Verzani Problem Set

Next are considered the problems from Verzani's book on page 19

Problem 3.1

Enter in the data

```
> x <- c(60, 85, 72, 59, 37, 75, 93, 7, 98, 63, 41, 90,
5, 17, 97)
```

Make a stem and leaf plot

```
> sort(x)
 [1]  5  7 17 37 41 59 60 63 72 75 85 90 93 97 98
> stem(x)

  The decimal point is 1 digit(s) to the right of the |

  0 | 577
  2 | 7
  4 | 19
  6 | 0325
  8 | 50378
```

Problem 3.3

You can generate random data with the `rnorm` for example.

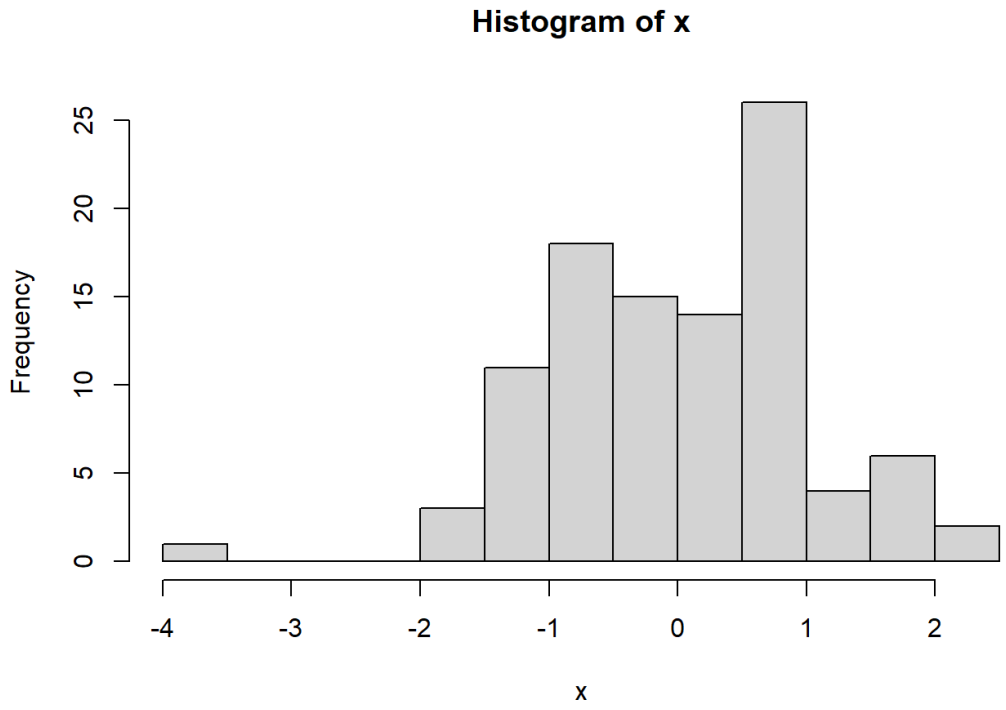
```
> x <- rnorm(100)
```

This produces 100 random numbers with normal distribution. Define it two times.

