Warm-Up

1.

The stem-and-leaf plot below shows the number of times Willy grabbed a rebound in each of 14 basketball games.

| Stem	Leaf
0	7 9
1	1 2 2 2 3 5 7 9 9
2	1 2 3

(*Note:* For example, 12 rebounds would have a stem value of 1 and a leaf value of 2.)

Medium

1 Which of the following is closest to the mean number of rebounds Willy grabbed per game?

Ⓐ 13
Ⓑ 14
Ⓒ 15
Ⓓ 16
Ⓔ 17

2.

New Leaf Learning Center held its annual yogathon for 3 days. The total money raised in the 3 days was $24,500. The money raised, in dollars, is shown for each of the 3 days in the bar graph below.
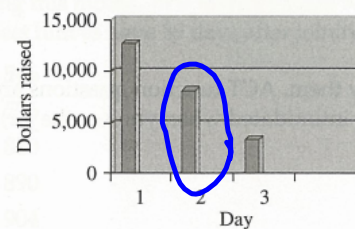
2 Approximately what percent of the money raised by the yogathon over the 3 days did New Leaf Learning Center raise on day 2 ?

Ⓕ 12%
Ⓖ 25%
Ⓗ 33%
Ⓙ 50%
Ⓚ 65%

$$\frac{8000}{24500}$$

1. a. Make a stem and leaf plot using the follow set of data.
43, 45, 65, 75, 32, 42, 66, 67, 55, 31, 59, 67, 76, 32, 54, 34, 43, 45, 55, 66

Key: 4|3 = 43

Stem	Leaves
3	1 2 2 4
4	2 3 3 5 5
5	4 5 5 9
6	5 6 6 7 7
7	5 6

b. Write an inequality to represent the interval of this data. $31 \le x \le 76$
(range)

2. Make a stem and leaf plot using the follow set of data.
99, 101, 112, 104, 98, 112, 114, 115, 116, 105, 109, 121, 129, 99, 117

Key: 10|1 = 101

Stem	Leaves
09	8 9 9
10	1 4 5 9
11	2 2 4 5 6 7
12	1 9

3. Find the mean, median, mode, and range using the stem and leaf plot.

```
6 | 0 5 6
7 | 0 1 3 5 5        Key  8|5 = 85
8 | 5 5 9
9 | 2 2 2 5 8 8 9
```

Mean = 82.$\overline{2}$ Median = 85   Mode = 92   Range = 39

4. Find the mean, median, mode, and range using the stem and leaf plot.

```
10 | 0 1 5 6 8
11 | 4 4 4 6           Key 12|9 = 129
12 | 9
13 | 0 4 5 6 8 9
14 |
15 | 7
```

Mean $\approx$ 122.1   Median = 116   Mode = 114   Range = 57

5. Find the mean, median, mode, and range using the stem and leaf plot.
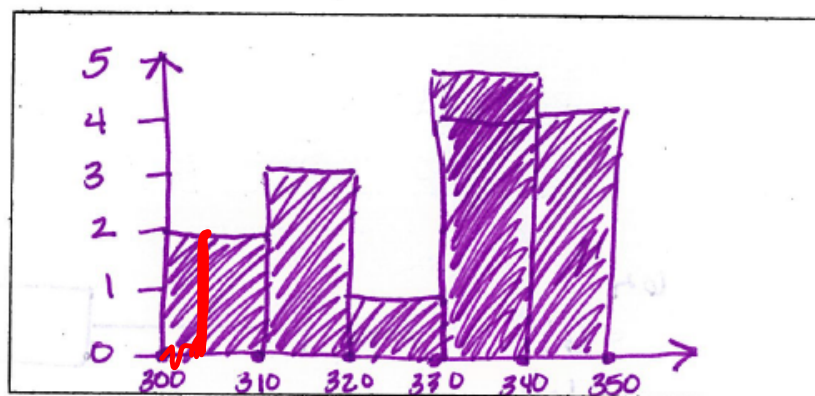
```
0 | 3 5 9
1 | 2 2 6
2 | 9
3 | 5 5 5 6 8 9
4 | 1 4 4 7
```

