Adult Basic & Literacy Education

Program Information	[Lesson Title] **Single Variable Data**	TEACHER NAME Jessica Untch	PROGRAM NAME **Parma City School District**
	[Unit Title] **Data Analysis**	NRS EFL(s) **3 – 5**	TIME FRAME **90 minutes**

	ABE/ASE Standards – Mathematics						
Instruction	**Numbers (N)**		**Algebra (A)**		**Geometry (G)**		**Data (D)**	

	Numbers (N)		Algebra (A)		Geometry (G)		Data (D)	
	Numbers and Operation		Operations and Algebraic Thinking	A.3.3	Geometric Shapes and Figures		Measurement and Data	**D.3.14** **D.4.1** **D.4.4** **D.3.2** **D.5.1**
	The Number System		Expressions and Equations		Congruence		Statistics and Probability	
	Ratios and Proportional Relationships		Functions		Similarity, Right Triangles. And Trigonometry		**Benchmarks identified in _RED_ are priority benchmarks. To view a complete list of priority benchmarks and related Ohio ABLE lesson plans, please see the Curriculum Alignments located on the Teacher Resource Center (TRC).**	
	Number and Quantity				Geometric Measurement and Dimensions			
					Modeling with Geometry			

Mathematical Practices (MP)			
X	Make sense of problems and persevere in solving them. (MP.1)	X	Use appropriate tools strategically. (MP.5)

X	Reason abstractly and quantitatively. (MP.2)	☐	Attend to precision. (MP.6)
☐	Construct viable arguments and critique the reasoning of others. (MP.3)	☐	Look for and make use of structure. (MP.7)
X	Model with mathematics. (MP.4)	☐	Look for and express regularity in repeated reasoning. (MP.8)

LEARNER OUTCOME(S)	ASSESSMENT TOOLS/METHODS
- Know how to calculate mean, median, mode and range for use in creating visual representations of data. - Display single variable data by constructing graphs (Dot Plot, Histogram, or Box Plot) to show store sales data.	- Formative: Evaluation of work in the classroom and on worksheets; questioning techniques to check for understanding. - Summative: Student-made graphs; lesson review pages from book.

LEARNER PRIOR KNOWLEDGE

- Demonstrate and apply knowledge of mean, median, and mode.

INSTRUCTIONAL ACTIVITIES	RESOURCES

1. Review mean, median, mode, and range by writing examples on the board.
   a. Use test scores, income data from newspaper, or hypothetical numbers if no article is available- e.g. "The incomes of five people in an apartment building are $35,000, $29,000, $24,000, $32,000, and $1,000,000.
   b. Using these numbers, find the mean income and the median income for the building." Discuss the differences in using these two measures of center- for example, how the person making $1,000,000 can skew the results if you use mean to describe typical income, and that sometimes the median can give us a more accurate picture.
	Projector, ability to project
	
	Computer
	
	Internet access
	
	Speakers
	
	White/chalk board
	
	Common core achieve: Mastering essential test

		2. Next, tell students that they will be learning about different visual representations, or graphs, using these central tendency concepts.	*readiness skills* (Mathematics). (2015). Columbus, OH: McGraw-Hill Education.
		3. Use <u>Common core achieve: Mastering essential test taking skills (Mathematics)</u> p.270-274 to introduce Dot Plots, Histograms, and Box Plots. a. Ask students what types of information they could show on these types of graphs (examples might include how many jobs each person has had, sales data from a business, or results of a class survey)	Hansen, C. (n.d.). Display data using a number line, dot plots, histograms, and box plots. Retrieved from https://learnzillion.com/lessons/3790-construct-a-dot-plot Hansen, C. (n.d.). Display data using a number line, dot plots, histograms, and box plots. Retrieved from https://learnzillion.com/lessons/3792-construct-a-box-plot

		4. Next, let the students know that they will be constructing a dot plot, histogram, and box plot of their own and that they are going to watch a video to learn how. Play the *Construct a Dot Plot* video.
		    a. Ask students to take notes while they are watching. When the video is done, create a sample dot plot on the board.
		    b. Ask students to think of an example of their own and give them time to create a new dot plot (they can use "made-up" numbers).
			Student copies of *Creating a Box Plot on a Numberline* worksheet (attached)
			
			 Hansen, C. (n.d.). Display data using a number line, dot plots, histograms, and box plots. Retrieved from https://learnzillion.com/lessons/3793-choose-the-best-graph-for-a-data-set-using-measures-of-center