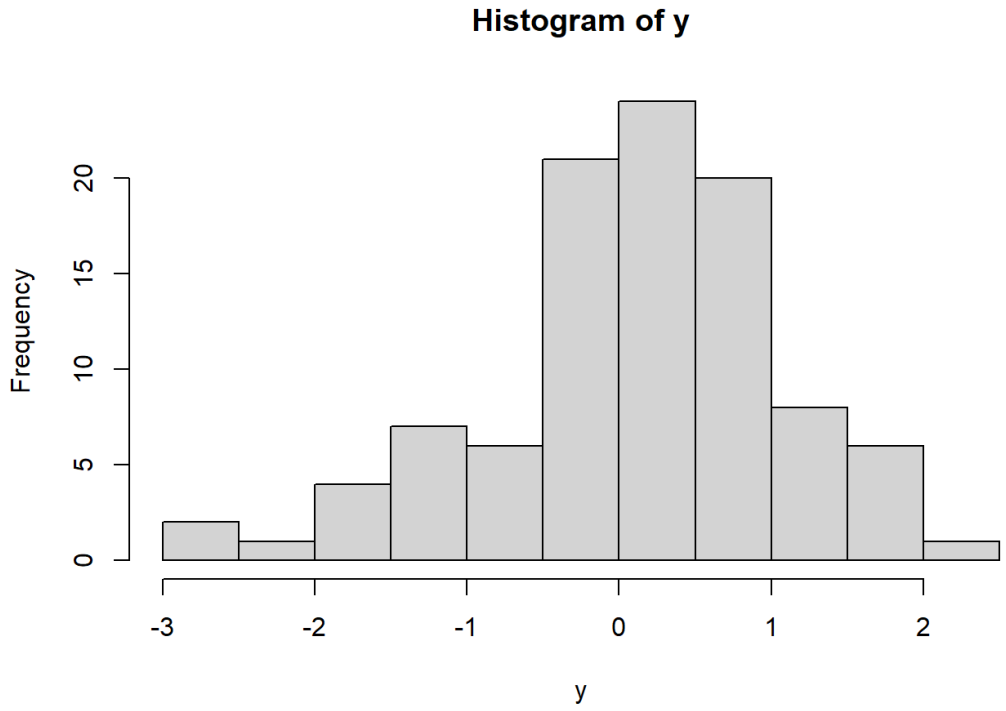
```
> y <- rnorm(100)
```

Create the two histograms. Do you get the same histogram?

```
> hist(x)
```


Histogram of x
Frequency
0
5
10
15
20
25
-4
-3
-2
-1
0
1
2
x

```
> hist(y)
```


Histogram of y
Frequency
0
5
10
15
20
-3
-2
-1
0
1
2
y

Problem 3.4

Lets review `south`, `crime` and `aid` data frames from `UsingR` package. What data are they containing?

```
> library(UsingR)
Warning: package 'UsingR' was built under R version 4.0.3
Loading required package: MASS
Loading required package: HistData
Loading required package: Hmisc
Loading required package: lattice
Loading required package: survival
Loading required package: Formula
Loading required package: ggplot2

Attaching package: 'Hmisc'
The following objects are masked from 'package:base':

    format.pval, units

Attaching package: 'UsingR'
The following object is masked from 'package:survival':

    cancer
> ?south
> ?crime
> ?aid
```

`south` data frame contains murder rates for 30 Southern US cities. `crime` data frame contains violent crime rates in 50 states of US in 1983 and 1993. `aid` data frame contains monthly payment for federal program.

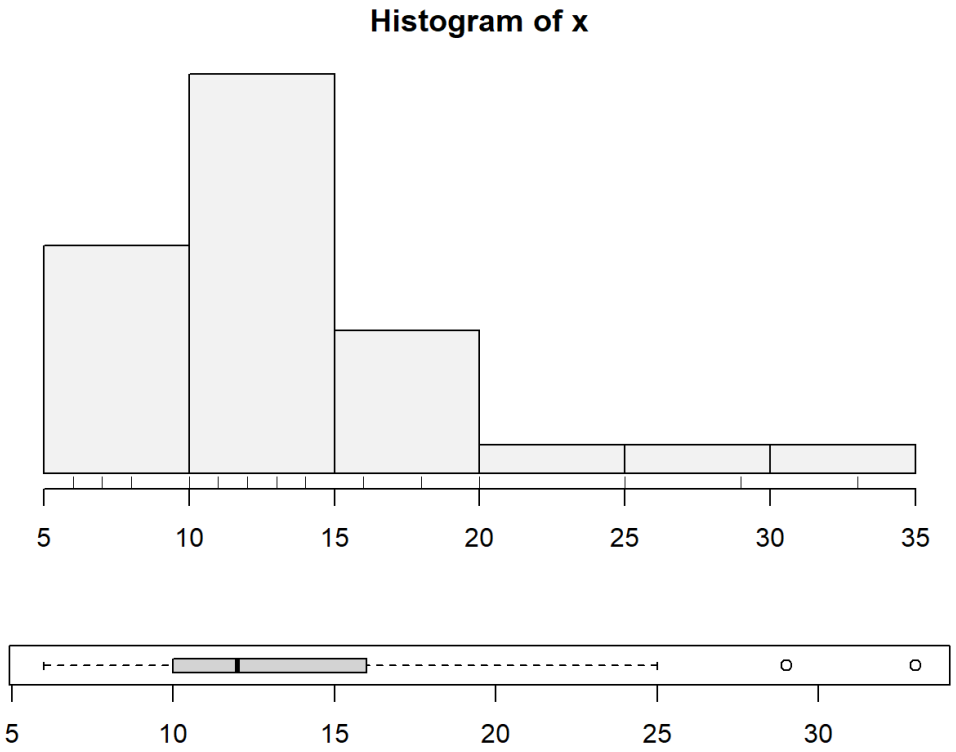
Now lets review what are this data sets containing

```
> head(south)
[1] 12 10 10 13 12 12
> head(crime)
           y1983  y1993
Alabama    416.0  871.7
Alaska     613.8  660.5
Arizona    494.2  670.8
```

