MULTIPLE CHOICE.  Choose the one alternative that best completes the statement or answers the question.

Describe the distribution (shape, center, spread, unusual features).
1) The histogram displays the body fat percentages of 65 students taking a college health course. In            1) _____
addition to describing the distribution, give a reason to account for the shape of this distribution.
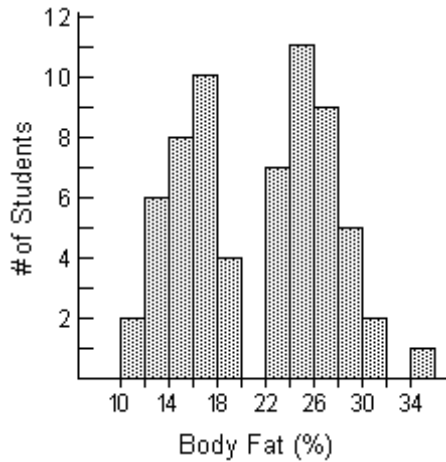


A) The distribution of body fat percentages is bimodal, with a cluster of body fat percentages
around 12% and another cluster of body fat percentages around 28%. The upper cluster
shows a bit of a skew to the right. Most students in the lower cluster have body fat
percentages between 12% and 18%, and most students in the upper cluster have body fat
percentages between 22% and 28%. Men and women have different body fat percentages: the
lower cluster would likely represent male students, and the upper cluster would likely
represent female students.
B) The distribution of body fat percentages is bimodal, with a cluster of body fat percentages
around 16% and another cluster of body fat percentages around 26%. The upper cluster
shows a bit of a skew to the right. Most students in the lower cluster have body fat
percentages between 12% and 18%, and most students in the upper cluster have body fat
percentages between 22% and 28%. Men and women have different body fat percentages: the
lower cluster would likely represent male students, and the upper cluster would likely
represent female students.
C) The distribution of body fat percentages is unimodal, with a bit of a skew to the right. The
body fat percentages are centered around 20%, with a range of 10% to 35%. Most students
have body fat percentages between 12% and 28%. Men and women have different body fat
percentages, but the average of body fat percentages for men and women would be around
20%.
D) The distribution of body fat percentages is unimodal, with a bit of a skew to the right. The
body fat percentages are centered around 24%, with a range of 10% to 34%. Most students
have body fat percentages between 12% and 28%. Men and women have different body fat
percentages, but the average of body fat percentages for men and women would be around
24%.
E) The distribution of body fat percentages is bimodal, with a cluster of body fat percentages
around 16% and another cluster of body fat percentages around 26%. The upper cluster
shows a bit of a skew to the right. Most students in the lower cluster have body fat
percentages between 16% and 20%, and most students in the upper cluster have body fat
percentages between 22% and 26%. Men and women have different body fat percentages: the
lower cluster would likely represent male students, and the upper cluster would likely
represent female students.

Solve the problem.

2) The distribution at the right is the number of family members reported by 25 people in the 2010 Census. The best description for the shape of this distribution is

2) _____
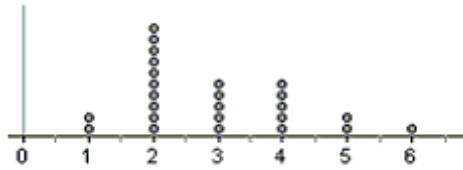


    A) Unimodal and symmetric                  B) skewed left
    C) skewed right                            D) bimodal

Compare the distributions (shape, center, spread, unusual features).

3) The back-to-back dotplot shows the number of fatalities per year caused by tornadoes in a certain state for two periods: 1950-1974 and 1975-1999. In addition to comparing these distributions, state a reason explaining any differences.

3) _____

Number of Fatalities per Year
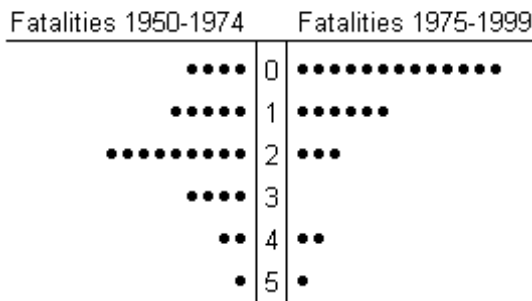


A) The distribution of the number of fatalities per year for the period 1950-1974 is unimodal and approximately symmetric. The center of the distribution is about 2 fatalities per year. The number of fatalities per year ranges from 0 to 5 deaths. For the period 1975-1999, the distribution of the number of fatalities per year is also unimodal, but skewed to the left. A typical number of fatalities for this distribution is 0 fatalities, with a range of 0 to 5 deaths. Before 1975, there were more fatalities as a result of tornadoes. Higher construction standards, better warning systems, or medical advancements could all account for this difference.