		5. Next, watch *Construct a Box Plot* and then do several examples from the student copies of *Creating a Box Plot on a Numberline* worksheet (attached) as a class.
		    a. This is a tough concept, so students may need extra support. Gradually decrease assistance so that students gain confidence in creating the box plots on their own.
		    b. You may need to remind students that they are finding 3 medians: first the median of the entire data set, then the median between that number and the lowest one in the set and then finally the one between that number and the highest one in the set.
		    c. Allow some time for independent work, but check in with each student and answer questions as needed.
			Student copies of *Store Sales Numbers worksheet* (attached)

6. Follow with the third video: *Choose the best graph for a data set using measures of center* and then discuss several examples as a class.
   a. Which type of graph would be best to show how many children each person has? Or how many hours each student has attended class? What about store sales data, for example the amount of money each customer has spent at the store?

7. Give students a real world example using *Store Sales Numbers worksheet* (attached).
   a. Explain that managers need to analyze data to know if they are meeting sales goals and present that data to *their* managers. What is the best type of graph for showing sales data?
   b. Ask students to work in teams to construct a histogram and a box plot of the data.
   c. Have each group present their graphs to the class

8. Give time at the end of class for students to independently complete the lesson review in Common core achieve: Mastering essential test taking skills (Mathematics) on p.276-277.
   a. Grade answer sheets using 75% as a benchmark to gauge understanding.
   b. Address problem areas at the beginning of the next class and give the class student copies of *Dot Plot and Box Plot Review* (attached) to see how well they retained the information.

|	
	DIFFERENTIATION • Students can work in pairs to create graphs. • Teacher will offer extra help to students who have questions or group struggling students together and facilitate the activity of creating graphs.
Reflection	**TEACHER REFLECTION/LESSON EVALUATION**
	ADDITIONAL INFORMATION

Name:

Create a box plot from the set of numbers.
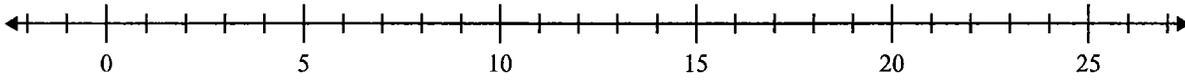
1) 11 , 12 , 10 , 7 , 9 , 18

2) 9 , 15 , 19 , 5 , 20 , 15
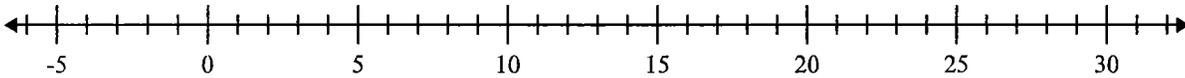
3) 38 , 73 , 28 , 36 , 80 , 50
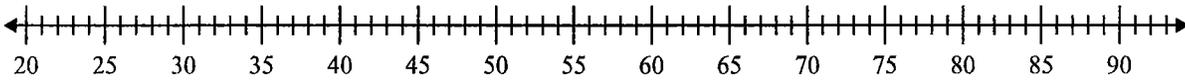
4) 9 , 13 , 19 , 16 , 14 , 19
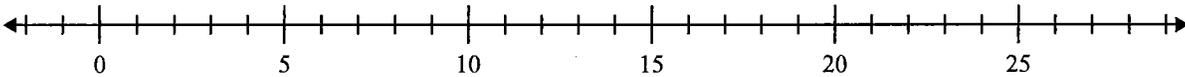
5) 57 , 41 , 40 , 67 , 66 , 45 , 63 , 42
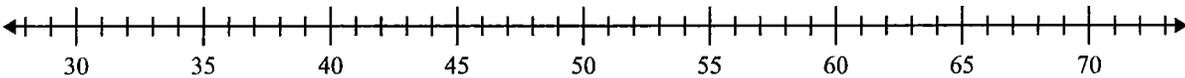
6) 37 , 84 , 70 , 64 , 24 , 93 , 25 , 39 , 82 , 49 , 82

7) 19 , 13 , 12 , 19 , 9 , 5 , 13 , 18 , 8

1-7 | 86 | 71 | 57 | 43 | 29 | 14 | 0

Name: **Answer Key**
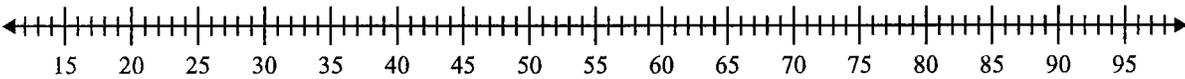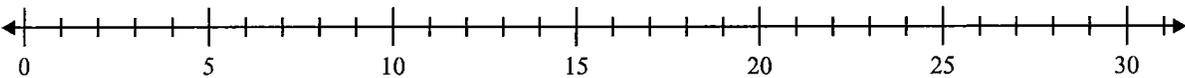
Create a box plot from the set of numbers.

