5.62 Examine the following sample data.

5.9	4.0	6.0	4.6	5.3	1.6	7.4
8.6	7.3	8.4	5.9	6.7	9.7	3.5
3.1	4.3	8.2	6.5	1.1	5.0	3.2
2.1	4.5	6.3	3.3	8.4	9.4	6.4

a. Construct a stem-and-leaf plot to assess whether the data are from an approximately normal distribution.
b. Compute s for the sample data.
c. Find the values of Q_L and Q_U and the value of s from part **b.** to assess whether the data come from an approximately normal distribution.
d. Generate a normal probability plot for the data, and use it to assess whether the data are approximately normal.

Indication: To load the data in R, you just have to write

```
X = c(5.9, 4.0, 6.0, 4.6, 5.3, 1.6, 7.4,
8.6, 7.3, 8.4, 5.9, 6.7, 9.7, 3.5,
3.1, 4.3, 8.2, 6.5, 1.1, 5.0, 3.2,
2.1, 4.5, 6.3, 3.3, 8.4, 9.4, 6.4)
```

Solution:

a. We plot the stem-and-leaf plot with R:

```
stem(X)

  The decimal point is at the |

  1 | 16
  2 | 1
  3 | 1235
  4 | 0356
  5 | 0399
  6 | 03457
  7 | 34
  8 | 2446
  9 | 47
```

The data seem reasonably symmetric around the center. A sample of size 28 from a normal distribution could have that shape. Only with very large sample sizes (around 100), can we nearly always expect a bell-shaped frequency graph.
b. The expression to compute the sample standard deviation s is

$$s = \sqrt{\frac{1}{27}\sum_{i=1}^{28}(x_i - \bar{x})}.$$

We compute it with R:

```
s = sd(X)
s
[1] 2.352537
```

c. To find the values of Q_L (1st or lower quartile) and Q_U (3rd or upper quartile) with R:

```
summary(X)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  1.100   3.875   5.900   5.596   7.325   9.700
```

To assess whether the data come from an approximately normal distribution we compute the ratio of the interquartile range to the standard deviation:

$$\frac{\text{IQR}}{s} = \frac{7.325 - 3.875}{2.352537} = 1.4665,$$

which is reasonably close to 1.3.

d. The normal probability plot for the data looks reasonably Gaussian too. Using all the results in this exercise, there is no reason to believe that the data have not been generated by a normal distribution.