B) The distribution of the number of fatalities per year for the period 1950-1974 is unimodal and skewed to the right. The center of the distribution is about 3 fatalities per year. The number of fatalities per year ranges from 0 to 5 deaths. For the period 1975-1999, the distribution of the number of fatalities per year is also unimodal and skewed to the right. A typical number of fatalities for this distribution is 0 fatalities, with a range of 0 to 5 deaths.

C) The distribution of the number of fatalities per year for the period 1950-1974 is unimodal and approximately symmetric. The center of the distribution is about 2 fatalities per year. The number of fatalities per year ranges from 0 to 5 deaths. For the period 1975-1999, the distribution of the number of fatalities per year is also unimodal, but skewed to the left. A typical number of fatalities for this distribution is 0 fatalities, with a range of 0 to 5 deaths.

D) The distribution of the number of fatalities per year for the period 1950-1974 is unimodal and approximately symmetric. The center of the distribution is about 2 fatalities per year. The number of fatalities per year ranges from 0 to 5 deaths. For the period 1975-1999, the distribution of the number of fatalities per year is also unimodal, but skewed to the right. A typical number of fatalities for this distribution is 0 fatalities, with a range of 0 to 5 deaths. Before 1975, there were more fatalities as a result of tornadoes. Higher construction standards, better warning systems, or medical advancements could all account for this difference.

E) The distribution of the number of fatalities per year for the period 1950-1974 is unimodal and skewed to the right. The center of the distribution is about 3 fatalities per year. The number of fatalities per year ranges from 0 to 5 deaths. For the period 1975-1999, the distribution of the number of fatalities per year is also unimodal and skewed to the right. A typical number of fatalities for this distribution is 0 fatalities, with a range of 0 to 5 deaths. Before 1975, there were more fatalities as a result of tornadoes. Higher construction standards, better warning systems, or medical advancements could all account for this difference.

Find the mean of the data.
4) John liked to order the all-you-can-eat shrimp at his favorite restaurant. Here are the number of shrimp he ate during his last five visits to the restaurant.

4) _____

12, 14, 20, 12, 16
A) 16 shrimp
B) 14.8 shrimp
C) 18.5 shrimp
D) 14 shrimp
E) 12 shrimp

Find the median of the data.
5) The annual incomes, in dollars, of several doctors are listed below.

5) _____

130,000   119,000   163,000   213,000   244,000
144,000   140,000   754,000   201,000   166,000
A) $252,000          B) $166,000          C) $163,000          D) $164,500          E) $227,000

Solve the problem.
6) The test scores of 19 students are listed below. Find the interquartile range (IQR) by hand.

6) _____

| 91 | 49 | 86 | 68 | 61 |
|----|----|----|----|----|
| 64 | 97 | 55 | 90 | 76 |
| 82 | 83 | 53 | 88 | 75 |
| 43 | 92 | 94 | 66 |    |

A) 28.5          B) 26.5          C) 25          D) 29.5          E) 29

7) The test scores of 19 students are listed below. Find the range.

7) _____

| 91 | 99 | 86 | 54 | 72 |
|----|----|----|----|----|
| 85 | 97 | 91 | 90 | 66 |
| 82 | 83 | 78 | 88 | 77 |
| 80 | 92 | 94 | 98 |    |

A) 33          B) (66, 99)          C) 44          D) 45          E) (54, 99)

8) Here are the commutes (in miles) for a group of six employees. Find the standard deviation.

8) _____

19.4   16.9   42.0   39.7   12.1   10.5

A) 40.9          B) 3294.7          C) 12.1          D) 4258.7          E) 13.89

9) Which set has the largest standard deviation?                                    9) _____

| Set 1 | Set 2 |
|---|---|
| 1  6  6  6  11 | 1  5  6  7  11 |

    A) Set 1, because 5 and 7 in set 1 are farther from 6 than 6 and 6 in set 2.
    B) Set 1, because 6 and 6 in set 1 are farther from 6 than 5 and 7 in set 2.
    C) Set 2, because 6 and 6 in set 2 are farther from 6 than 5 and 7 in set 1.
    D) Set 2, because 5 and 7 in set 2 are farther from 6 than 6 and 6 in set 1.
    E) Neither, because set 1 and set 2 have the same standard deviation.