1) 11 , 12 , 10 , 7 , 9 , 18 Min=7 Max=18 q1=9 Q2=10.5 q3=12
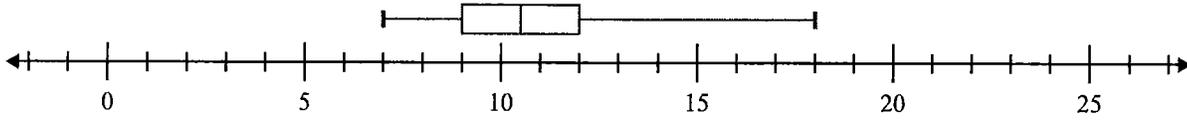
**2)** 9 , 15 , 19 , 5 , 20 , 15 Min=5 Max=20 q1=9 Q2=15 q3=19
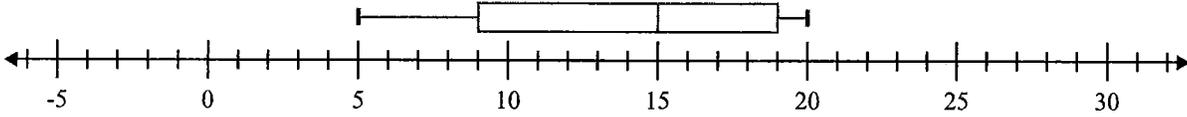
**3)** 38 , 73 , 28 , 36 , 80 , 50 Min=28 Max=80 q1=36 Q2=44 q3=73
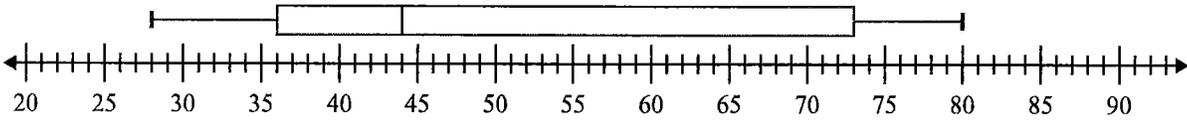
4) 9 , 13 , 19 , 16 , 14 , 19 Min=9 Max=19 q1=13 Q2=15 q3=19
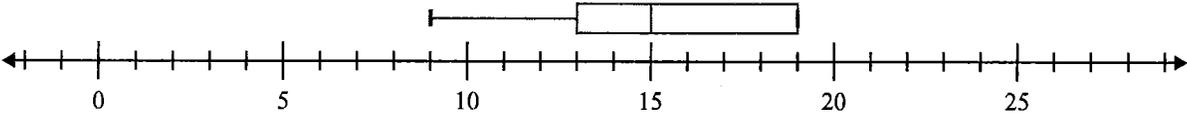
5) 57 , 41 , 40 , 67 , 66 , 45 , 63 , 42 Min=40 Max=67 q1=41.5 Q2=51 q3=64.5
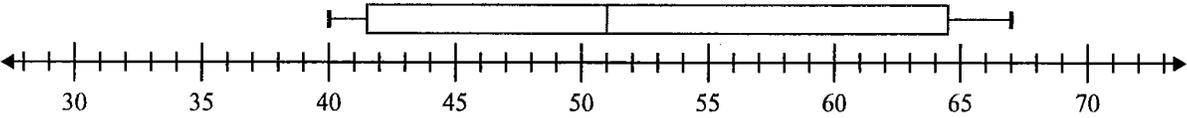
6) 37 , 84 , 70 , 64 , 24 , 93 , 25 , 39 , 82 , 49 , 82 Min=24 Max=93 q1=37 Q2=64 q3=82
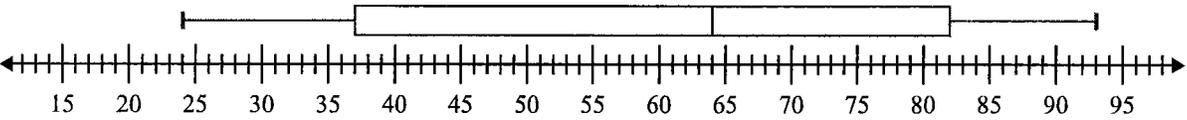
7) 19 , 13 , 12 , 19 , 9 , 5 , 13 , 18 , 8 Min=5 Max=19 q1=8.5 Q2=13 q3=18.5
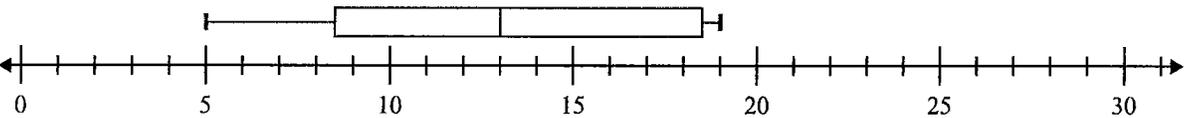
Name _____   Dot Plot Worksheet

