Name: _____          Date: _____
**12.2 NOTES: Box Plots**                                      Algebra 1

Another visual representation of how a data set is distributed comes in the form of a box plot. We create box plots by dividing the data up into _____ by finding the quartiles of the data set. Be sure that the data is in numerical order first.

*Exercise #1:* **Shown below are the current averages of all the students in your class.**

**Period 2 (red class):** 68, 95, 32, 79, 55, 59, 90, 60, 77, 54, 96, 86, 26, 85, 64, 76, 93, 81, 73, 83

A) Find the median of data set ($50^{th}$ percentile).

B) Find the range of the data set.

C) Find the median of the lower half of the data set (known as the first quartile, Q1).

D) Find the median of the upper half of this data set (known as the third quartile, Q3).

The first and third quartiles are sometimes known as the lower and upper quartiles, and represent the $25^{th}$ and $75^{th}$ percentiles respectively. The quartiles, the median, and the lowest and highest values in a data set comprise what is known as the _____ _____ and can be graphically represented on a **box plot.** This type of plot is also sometimes known as a **box-and-whisker plot.**

### Five Number Statistical Summary

**Min =** _____   $Q_1 =$ _____   **Median ($Q_2$) =** _____   $Q_3 =$ _____   **Max =** _____

Name: _____     Date: _____
**12.2 NOTES:  Box Plots**                       Algebra 1

Another visual representation of how a data set is distributed comes in the form of a box plot.  We create box plots by dividing the data up into _____ by finding the quartiles of the data set.  Be sure that the data is in numerical order first.

***Exercise #1:*  Shown below are the current averages of all the students in your class.**

**Period 3 (blue class):**  72, 84, 26, 62, 49, 64, 71, 91, 78, 77, 84, 24, 75, 77, 55, 64, 94, 87, 87, 72, 77, 81

   A)  Find the median of data set ($50^{th}$ percentile).

   B)  Find the range of the data set.

   C)  Find the median of the lower half of the data set (known as the first quartile, Q1).

   D)  Find the median of the upper half of this data set (known as the third quartile, Q3).

The first and third quartiles are sometimes known as the lower and upper quartiles, and represent the $25^{th}$ and $75^{th}$ percentiles respectively.  The quartiles, the median, and the lowest and highest values in a data set comprise what is known as the _____ _____ and can be graphically represented on a **box plot.** This type of plot is also sometimes known as a **box-and-whisker plot**.

<div align="center">

**Five Number Statistical Summary**

</div>

   **Min =** _____   $Q_1$ = _____   **Median ($Q_2$) =** _____   $Q_3$ = _____   **Max =** _____

Name: _____     Date: _____
**12.2 NOTES:  Box Plots**                     Algebra 1

Another visual representation of how a data set is distributed comes in the form of a box plot.  We create box plots by dividing the data up into _____ by finding the quartiles of the data set.  Be sure that the data is in numerical order first.

*Exercise #1:*  **Shown below are the current averages of all the students in your class.**

**Period 8 (yellow class):**  60, 97, 96, 62, 30, 76, 70, 27, 76, 85, 91, 57, 90, 68, 80, 100, 79, 86, 35, 78, 98, 79, 37, 71

A)  Find the median of data set ($50^{th}$ percentile).

B)  Find the range of the data set.

C)  Find the median of the lower half of the data set (known as the first quartile, Q1).

D)  Find the median of the upper half of this data set (known as the third quartile, Q3).

The first and third quartiles are sometimes known as the lower and upper quartiles, and represent the $25^{th}$ and $75^{th}$ percentiles respectively.  The quartiles, the median, and the lowest and highest values in a data set comprise what is known as the _____ _____ and can be graphically represented on a **box plot.** This type of plot is also sometimes known as a **box-and-whisker plot**.

### Five Number Statistical Summary

**Min =** _____     $Q_1$ = _____     **Median ($Q_2$) =** _____     $Q_3$ = _____     **Max =** _____

Another value that is often considered statistically significant is the _____
_____ (or $IQR$).  This value gives you an idea of how spread out the middle
50% of the data values are.

$$\text{Inter-Quartile Range } (IQR) = Q_3 - Q_1$$

A)  Find the Inter-Quartile Range ($IQR$) of the data set.

In addition to finding the five number statistical summary and the $IQR$, it's important to
identify any _____.  Although they are sometimes obvious, there are
formulas that should be used to determine, statistically, whether or not outliers are
present.

$$\text{Lower Boundary} = Q_1 - 1.5(IQR) \qquad \text{Upper Boundary} = Q_3 + 1.5(IQR)$$

If there are data values less than the lower boundary or greater than the upper boundary
they are considered outliers.

B)  Find the lower and upper boundaries of the data set and indentify any outliers.