✳ Key 4|1 = 4.1 ✳

Mean ≈ __2.8__   Median = __3.5__ Mode = __3.5__   Range = __4.4__

6. Make a histogram using the following stem and leaf plot.

```
30 | 4 7
31 | 2 2 6
32 | 3
33 | 0 5 5 6 8
34 | 1 3 4 7
```
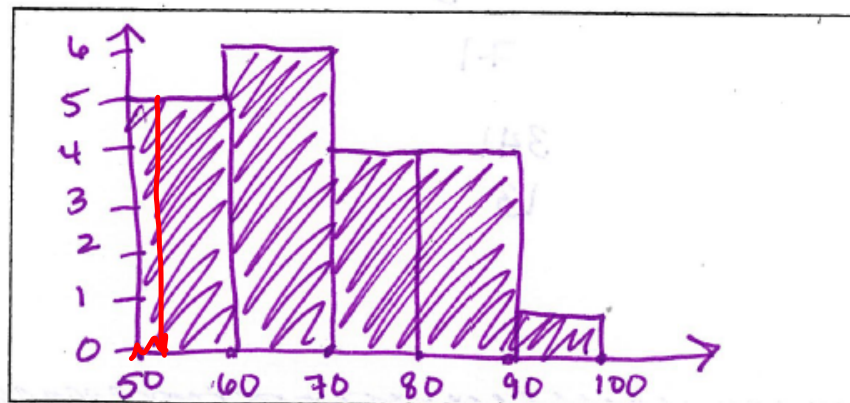
Key 34|1 = 341

7. Make a histogram using the following stem and leaf plot.

```
5 | 1 2 2 5 9
6 | 0 4 4 6 7 8
7 | 6 7 7 9
8 | 0 3 5 6
9 | 1
```

Key 5|1 = 51

10.5 Interpret Box-and-Whisker Plots
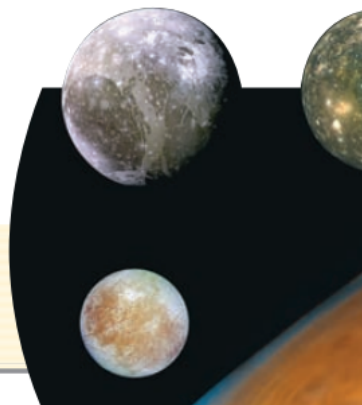
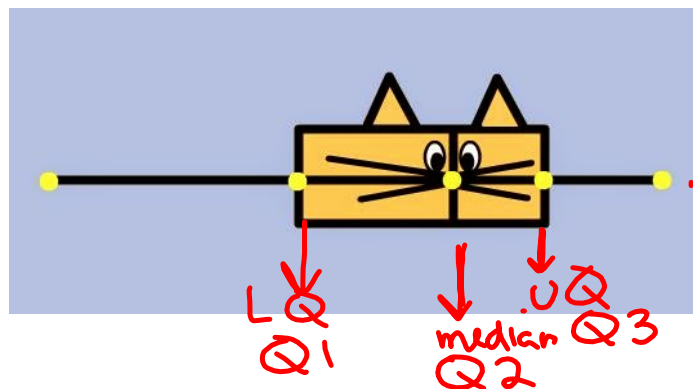|	
Before	You made stem-and-leaf plots and histograms.
Now	You will make and interpret box-and-whisker plots.
Why?	So you can compare sets of scientific data, as in Ex. 19.