10) Here are summary statistics of the four last digits of social security number of 500 customers,   10) _____
corresponding to the following histogram.

| Count | 500 |
|---|---|
| Mean | 4950 |
| StdDev | 1531 |
| Median | 5009 |
| IQR | 2009 |
| Q1 | 4028 |
| Q3 | 6037 |



Four Last Digits of Social Security Number
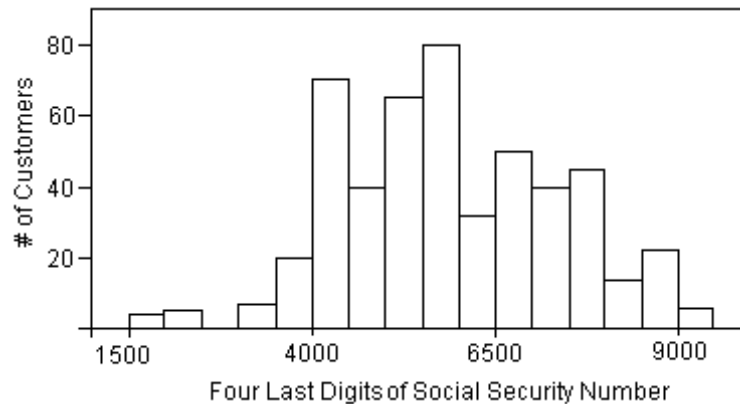
Is the mean or median a "better" summary of the center of the distribution?
    A) Median, because of the outliers.
    B) Neither, because these are not categorical data.
    C) Median, because the IQR is smaller than the standard deviation.
    D) Neither, because these are not quantitative data.
    E) Mean, because the distribution is quite symmetric.

11) A small company employs a supervisor at $1200 a week, an inventory manager at $800 a week, 5   11) _____
stock boys at $300 a week, and 3 drivers at $700 a week. Which measure of center best describes a
typical wage at this company, the mean at $560 or the median at $500?
    A) Mean, because there are no outliers.
    B) Median, because of the outlier $1200.
    C) Median, because of the outliers $800 and $1200.
    D) Mean, because the distribution is symmetric.
    E) Median, because the distribution is skewed to the left.

12) A small company employs a supervisor at $1200 a week, an inventory manager at $800 a week, 6   12) _____
stock boys at $400 a week, and 4 drivers at $700 a week. Which measure of spread, would best
describe the payroll, the range, the IQR, or the standard deviation?
    A) Range, because it would be least sensitive to the outlier at $1200.
    B) IQR, because it would be least sensitive to the outliers at $800 and $1200.
    C) IQR, because the distribution is symmetric.
    D) Standard deviation, because it would be least sensitive to the outlier at $1200.
    E) IQR, because it would be least sensitive to the outlier at $1200.

Find the five-number summary for the given data by hand.

13) A small company employs a supervisor at $1400 a week, an inventory manager at $800 a week, 5 stock boys at $400 a week, and 3 drivers at $600 a week.
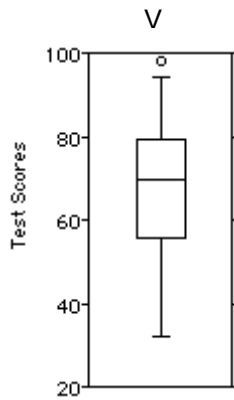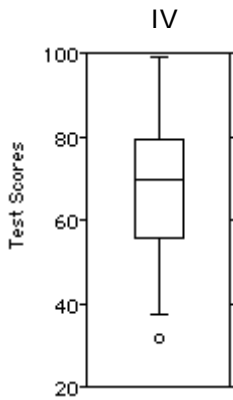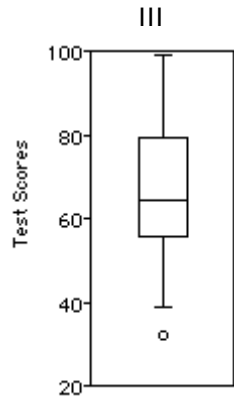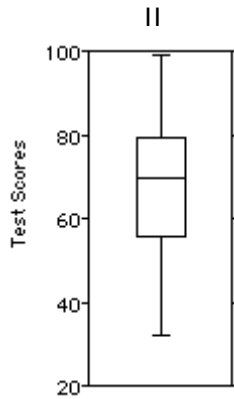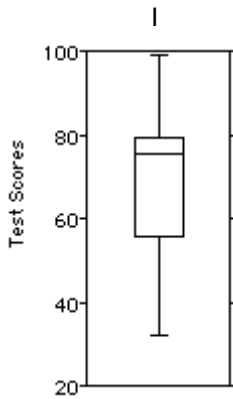
13) _____

   A) 400, 400, 500, 800, 1400 dollars
   B) 400, 400, 1000, 600, 1400 dollars
   C) 2000, 400, 500, 1800, 1400 dollars
   D) 400, 400, 500, 600, 1400 dollars
   E) 1400, 400, 500, 600, 400 dollars

Create a boxplot that represents the given data.