1. The students in one social studies class were asked how many brothers and sisters (siblings) they each have. The dot plot here shows the results.

```
                    •
                    •
                    •    •
       •    •    •  •    •
       •    •    •  •    •
       •    •    •  •    •         •
    <------------------------------------->
       0    1    2  3    4    5    6
```
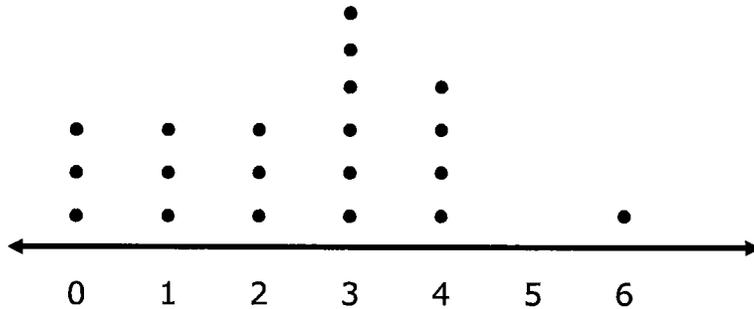
a. How many of the students have six siblings?

b. How many of the students have no siblings?

c. How many of the students have three or more siblings?

2.   The resting pulse rates were recorded for 16 boys in gym class before they exercised. The line plot here shows the results.

```
            X                   X
            X         X    X
       X    X         X    X         X
       X    X    X    X    X         X
    <------------------------------------->
       79   80   81   82   83   84   85
```
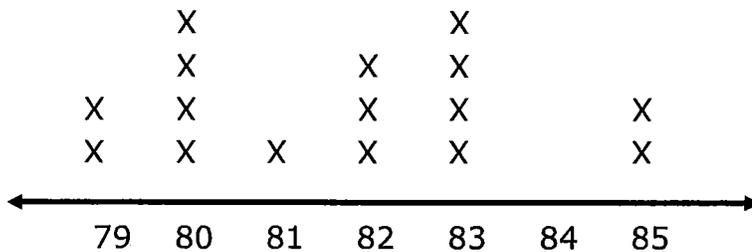
a. What is the range of the pulse rates?

b. How many boys had a pulse rate over 81?

c. How many boys had a pulse rate of 83?

4. The ages of 22 students in a karate class are given below.

$$11, \ 5, \ 9, 13, \ 8, \ 9, \ 9, 11, 10, \ 8, \ 6, \ 7,$$

$$12, \ 11, \ 13, \ 12, \ 7, \ 6, \ 11, \ 12, \ 10, \ 8$$

a) Make a **line plot** using the number line below.

$$\xleftarrow{\hspace{1cm}} \quad 5 \quad 6 \quad 7 \quad 8 \quad 9 \quad 10 \quad 11 \quad 12 \quad 13 \xrightarrow{\hspace{1cm}}$$
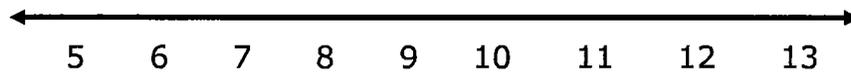
b) What is the spread (range) of the data?

c) What is the mode of the data?

d) How many students are *at least* 10 years old?

d. How many boys had a pulse rate of at most 82?