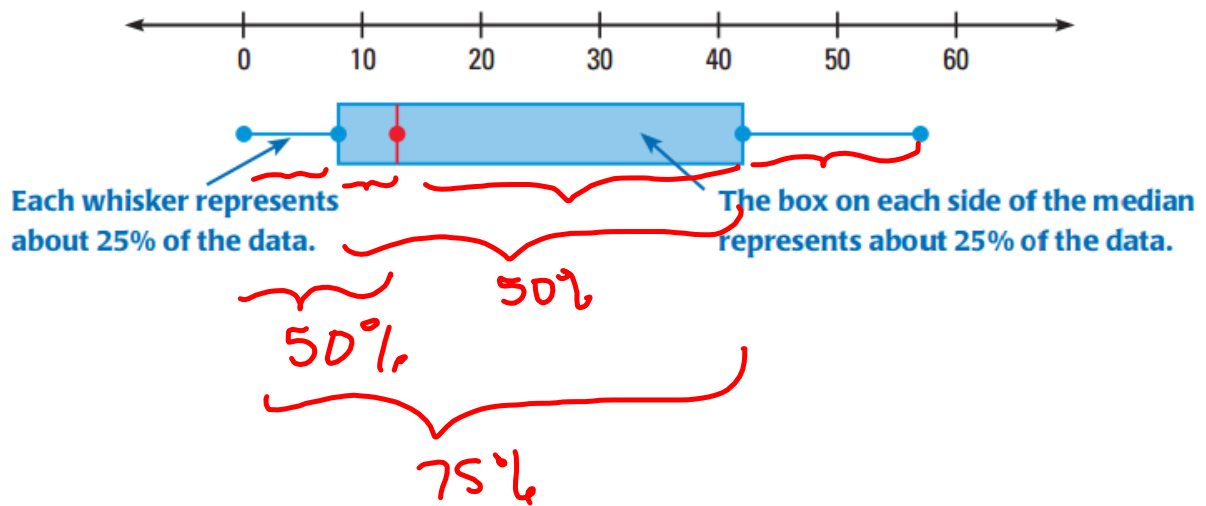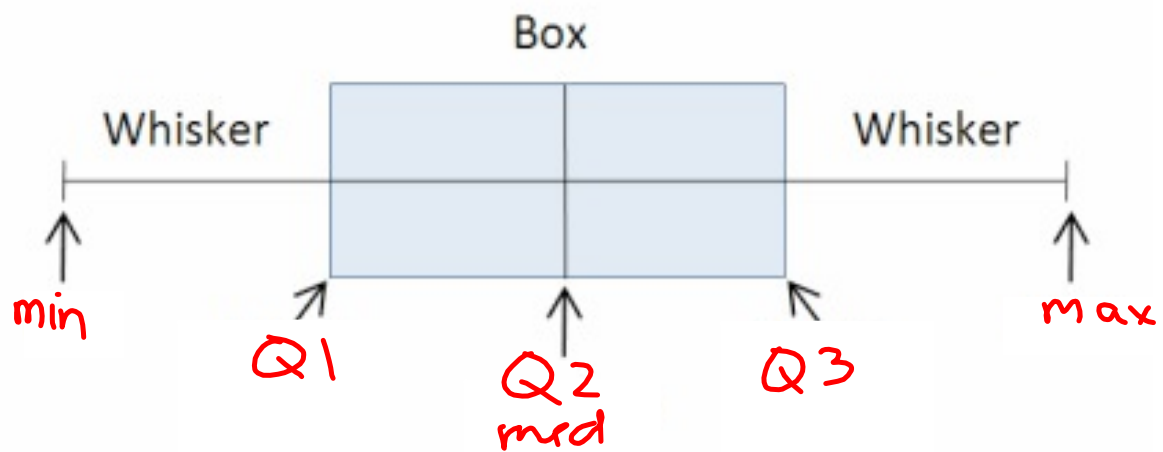*Handwritten annotations on the box plot:* LQ — Q1; median Q2; UQ — Q3

A box-and-whisker plot organizes data values into four groups.

Ordered data are divided into lower and upper halves by the median.