14) Here are the test scores of 32 students:

14) _____

```
32  37  41  44  46  48  53  55
56  57  59  63  65  66  68  69
70  71  74  74  75  77  78  79
80  82  83  86  89  92  95  99
```



A) I      B) II      C) III      D) IV      E) V

Identify potential outliers, if there are any, in the given data.

15) The normal annual precipitation (in inches) is given below for 21 different U.S. cities.      15) _____
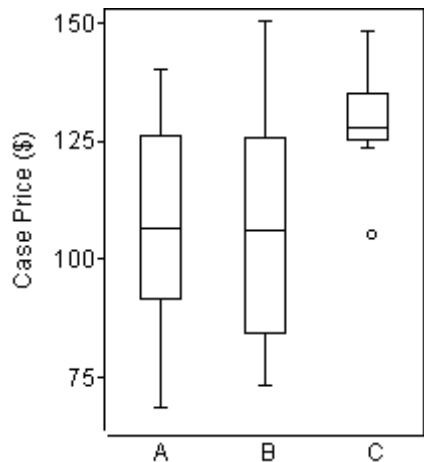
| 32.4 | 30.5 | 34.6 | 63.9 | 22.1 | 31.8 | 16.6 |
| 27.9 | 36.2 | 59.3 | 25.8 | 47.2 | 45.6 | 8.6 |
| 26.6 | 18.9 | 14.3 | 31.4 | 24.2 | 12.4 | 35.4 |

A) 59.3, 63.9
B) 8.6, 59.3, 63.9
C) 63.9
D) 25.8
E) None

Solve the problem.

16) The boxplots display case prices (in dollars) of white wines produced by three vineyards in the western United States. Describe these wine prices.      16) _____



A) Vineyards A and B have different average price, but a similar spread. Vineyard C has lower prices except for one low outlier, and a more consistent pricing as shown by the smaller IQR.
B) Vineyards A and B have about the same average price; the boxplots show similar medians and similar IQRs. Vineyard C has consistently higher prices except for one low outlier, and a more consistent pricing as shown by the larger IQR.
C) Vineyards A and B have about the same average price; the boxplots show similar medians and similar IQRs. Vineyard C has higher prices except for one low outlier, and a more consistent pricing as shown by the smaller IQR.
D) Vineyards A and B have about the same average price; the boxplots show similar medians and similar IQRs. Vineyard C has higher prices except for one low outlier, and a less consistent pricing as shown by the larger IQR.
E) Vineyards A and B have about the same average price; the boxplots show similar medians and similar IQRs. Vineyard C has higher prices except for one low outlier, and a more consistent pricing as shown by the smaller IQR. The three distributions are roughly symmetric.

Three statistics classes (50 students each) took the same test. Shown below are histograms of the scores for the classes. Use the histograms to answer the question.
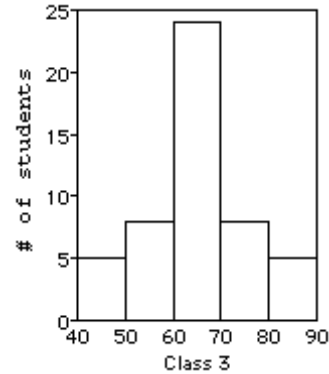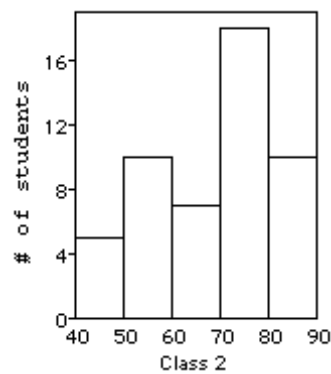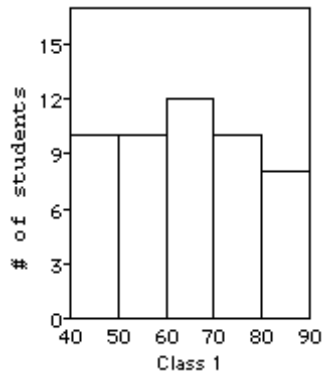


17) Which class had the largest standard deviation?                                                17) _____
    A) Class 3, because the shape is symmetric.
    B) Class 2, because the shape is skewed.
    C) Class 3, because the shape has the highest number of students.
    D) Class 1, because the shape is not perfectly symmetric.
    E) None, because the classes had the same standard deviation.