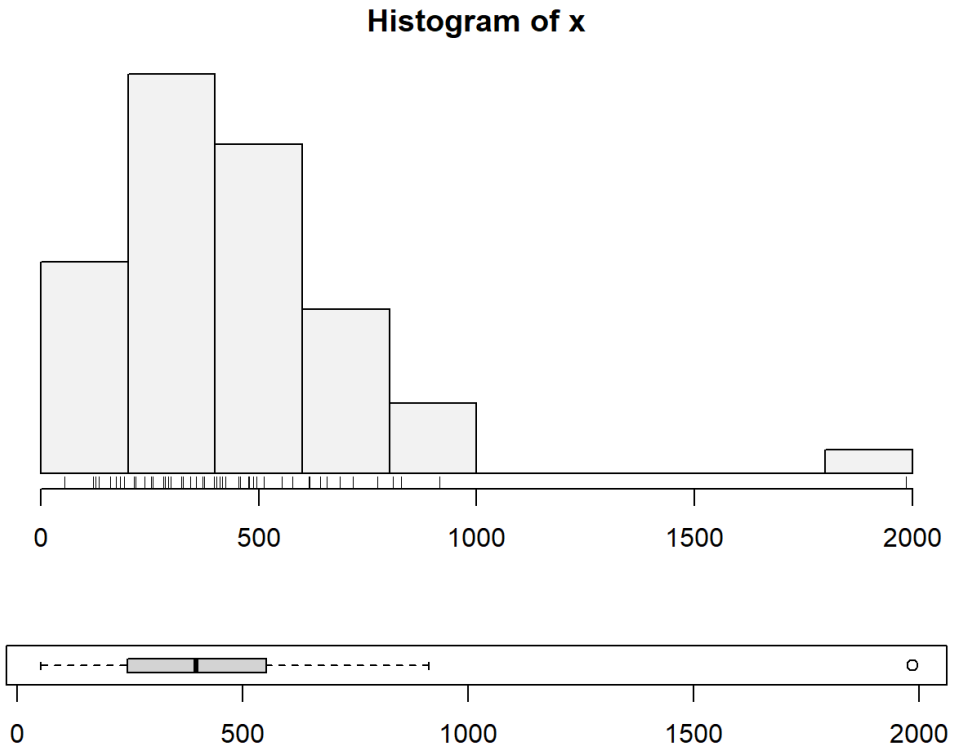
```
Arkansas   297.7  576.5
California 772.6 1119.7
Colorado   476.4  578.8
> head(aid)
   Alabama     Alaska    Arizona   Arkansas California
Colorado
     57.16     253.54     114.23      68.22     199.57
110.86
```

Make a histogram and boxplot for every one of them. Which of them are symmetric? Which of them are skewed? Which of them has outliers?