The median of the lower half is the lower quartile. (Q1)

The median of the upper half is the upper quartile. (Q3)

Box

Whisker   Whisker

↑
min
        ↗   ↑   ↖
        Q1   Q2   Q3
                 med

Each whisker represents   The box on each side of the median
about 25% of the data.   represents about 25% of the data.

50%

50%

75%

EXAMPLE 1   **Make a box-and-whisker plot**

SONG LENGTHS The lengths of songs (in seconds) on a CD are listed below. Make a box-and-whisker plot of the song lengths.

173, 206, 179, 257, 198, 251, 239, 246, 295, 181, 261

173, 179, (181), 198, 206, (239), 246, 251, (257), 261, 295

min   Q1 LQ   median   Q3 UQ   max

170 180 190 200 210 220 230 240 250 260 270 280 290 300
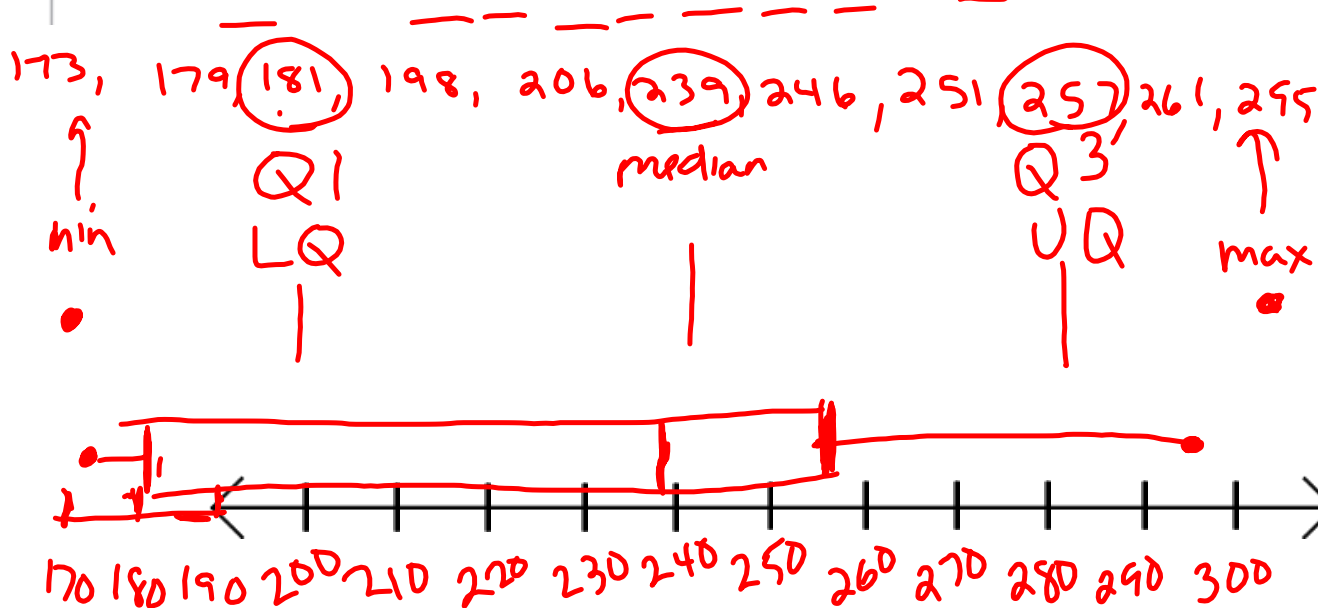
Outlier = 1.5 IQR = 1.5(76)
= 114