**Construct a box plot of the data on the previous page on the number line below.**

Step 1)     Find the five number summary:  Minimum, Q1, Median, Q3, and Maximum.
Step 2)     Draw a number line and plot these 5 values on the number line (use asterisks
            to identify any outliers).
Step 3)     Draw a box from Q1 to Q3 and draw a line through the median.
Step 4)     Draw line segments from Q1 to the least value (not considered an outlier)
            and from Q3 to the greatest value (not considered an outlier).

Each section of
the box plot
represents 25%
of the data.

*Exercise #2:* **The ages of the 15 employees of the Red Hook Curry House are given**
**below.**
          **16, 17, 17, 18, 19, 22, 25, 26, 29, 33, 33, 37, 40, 42, 67**


Min = _____    Max = _____    Q1 = _____    Q2 = _____    Q3 =_____

A) What is the range of the data?

B) What is the inter-quartile range?

C) Calculate the upper and lower boundaries. Are there any outliers?
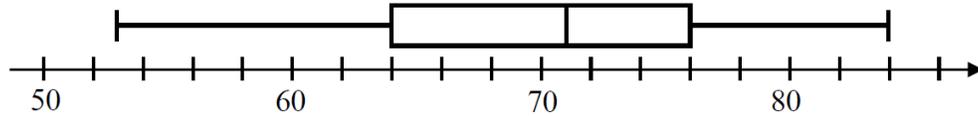
        Lower Boundary =


        Upper Boundary =


D) Create a box-and-whisker diagram below.


E) What percent of the data is between Q1 and Q3? _____

***Exercise #4:*** **Twenty of Mr. Ouimet's physics students recently took a quiz. The results of this quiz are shown in the following box plot. Assume all scores are whole numbers.**



A) What was the highest score? _____

B) What was the lowest score? _____

C) What was the range of the scores? _____

D) What was the median score (Q2)? _____

E) What was the first quartile (Q1)? _____

F) What was the third quartile (Q3)? _____

G) What was the inter-quartile range? _____

H) What is the upper boundary? _____

I) What is the lower boundary? _____

J) Are the max or min considered outliers? _____

K) Joe scored a 70. What quarter does his score lie in ($1^{st}$, $2^{nd}$, $3^{rd}$, or $4^{th}$)? _____

L) What score is greater than or equal to 75% of all other scores on this quiz? _____

**12.2 HOMEWORK:  Box Plots**                     Algebra 1
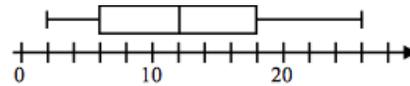
1.  Which of the following data sets, given in ascending order, has the greatest range?

    (1)  $\{3, 4, 7, 10, 18\}$          (3)  $\{-2, 5, 8, 11, 26\}$

    (2)  $\{56, 66, 70, 72\}$          (4)  $\{-5, -2, 4, 7, 10\}$
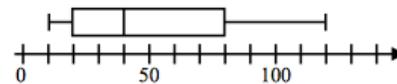
2.  Given the box-and-whisker diagram shown below, which of the following
    represents the third quartile value for this data set?

    (1)  12                    (3)  6

    (2)  18                    (4)  19

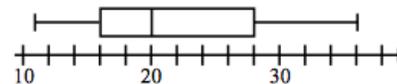3.  Given the box-and-whisker diagram shown below, which of the following
    represents the range of this data set?

    (1)  110                   (3)  60
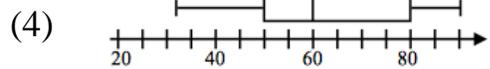
    (2)  40                    (4)  75
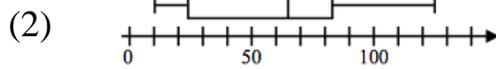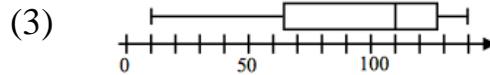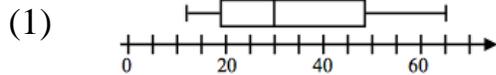
4.  According to the following box-and-whisker diagram, which of the following
    represents the lower quartile of this data set?

    (1)  20                    (3)  28

    (2)  13                    (4)  16

5. Which of the following box-and-whisker diagrams represents a data set whose median value is equal to 65?

(1) 

(3) 

(2) 

(4) 

6. The ages of 12 retail workers are given in the data set below.

17, 18, 18, 19, 20, 21, 22, 23, 25, 25, 34, 47

A) What is the range of the data?

B) What is the inter-quartile range?

C) Calculate the upper and lower boundaries. Are there any outliers?

D) Create box-and-whisker diagram of this data set below.

Min = _____  Q1 = _____  Q2 = _____  Q3 = _____  Max = _____



D) What percent of the data is between Q1 and Q3? _____