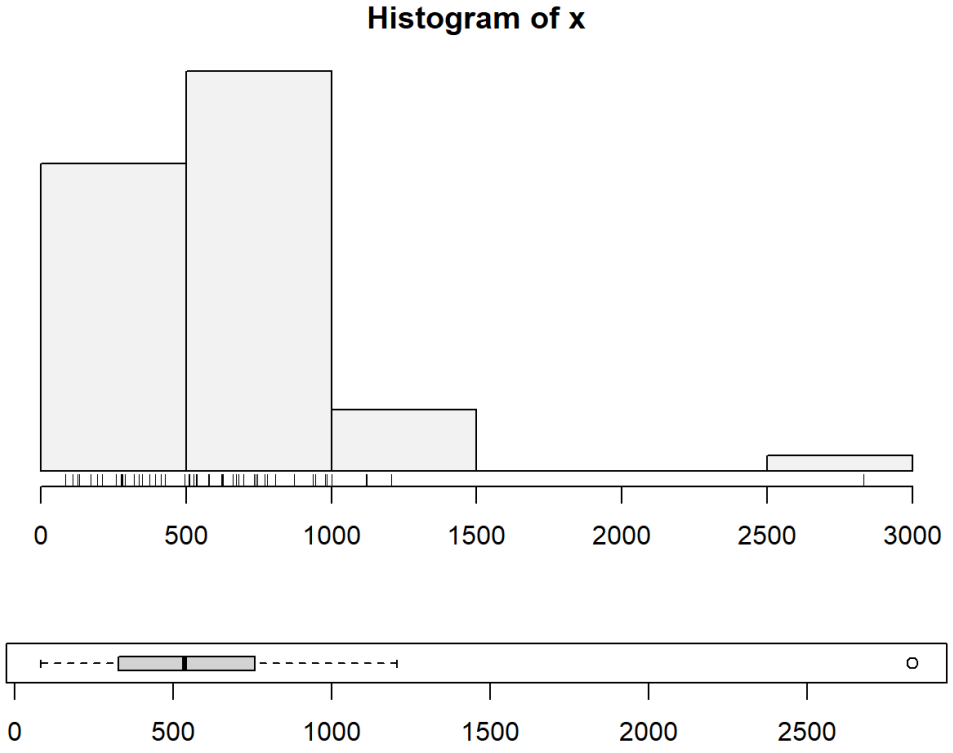
```
> simple.hist.and.boxplot(south)
```



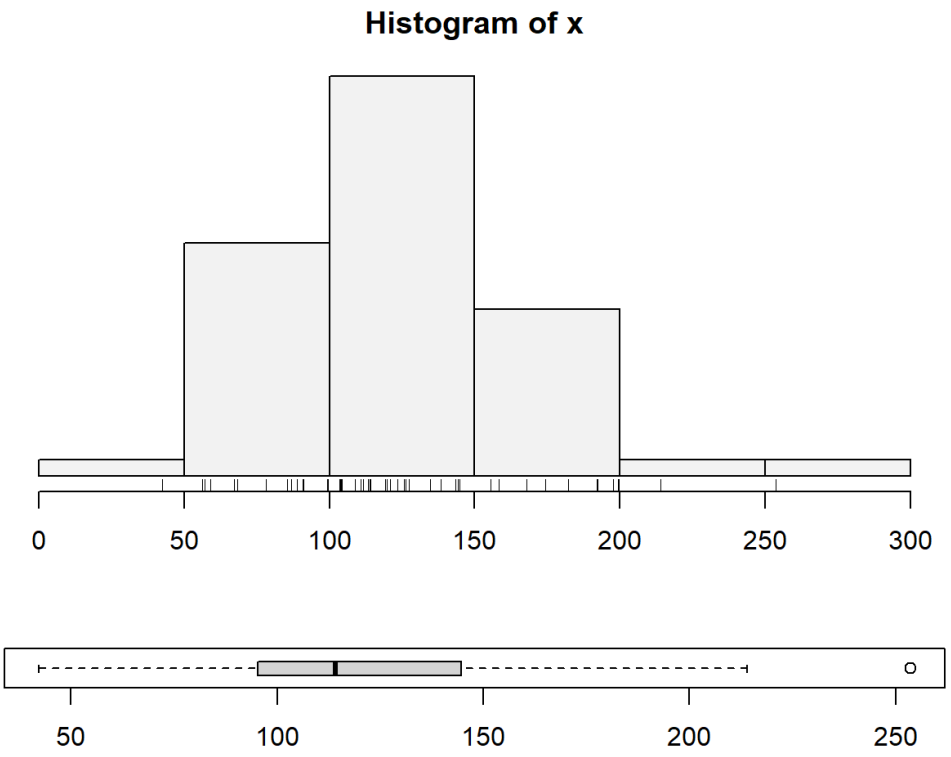
```
> simple.hist.and.boxplot(crime$y1983)
```




```
> simple.hist.and.boxplot(crime$y1993)
```



```
> simple.hist.and.boxplot(aid)
```



Problem 3.5

Lets review `bumpers`, `firstchi` and `math` data frames from `UsingR` package. What data are they containing?

```
> ?bumpers
> ?firstchi
> ?math
```

`bumpers` data frame contains bumper repair costs for various automobiles. `firstchi` data frame contains age of mother at birth of first child. `math` data frame contains standardized math scores.