IQR = 76

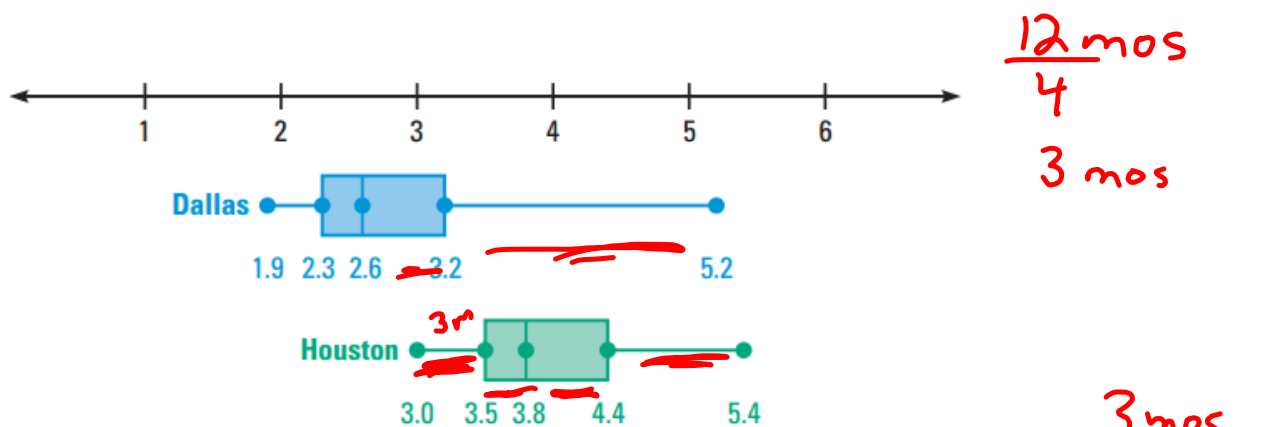Interquartile range = Q3 − Q1
257 − 181 = 76
Q1 = LQ − 181 − 114 = 67
Q3 = UQ − 257 + 114 = 371
No outliers

EXAMPLE 2   **Interpret a box-and-whisker plot**

PRECIPITATION The box-and-whisker plots below show the normal precipitation (in inches) each month in Dallas and in Houston, Texas.

$\dfrac{12\,mos}{4}$

3 mos

Dallas

1.9 2.3 2.6 ~~3.2~~   5.2

3ᵐ

Houston

3.0   3.5 3.8   4.4   5.4   3 mos.

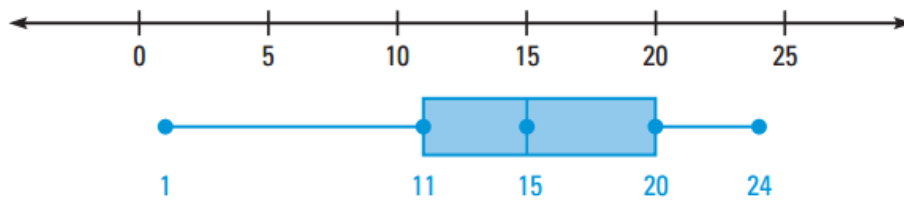**a.** For how many months is Houston's precipitation less than 3.5 inches?

b. Compare the precipitation in Dallas with the precipitation in Houston.

median for Dallas is lower.   IQR same
max for Houston is higher

c. PRECIPITATION In Example 2, for how many months was the precipitation in Dallas more than 2.6 inches?

6 mos

BOX-AND-WHISKER PLOT

1. ★ **MULTIPLE CHOICE** About what percent of the data are greater than 20?

   (A) 25%   (B) 50%   (C) 75%   (D) 100%

2. ★ **MULTIPLE CHOICE** About what percent of the data are less than 15?

   (A) 25%   (B) 50%   (C) 75%   (D) 100%

3. **ERROR ANALYSIS** *Describe* and correct the error in interpreting the box-and-whisker plot.

   50%

   About ~~25%~~ of the data values lie between 11 and 20.

The interquartile range of a data set is the difference of the upper quartile and the lower quartile.

$$UQ - LQ \quad \text{or} \quad Q3 - Q1$$

A value that is widely separated from the rest of the data in a data set is called an outlier.

