Homework for Central Tendency, Variability, and Graphical Displays

There are four activities below. Answers to each can be found following the activities.

1. Below are scores from test 1 of a section of EDUR 7130. Use these data to address each of the following:

(a) Find M, Md, Mo, Range, SD, and VAR (variance).
(b) Construct a frequency display.
(c) Construct a stem-and-leaf display (round scores to remove fractions).
(d) Construct a histogram or bar-chart, whichever is most appropriate (round scores to remove fractions).

Test 1 Grades in EDUR 7130

82.5	72.5	90	97.5	95	85	95	97.5	92.5
95	60	78.75	87.5	92.5	77.5	85	78.75	95
95	82.5	85	100	85	73.75	72.5	92.5	76.25
97.5	80	97.5	91.25	93.75	85	66.25		

2. Male and Female students from a graduate class were asked their opinion about a particular textbook. The scale on which they replied ranged from 1=strongly unfavorable to 5=strongly favorable. Calculate M, Md, Mo, Range, SD, and VAR for these data by hand. For SD and VAR, use the deviation method presented in class. Which group appears to have more favorable opinions regarding the textbook, males or females? What information did you use to arrive at this conclusion?

Male Opinion Scores		Female Opinion Scores	
1	5	5	1
5	4	3	2
4	3	1	1

3. Test scores are reported separately for boys and girls. Calculate the mean for both boys and girls combined to obtain a total, overall mean for these students.