18) Which class do you think performed better on the test?                                         18) _____
    A) Class 2, because it has the highest median and 50% of class 2 scored at or above the medians of 1 and 3.
    B) Class 1, because it has the smallest median and 70% of class 1 scored at or above the medians of 2 and 3.
    C) Class 2, because it has the highest median and 70% of class 2 scored at or above the medians of 1 and 3.
    D) Class 3, because 74% of class 3 scored at or above the medians of 1 and 2.
    E) Class 2, because it has different mean and median and 70% of class 2 scored at or above the medians of 1 and 3.

Solve the problem.

19) Here are summary statistics for the normal monthly precipitation (in inches) in August for 20 different U.S. cities.
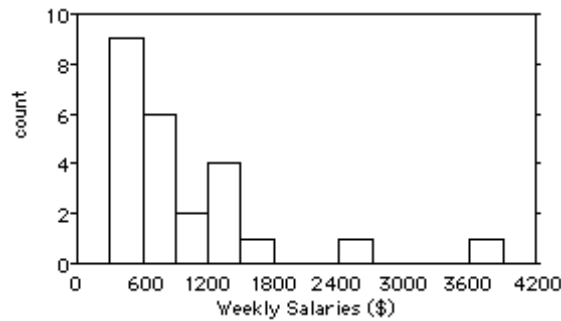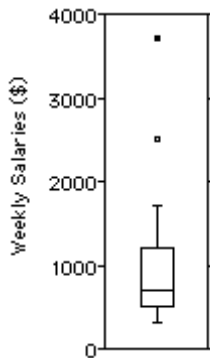
| Count | Mean | Median | StdDev | Min | Max | Q1 | Q3 |
|---|---|---|---|---|---|---|---|
| 20 | 3.23 | 3.45 | 1.2 | 0.4 | 7.0 | 2.1 | 3.8 |

Write a few sentences about the normal monthly precipitation in August.

A) The 20 precipitations range in size between 0.4 and 7 inches. The median amount is 3.45 inches, so half are larger and half are smaller. The middle 50% of these precipitations ranges between 2.1 and 3.8 inches. The distribution is skewed to the right, with at least the outlier 0.4 inch.

B) The 20 precipitations range in size between 0.4 and 7 inches. The median amount is 3.45 inches, so half are larger and half are smaller. The middle 50% of these precipitations ranges between 2.1 and 3.8 inches. The distribution is skewed to the right, with at least the outlier 7 inches.

C) The 20 precipitations range in size between 0.4 and 7 inches. The median amount is 3.45 inches, so half are larger and half are smaller. The middle 50% of these precipitations ranges between 2.1 and 3.8 inches. The distribution is skewed to the right, with no outliers.

D) The 20 precipitations range in size between 0.4 and 7 inches. The median amount is 3.23 inches, so half are larger and half are smaller. The middle 50% of these precipitations ranges between 2.1 and 3.45 inches. The distribution is skewed to the right, with at least the outlier 7 inches.

E) The 20 precipitations range in size between 0.4 and 7 inches. The median amount is 3.45 inches, so half are larger and half are smaller. The middle 50% of these precipitations ranges between 0.4 and 3.8 inches. The distribution is skewed to the left, with at least the outlier 0.4 inch.

20) Shown below are the boxplot, the histogram and summary statistics for the weekly salaries (in dollars) of 24 randomly selected employees of a company:



| Count | Mean | Median | StdDev | Min | Max | Q1 | Q3 |
|-------|------|--------|--------|-----|-----|-----|-----|
| 24 | 978.8 | 705 | 765.7 | 310 | 3700 | 510 | 1225 |