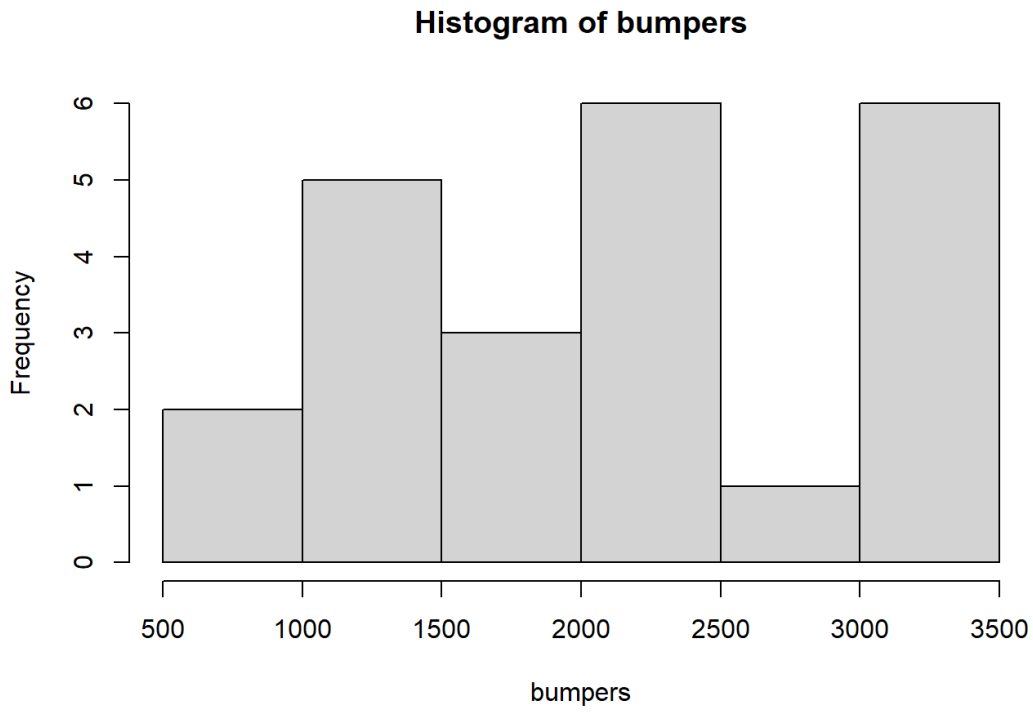
Now lets review what are this data sets containing

```
> head(bumpers)
      Honda Accord Chevrolet Cavalier       Toyota Camry
Saturn SL2
               618                 795               1304
1308
 Mitsubishi Galant       Dodge Monaco
              1340               1456
```