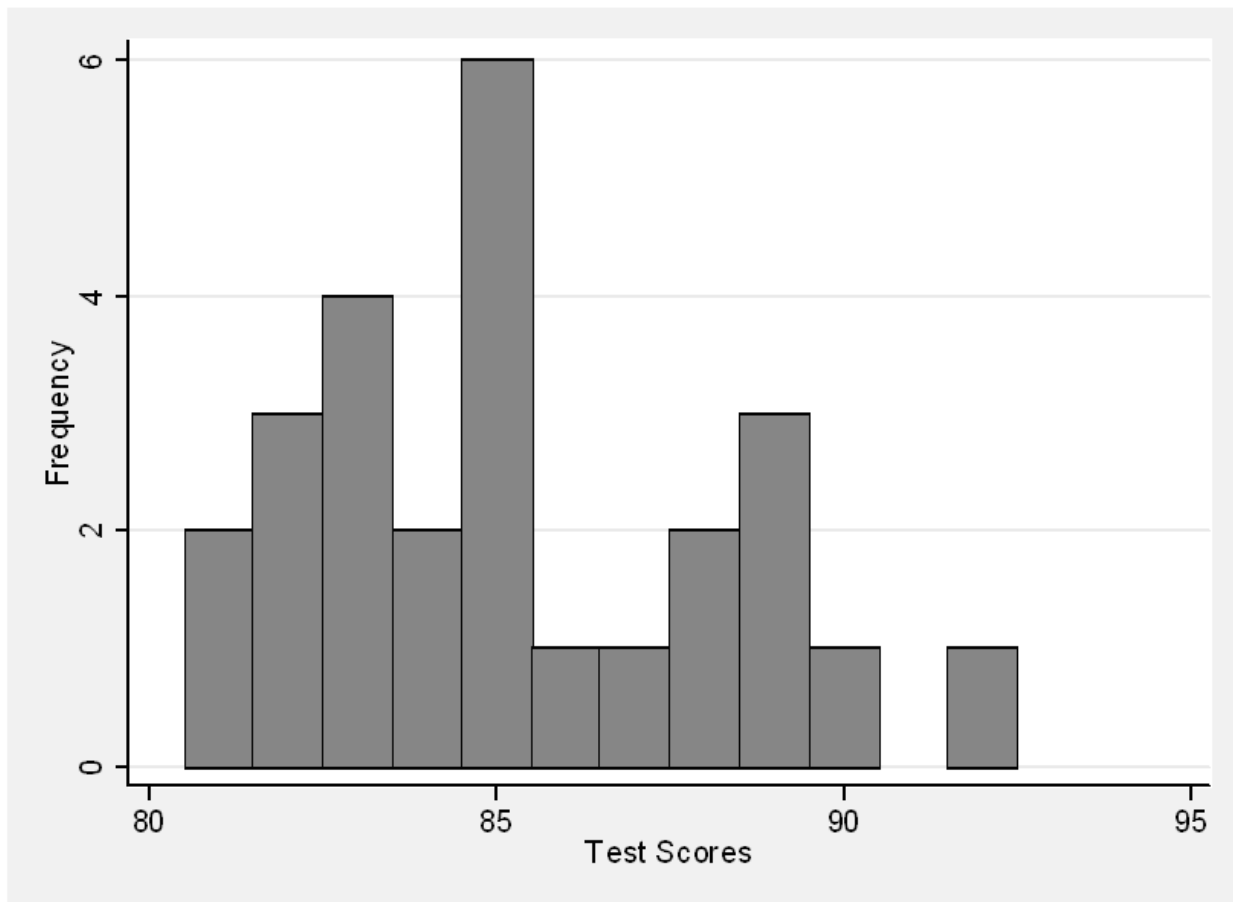Boys
M = 75
n = 10

Girls
M = 85
n = 5

4. Find M, Md, Mo, Range, SD, and VAR for data in (a); also find these same sample statistics for data in (b) below.

(a) Data are displayed in stem-and-leaf

```
. stem var5, round(1)
Stem-and-leaf plot for var5
var5 rounded to integers

   6.  | 55678
   7*  | 114
   7.  | 5
   8*  | 34
   8.  | 56
   9*  |
   9.  | 5
```

(b) Data are displayed in histogram

Answers

1. Test 1 grades from EDUR 7130:

(a) Find M, Md, Mo, Range, SD, and VAR.

```
Statistics
Test 1 Grades from EDUR 7130
                  N      Valid              34
                       Missing               0
                    Mean               86.2132
                  Median               86.2500
                    Mode                 85.00
          Std. Deviation                9.9691
                Variance               99.3831
                   Range                 40.00
                 Maximum                100.00
a  Multiple modes exist. The smallest value is shown
```

(b) Construct a frequency display.

```
Test 1 Grades from EDUR 7130
                  Frequency Percent   Valid   Cumulative
                                     Percent    Percent
   Valid   60.00          1    2.9      2.9        2.9
           66.25          1    2.9      2.9        5.9
           72.50          2    5.9      5.9       11.8
           73.75          1    2.9      2.9       14.7
           76.25          1    2.9      2.9       17.6
           77.50          1    2.9      2.9       20.6
           78.75          2    5.9      5.9       26.5
           80.00          1    2.9      2.9       29.4
           82.50          2    5.9      5.9       35.3
           85.00          5   14.7     14.7       50.0
           87.50          1    2.9      2.9       52.9
           90.00          1    2.9      2.9       55.9
           91.25          1    2.9      2.9       58.8
           92.50          3    8.8      8.8       67.6
           93.75          1    2.9      2.9       70.6
           95.00          5   14.7     14.7       85.3
           97.50          4   11.8     11.8       97.1
          100.00          1    2.9      2.9      100.0
           Total         34  100.0    100.0
```

(c) Construct a stem-and-leaf display (round scores to remove fractions).

```
. stem test1, round(1)
Stem-and-leaf plot for test1 (Test 1 Grades)
test1 rounded to integers

    6*  |  0
    6.  |  6
    7*  |  334
    7.  |  6899
    8*  |  033
    8.  |  555558
    9*  |  013334
    9.  |  555558888
   10*  |  0
```

(d) Construct a histogram or bar-chart, whichever is most appropriate (round scores to remove fractions).

Since these data are quantitative, a histogram is most appropriate.
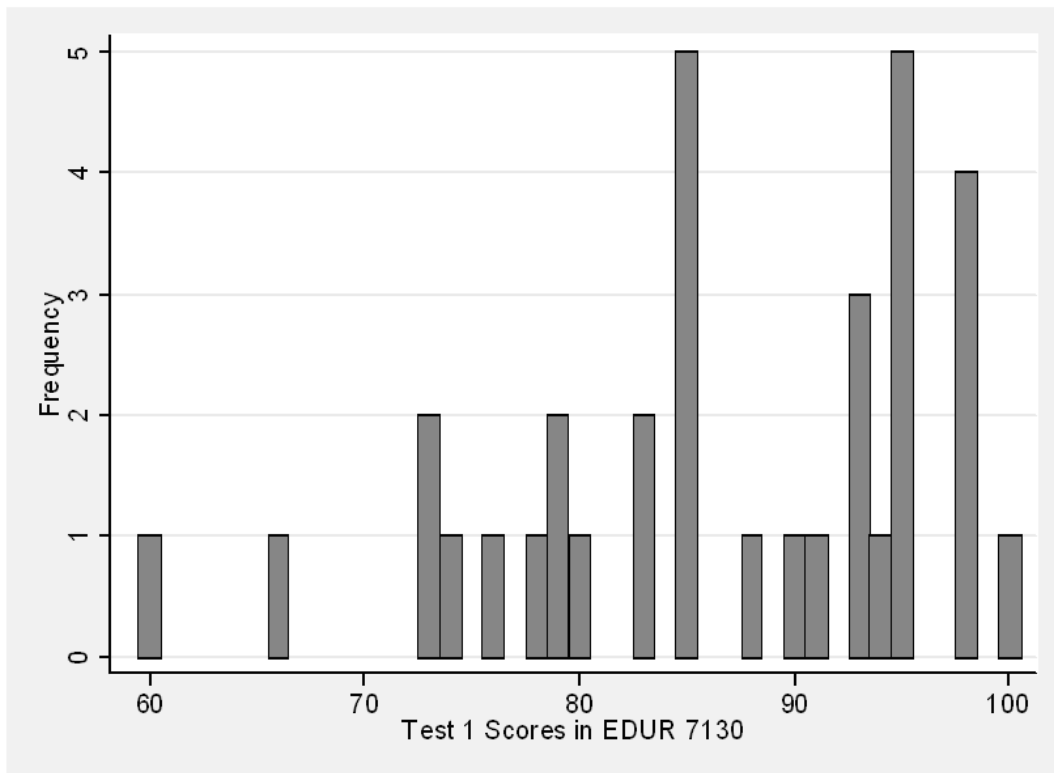
2. Male and female opinions about a textbook:

Male Opinion Scores		Female Opinion Scores	
1	5	5	1
5	4	3	2
4	3	1	1

Calculations for male scores

M = (1+5+4+5+4+3)/6 = 22/6 = 3.66666

Md = 1, 3, 4, 4, 5, 5 = (4+4)/2 = 4

Mo = 4 and 5 are most frequent, so these data are bi-modal

Deviation method for SD and VAR for male Opinion Scores:

X	M	X-M	(X-M)^2
1.000	3.667	-2.667	7.113
5.000	3.667	1.333	1.777
4.000	3.667	0.333	0.111
5.000	3.667	1.333	1.777
4.000	3.667	0.333	0.111
3.000	3.667	-0.667	0.445

SS (sum of squares) = Σ(X-M)^2 = (7.113 + 1.777 + 0.111 + 1.777 + 0.111 + 0.445) = 11.334

VAR = s^2 = Σ(X-M)^2/(n-1) = SS/(n-1) = 11.334/(6-1) = 11.334/5 = 2.2668

SD = s = $\sqrt{var}$ = $\sqrt{2.2668}$ = 1.506

Calculations for female scores

M = (5+3+1+1+2+1)/6 = 13/6 = 2.1666

Md = 1, 1, 1, 2, 3, 5 = (1+2)/2 = 1.5

Mo = 1

Deviation method for SD and VAR for male Opinion Scores:

X	M	X-M	$(X-M)^2$
5.000	2.167	2.833	8.026
3.000	2.167	0.833	0.694
1.000	2.167	-1.167	1.362
1.000	2.167	-1.167	1.362
2.000	2.167	-0.167	0.028
1.000	2.167	-1.167	1.362

SS (sum of squares) $= \Sigma(X-M)^2 = (8.026 + 0.694 + 1.362 + 1.362 + 0.028 + 1.362) = 12.834$

VAR $= s^2 = \Sigma(X-M)^2/(n-1) = SS/(n-1) = 12.834/(6-1) = 12.834/5 = 2.5668$

SD $= s = \sqrt{var} = \sqrt{2.5668} = 1.602$

Based upon the measures of central tendency for this sample, it appears that males have the more favorable opinion of this text.

3. Test scores are reported separately for boys and girls. Calculate the mean for both boys and girls combined to obtain an total, overall mean for these students.

Boys
M = 75
n = 10

Girls
M = 85
n = 5

To combine these, work backwards to find the sums, then add sums for both groups and divide by the total sample size.

Boys: 75 x 10 = 750 (total sum for boys)
Girls: 85 x 5 = 425 (total sum for girls)

Combine sums: 750 + 425 = 1175

Combined mean $= 1175/(n_{boys} + n_{girls}) = 1175/(10+5) = 1175/15 = 78.333$

4. Find M, Md, Mo, Range, SD, and VAR for data in (a); also find these same sample statistics for data in (b) below.

(a) Data are displayed in stem-and-leaf

M, Md, Mo, SD and VAR are reported below. The Range is 95-65 = 30.

```
. summarize var5, detail
-------------------------------------------------------------
        Percentiles      Smallest
 1%            65               65
 5%            65               65
10%            65               66         Obs                   14
25%            67               67         Sum of Wgt.           14

50%            72.5                        Mean             75.35714
                             Largest       Std. Dev.        9.572454
75%            84               84
90%            86               85         Variance         91.63187
95%            95               86         Skewness         .5990197
99%            95               95         Kurtosis         2.156291
```

(b) Data are displayed in histogram

M, Md, Mo, SD and VAR are reported below. The Range is 92-81 = 11.

```
. summarize var6, detail
-------------------------------------------------------------
        Percentiles      Smallest
 1%            81               81
 5%            81               81
10%            82               82         Obs                   26
25%            83               82         Sum of Wgt.           26

50%            85                          Mean             85.23077
                             Largest       Std. Dev.        2.970625
75%            88               89
90%            89               89         Variance         8.824615
95%            90               90         Skewness         .5087565
99%            92               92         Kurtosis         2.362027
```