Write a few sentences describing the distribution.
  A) The distribution is bimodal and skewed to the right. As shown in the boxplot, there are two outliers, weekly salaries of $2500 and about $3700. The median was 705, while the mean was 978.8, above the median score. The middle 50% of the weekly salaries were between $705 and $1225 for an IQR of $520.
  B) The distribution is unimodal and skewed to the right. As shown in the boxplot, there are two outliers, weekly salaries of $2500 and about $3700. The median was 978.8, while the mean was 705, above the median score. The middle 50% of the weekly salaries were between $510 and $1225 for an IQR of $715.
  C) The distribution is unimodal and skewed to the left. As shown in the boxplot, there are two outliers, weekly salaries of $2500 and about $3700. The median was 705, while the mean was 978.8, above the median score. The middle 50% of the weekly salaries were between $510 and $1225 for an IQR of $715.
  D) The distribution is unimodal and skewed to the left. As shown in the boxplot, there are two outliers, weekly salaries of $2500 and about $3700. The median was 705, while the mean was 978.8, above the median score. The middle 50% of the weekly salaries were between $705 and $1225 for an IQR of $520.
  E) The distribution is unimodal and skewed to the right. As shown in the boxplot, there are two outliers, weekly salaries of $2500 and about $3700. The median was 705, while the mean was 978.8, above the median score. The middle 50% of the weekly salaries were between $510 and $1225 for an IQR of $715.

Provide an appropriate response.
21) A professor has kept records on grades that students have earned in his class. If he wants to examine the percentage of students earning the grades A, B, C, D, and F during the most recent term, which kind of plot could he make?
  A) pie chart      B) boxplot      C) timeplot      D) dotplot      E) histogram

20) _____

21) _____

9

22) Which is true of the data shown in the histogram?　　　　　　　　　　　　　　22) _____

**Histogram of Data**
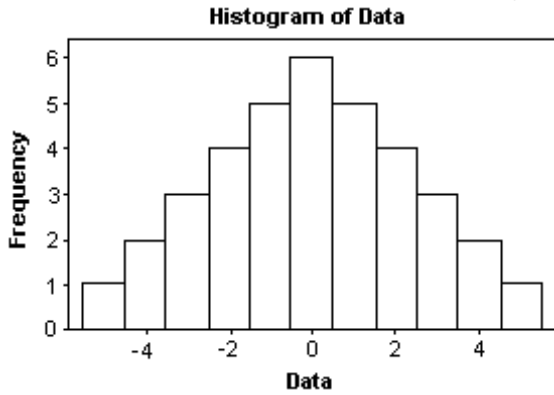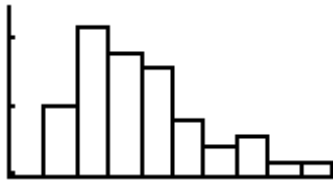


I.   The distribution is approximately symmetric.
II.  The mean and median are approximately equal.
III. The median and IQR summarize the data better than the mean and standard deviation.
   A) III only
   B) I and III
   C) I only
   D) I and II
   E) I, II, and III

23) Which is true of the data whose distribution is shown?　　　　　　　　　　　　23) _____



I.   The distribution is skewed to the right.
II.  The mean is probably smaller than the median.
III. We should summarize with mean and standard deviation.
   A) I and II
   B) I, II, and III
   C) II only
   D) I only
   E) II and III

SHORT ANSWER.  Write the word or phrase that best completes each statement or answers the question.

Create the requested display for the data.

24) The number of days off that 30 police officers took in a given year are provided below.　　24) _____
    Create a histogram of the data using bins 2 days wide.  Describe the main features of the
    histogram.

| 10 | 1 | 3 | 5 | 4 | 7 |
|----|---|---|---|---|---|
| 5 | 1 | 0 | 9 | 11 | 1 |
| 5 | 4 | 1 | 7 | 7 | 11 |
| 0 | 6 | 6 | 1 | 5 | 7 |
| 10 | 1 | 1 | 5 | 6 | 0 |

10

25) The weights, in pounds, of the members of the varsity football team are listed below.     25) _____
Create a stem-and-leaf display of the data. Do not use split stems.

| 144 | 152 | 142 | 151 | 160 | 152 |
| 131 | 164 | 141 | 153 | 140 | 149 |
| 144 | 135 | 156 | 147 | 133 | 172 |
| 159 | 135 | 159 | 148 | 171 | 163 |

Provide an appropriate response.

26) An automobile service shop reported the summary statistics shown for repair bills (in $)     26) _____
for their customers last month.

| Min | 27 |
|---|---|
| Q1 | 88 |
| Median | 132 |
| Q3 | 308 |
| Max | 1442 |
| Mean | 284 |
| SD | 140 |

Were any of the bills outliers? Show how you made your decision.