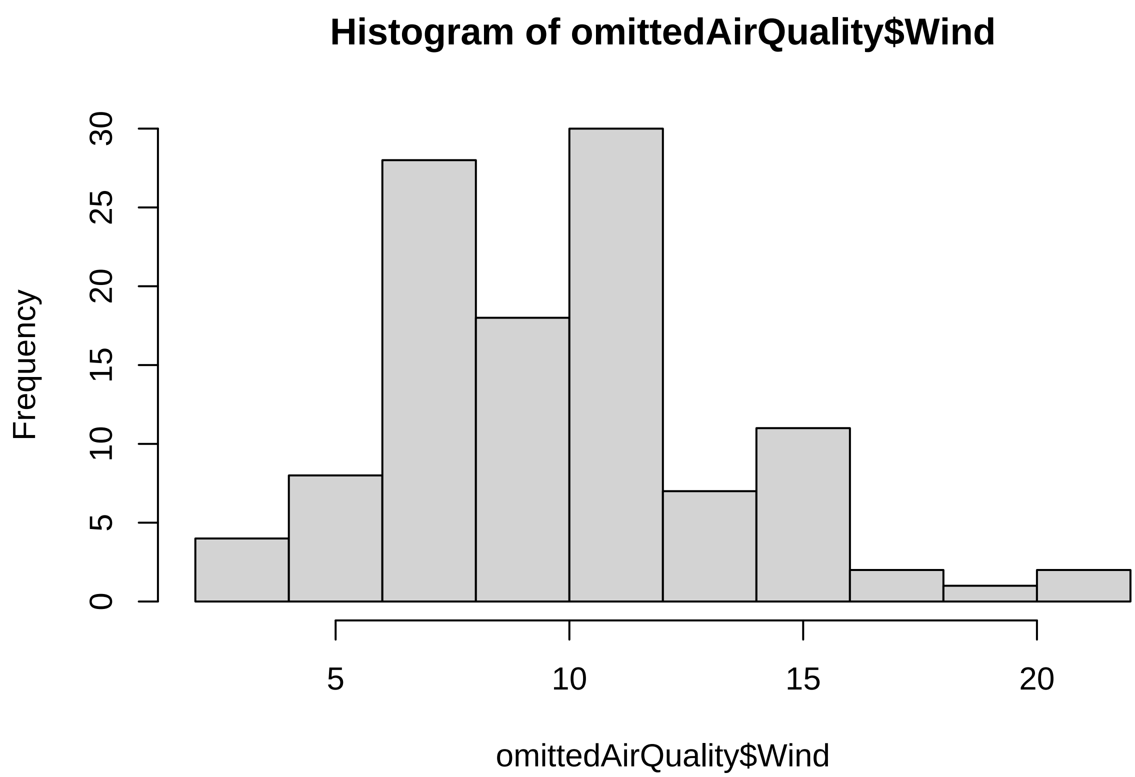
```r
hist(omittedAirQuality$Ozone)
```




```r
#Wind
printVecInfo(omittedAirQuality$Wind)
```

```
## [1] "Mean:  9.93963963963964"
## [1] "Median:  9.7"
## [1] "Min:  2.3"
## [1] "Max:  20.7"
## [1] "Standard Deviation:  3.55771324101922"
## [1] "Quantile (0.05 - 0.95):  4.6"
## [1] "Skewness:  0.455641432036776"
```

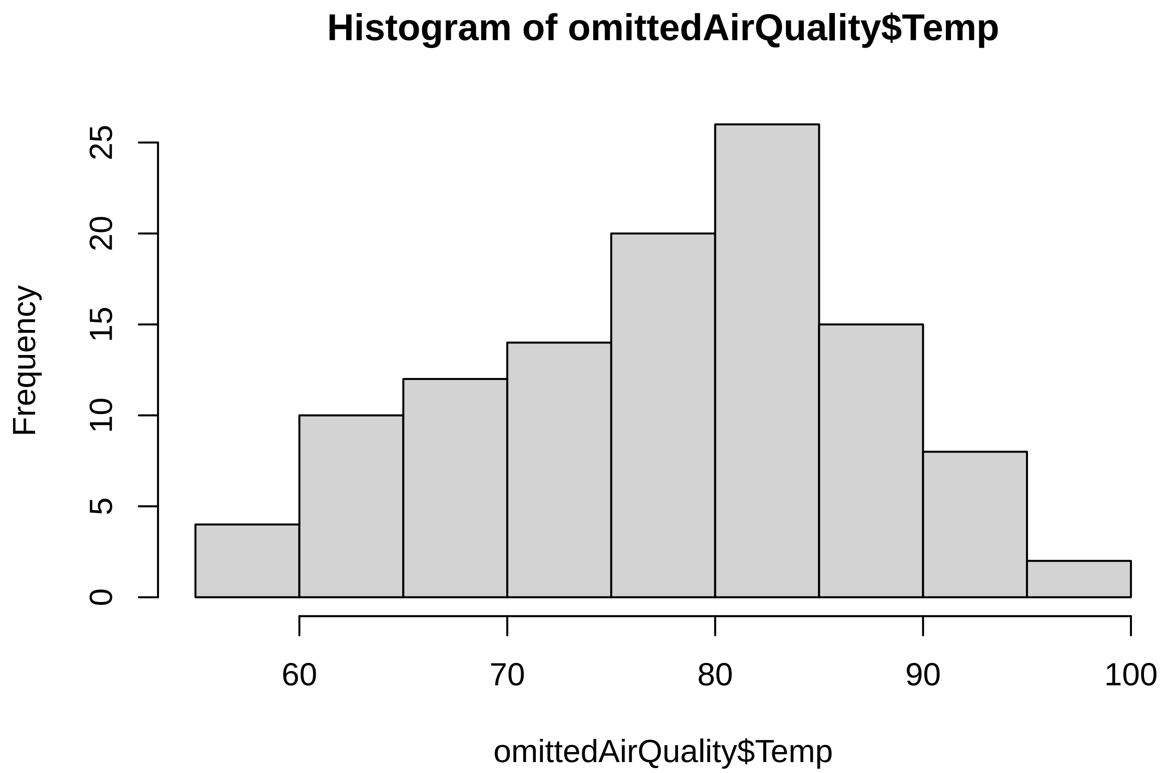
```r
hist(omittedAirQuality$Wind)
```




```r
#Temp
printVecInfo(omittedAirQuality$Temp)
```

```
## [1] "Mean:  77.7927927927928"
## [1] "Median:  79"
## [1] "Min:  57"
## [1] "Max:  97"
## [1] "Standard Deviation:  9.52996910909533"
## [1] "Quantile (0.05 - 0.95):  61"
## [1] "Skewness:  -0.225095889347339"
```

```r
hist(omittedAirQuality$Temp)
```


Histogram of omittedAirQuality$Temp
Frequency
0
5
10
15
20
25
60
70
80
90
100
omittedAirQuality$Temp