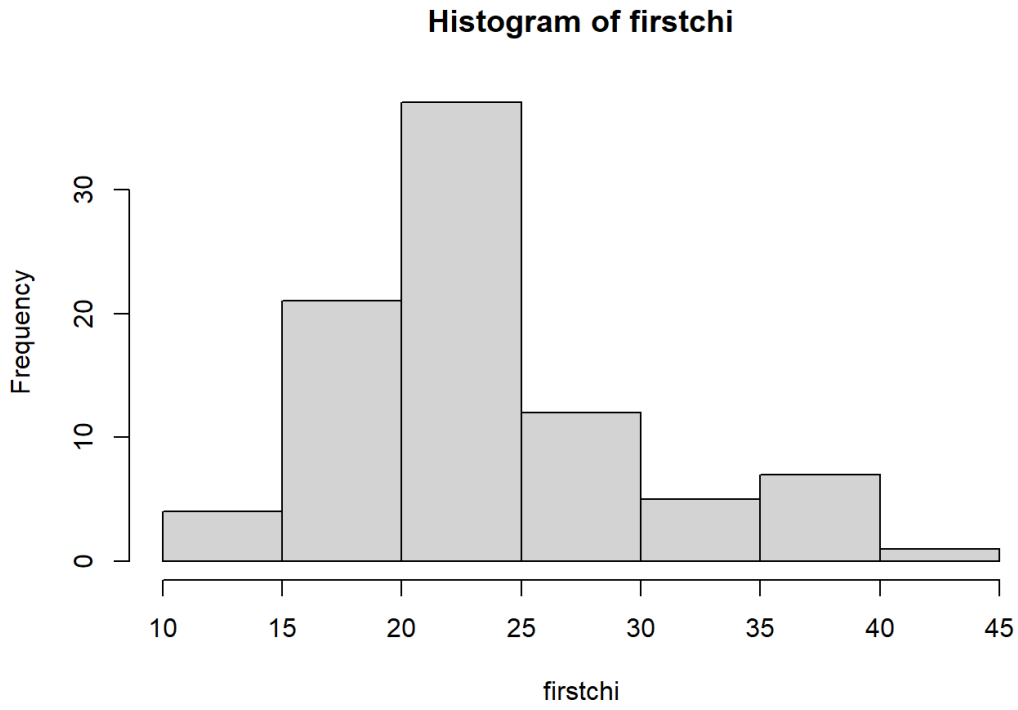
```
> head(firstchi)
[1] 30 18 35 22 23 22
> head(math)
[1] 44 49 62 45 51 59
```

Make a histogram for every one of them.

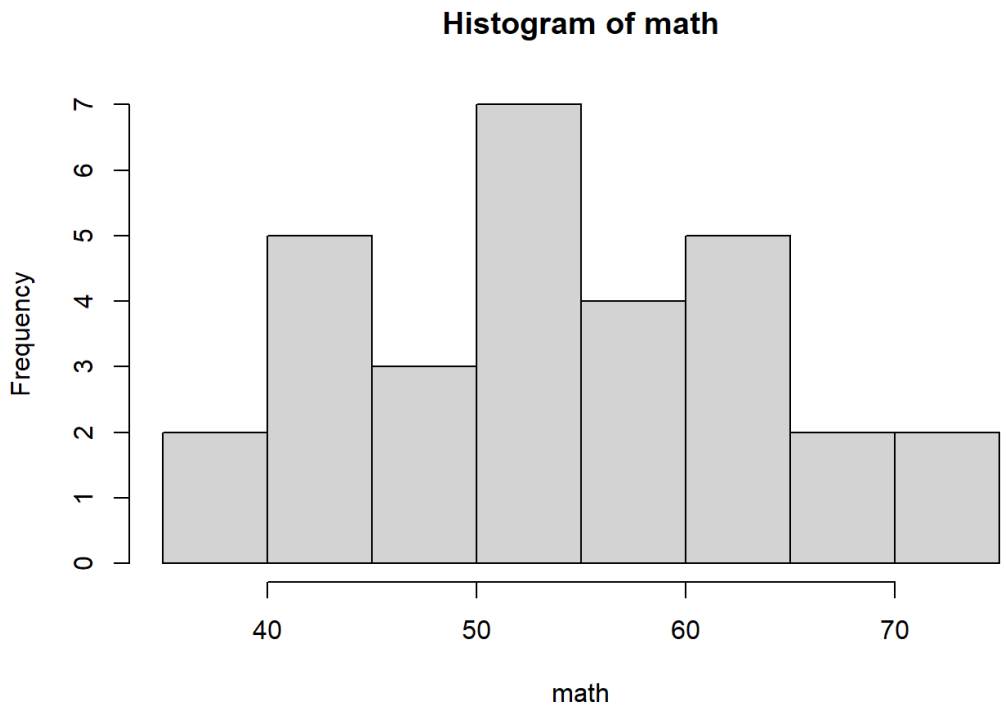
```
> hist(bumpers)
```




```
> hist(firstchi)
```



```
> hist(math)
```