Typically, a data value is considered to be an outlier if it is 1.5 times the interquartile range higher than the upper quartile or lower than the lower quartile.

$$LQ - 1.5 \, IQR$$

$$UQ + 1.5 \, IQR$$

EXAMPLE 3 **Standardized Test Practice**

The normal monthly amounts of precipitation (in inches) in Dallas are: 1.9, 2.4, 3.1, 3.2, 5.2, 3.2, 2.1, 2.0, 2.4, 4.1, 2.6, 2.6. These data were used to create the box-and-whisker plot in Example 2. Which value, if any, is an outlier?

(A) 1.9 **(B)** 5.2 **(C)** 1.9 and 5.2 **(D)** No outlier

$$LQ = 2.3 - 1.35 = .95$$

$$UQ = 3.2 + 1.35 = 4.55$$

$$IQR = 3.2 - 2.3 = .9$$

$$IQR(1.5) = .9(1.5) = 1.35$$

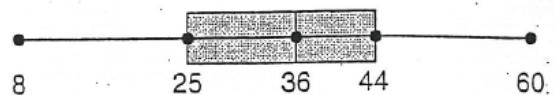$$.95 \leq x \leq 4.55 \text{ Good data}$$

ANSWER: THERE WAS NO CHEMISTRY

Why Didn't the Physics Teacher Marry the Biology Teacher?

Find each correct answer at the bottom of the page and write the letter for that answer under it.

**1** For the box-and-whisker plot at the right, give the following:

O. the first quartile **25**

E. the second quartile (median) **36**

T. the third quartile **44**

H. the range **52**

8   25   36   44   60

2 Arrange these scores in order from smallest to largest. Draw a box-and-whisker plot of the data under the number line at the right. Give the following:

TEST SCORES

| 82 | 86 | 89 | 84 | 78 | 82 | 92 |
| 95 | 77 | 69 | 98 | 95 | 63 | 73 |

A. the median **83**

I. the first quartile **77**

E. the third quartile **92**

C. the range **35**

R. percent of the scores between the first and third quartiles **50%**

60   70   80   90   100
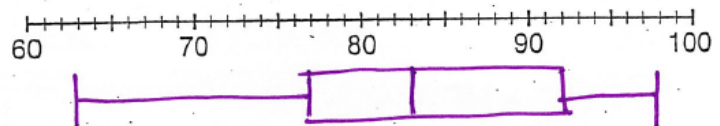
3 Arrange each set of heights in order from smallest to largest. Draw two box-and-whisker plots, one for boys and one for girls, under the number line at the right.

Heights of boys (in.): 64, 61, 66, 64, 58, 63, 68, 64, 60, 57, 65, 63, 69, 64, 64, 68, 61, 65
Heights of girls (in.): 63, 60, 67, 62, 58, 63, 68, 59, 62, 65, 56, 63, 59, 62, 58

Give the following:

T. the median for boys 64

E. the first quartile for boys 61

S. the third quartile for boys 65

Y. the median for girls 62

R. the first quartile for girls 59

H. the third quartile for girls 63
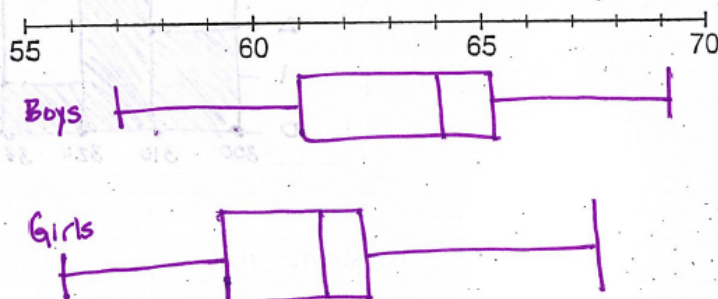
4 Match each description with the most reasonable box-and-whisper plot. Look for the median of this plot in the answer spaces. Write the exercise letter in that box.

N. Season scores of a baseball team 5

S. Resting heart rates (beats per minute) 71

W. Prices of 25-inch TV sets ($) 341

M. Ages at a Boy Scout meeting 13