3. The height's of 20 basketball players, in inches, are given below.

68, 70, 70, 71, 75, 80, 81, 82, 84, 75

75, 80, 75, 77, 75, 80, 83, 80, 71, 70

a) Make a **dot plot** using the number line below.

68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84
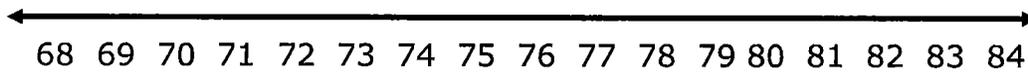
b) What is the spread (range) of the data?

c) What is the mode of the data?

d) How many players are greater than 70 inches tall?

Making and Understanding Box and Whisker Plots - Step-by-Step Lesson

Problem: Draw the box and whisker plot for the data set:

40, 42, 28, 38, 41, 39, 40, 47, 44

Explanation:

Box and whisker plots contain 5 key pieces of data: The range, minimum, median, lower quartile, upper quartile, and maximum.

Step 1) Order the data and find the range. The data in order (lowest to highest) would be:

28, 38, 39, 40, 40, 41, 42, 44, 47

This means the range (highest to lowest) would be: 28-47.

We subtract the largest value by the smallest value: 47 – 28 = 19 (range)

Step 2) Find the median (middle number)

The median is the middle value. If there are an odd number of items, it is simple because there will be just one middle number. If there are an even number of items, we would average the two middle numbers. There are 9 pieces of data (odd), so the middle number will have 4 integers above and below it:

28, 38, 39, 40, **40**, 41, 42, 44, 47

Median can be determined by the equation: ½ (n + 1), n is the number of data values (9)

½ (9 + 1) = 5 or 5th data value.

The median is: **40**

Step 3) Find the lower quartile:

The lower quartile is the median of the lower half of data.   The lower half of the data consists of (28, **38, 39**, 40) When you have an even number of data, take the average of the middle number numbers = 38.5

Step 4) Find the upper quartile.

The upper quartile is the median of the upper half of data. The upper half of the data consists of (41, **42, 44**, 47). 43 is the median of lower half of the data set.

Step 5) Find the average: 39.88. Add up all the data and divide by the number of pieces of data you have (9).

Step 6) It is time to visualize this data. We have all the values we need.

a) Make a range chart. (28 – 47)

b) Draw three large lines to indicate the minimum, maximum, and median (40).

c) Draw a box from the median to the lower quartile (38.5) and enclose the box.

d) Draw a box from the median to the upper quartile (43) and enclose the box.
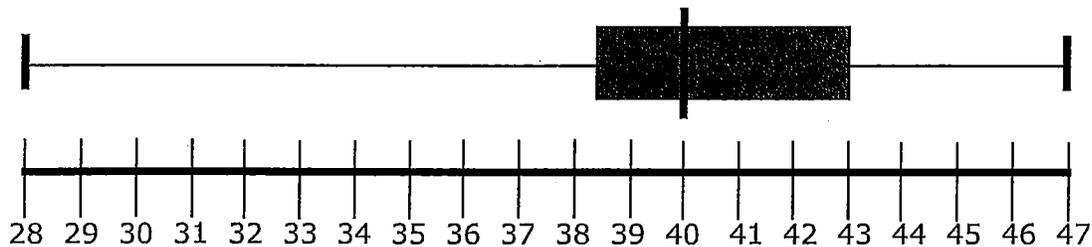
Dogwood Crossing Garden Center

Department	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Fertilizer	$1,500.00	$1,450.00	$1,280.00	$1,550.00	$2,776.00	$3,990.00	$2,710.00
Annuals	$776.00	$950.00	$650.00	$886.00	$3,260.00	$5,000.00	$3,210.00
Perennials	$805.00	$1,056.00	$681.00	$1,200.00	$2,854.00	$4,250.00	$2,512.00
Shrubs	$985.00	$1,240.00	$505.00	$1,500.00	$3,050.00	$3,800.00	$1,856.00
Pottery	$425.00	$156.00	$86.00	$250.00	$560.00	$775.00	$500.00
Patio Furniture	$2,999.00	$3,999.00	$1,500.00	$5,085.00	$12,000.00	$9,080.00	$4,500.00
Décor	$180.00	$105.00	$85.00	$224.00	$356.00	$458.00	$302.00
Totals	**$7,670.00**	**$8,956.00**	**$4,787.00**	**$10,695.00**	**$24,856.00**	**$27,353.00**	**$15,590.00**