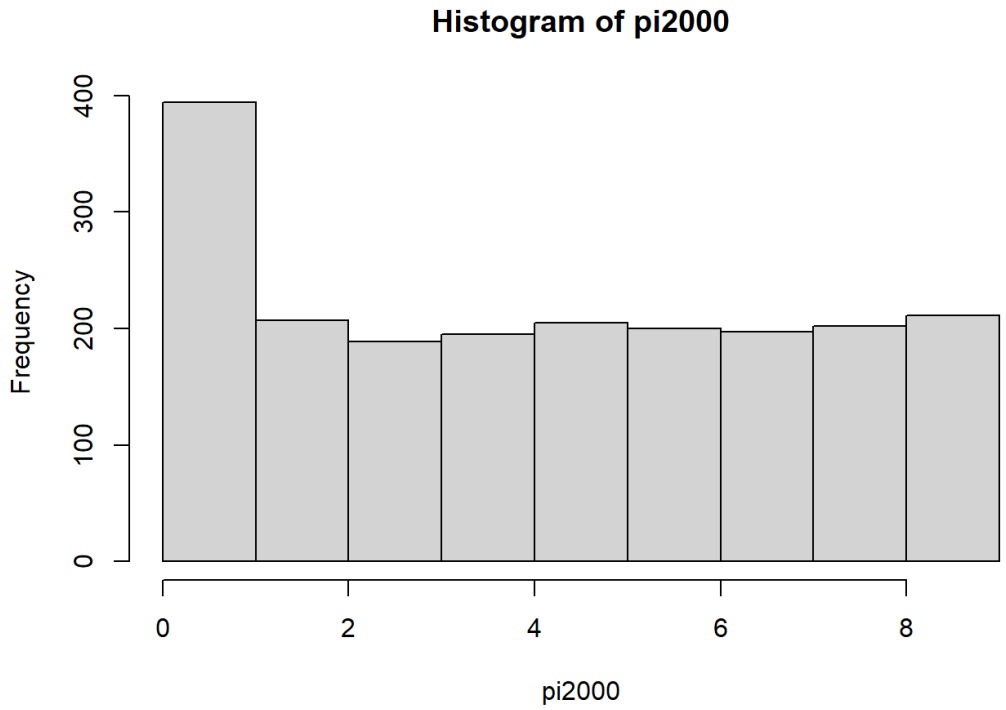
Try to predict the mean, median and standard deviation of every one of them. Check your guesses with the appropriate R commands.

```
> summary(bumpers)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max. 
    618    1478    2129    2122    2774    3298 
> summary(firstchi)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max. 
  14.00   20.00   23.00   23.98   26.00   42.00 
> summary(math)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max. 
  38.00   49.00   54.00   54.90   61.75   75.00 
```

Problem 3.7

The `pi2000` data frames from `UsingR` package contains the first 2000 digits of π. Make a histogram.

```
> hist(pi2000)
```



Is it surprising? Find the proportion of 1's, 2's and so on.

```
> table(pi2000)
pi2000
  0   1   2   3   4   5   6   7   8   9
181 213 207 189 195 205 200 197 202 211
> table(pi2000) / length(pi2000)
pi2000
     0      1      2      3      4      5      6      7
8      9
0.0905 0.1065 0.1035 0.0945 0.0975 0.1025 0.1000 0.0985
0.1010 0.1055
> prop.table(table(pi2000))
pi2000
     0      1      2      3      4      5      6      7
8      9
0.0905 0.1065 0.1035 0.0945 0.0975 0.1025 0.1000 0.0985
0.1010 0.1055
> proportions(table(pi2000))
pi2000
     0      1      2      3      4      5      6      7
8      9
0.0905 0.1065 0.1035 0.0945 0.0975 0.1025 0.1000 0.0985
0.1010 0.1055
```

Problem 3.8

Fit a density estimate to the `pi2000` data frame.

```
> density(pi2000)

Call:
    density.default(x = pi2000)

Data: pi2000 (2000 obs.);   Bandwidth 'bw' = 0.5657

       x                   y            
 Min.   :-1.697   Min.   :0.0007207  
 1st Qu.: 1.401   1st Qu.:0.0755293  
 Median : 4.500   Median :0.0990100  
 Mean   : 4.500   Mean   :0.0805830  
 3rd Qu.: 7.599   3rd Qu.:0.1007573  
 Max.   :10.697   Max.   :0.1046462  
> hist(pi2000, probability = TRUE)
> lines(density(pi2000), lwd = 2)
```