

Title: Are You a Trash-Talking Litter Bug?

Brief Overview:

The typical American produces 4.5 pounds of trash a day! Americans produce 40% of the trash produced worldwide, yet their population only makes up less than 6% of the Earth's surface! [http://www.earthresourcesrecycling.com/trash_facts]

In this unit, the students will explore this topic by collecting, graphing, and analyzing data in order to find out if their school (including teachers and students) are "Trash-Talking Litter Bugs" or "Clean, Green Earth-saving Machines." Students will first review range, median, and mode and learn how to find the mean for a set of data. It is expected that students have experience with data collection and other types of graphing including range, mode, and median. They also need an understanding of decimals.

Their focus for the first day will be to look at data on trash produced per person per day in the top trash-producing countries. The following day, the focus is on their teachers! They will graph and analyze data in the form of a line plot to demonstrate the number of worksheets produced in a week and the garbage habits of their teachers. Finally, on the third day, they will collect trash from their own school yard in order to determine the number of recyclable and non-recyclable items. Students will use the information they collect to create a stem-and-leaf plot. By the end of the lesson, students will be able to use facts and data to determine just how "green" their school yard and the school community really is. Students may use calculators throughout this unit.

NCTM Content Standard/National Science Education Standard:

Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them

- collect data using observations, surveys, and experiments
- represent data using tables and graphs such as line plots, bar graphs, and line graphs

Select and use appropriate statistical methods to analyze data

- use measures of center, focusing on the median, and understand what each does and does not indicate about the data set;

Develop and evaluate inferences and predictions that are based on data

- propose and justify conclusions and predictions that are based on data and design studies to further investigate the conclusions or predictions.

Grade/Level:

Grade 5 (could be adapted for Grade 4)

Duration/Length:

3 Days (60 minutes each day)

Student Outcomes:

Students will:

- Calculate the range, median, mode, and mean of a set of data
- Create a line plot
- Create a stem-and-leaf plot
- Analyze a line plot
- Analyze a stem-and-leaf plot

Materials and Resources:

Day 1

- Vocabulary Pinch Cards (Student Resource 1)
- Post-it Notes
- Teacher Questions for Pinch Cards (Teacher Resource 1)
- Quick Stats – true/false (Teacher Resource 2)
- Student Country Trash Can Data Cards – small (Student Resource 2A-B)
- Teacher Country Trash Can Data Cards – big (Teacher Resource 3A-E)
- 5-10 feet of string
- Has the United States Gone Green? (Student Resource 3A-B)
- Has the United States Gone Green? – Answer Key (Teacher Resource 4)
- People Cards (Student Resource 4)
- Recycle Numbers (Student Resource 5)
- Recycle Numbers (Teacher Resource 5)
- Note page (Student Resource 6A)
- Exit Ticket Day 1 (Student Resource 6B)
- Exit Ticket Day 1 - Answer Key (Teacher Resource 6)
- 1 Calculator per student

Day 2

- What Type of Graph Worksheet (Student Resource 7)
- Chart (Teacher Resource 7A-B)
- Sandbag or weight weighing 4.5 pounds
- 30 Teacher Trash Can Data Cards (Student Resource 8A-C)
- Post-it Notes (optional)
- Note Page (Student Resource 9)
- Line Plot Template (Student Resource 10)
- Line Plot – Answer Key (Teacher Resource 8A-B)
- Trash Footprint (Student Resource 11A-B)
- Trash Footprint (Teacher Resource 9A-B)
- Exit Ticket Day 2 (Student Resource 12)
- Exit Ticket Day 2 – Answer Key (Teacher Resource 10)
- 1 Calculator per student

Day 3

- Real trash including both recyclable and non-recyclable materials or Recycle Cards for sort (Teacher Resource 11A-D)
- Sorting Cards Answer Key (Teacher Resource 12)
- Gloves for all students
- Two plastic bags for each group of students
- Clipboard for each group
- Trash Collection Data Sheet (Student Resource 13)
- Stem/Leaf Template (Teacher Resource 13)
- Stem/Leaf Note Page (Student Resource 14)
- Summative Assessment (Student Resource 15A-C)
- Answer Key for Summative Assessment (Teacher Resource 14A-C)
- 1 Calculator per student

Development/Procedures:

Day 1

- Pre-assessment
Give students pinch-cards (Student Resource 1) in order to assess their prior knowledge on the topic. As you ask each question, (Teacher Resource 1) direct students to pinch the section of the pinch cards that they feel best answers the question being asked. Survey the room as responses are given in order to determine students' current understanding of the terms range, median, mode, mean, graph, stem-and-leaf plot, and line plot.
- Engagement
Tell students that you are going to read some statements about garbage and they will need to predict whether they think the statement is true or false. If they think it is true, they should show a thumbs-up. If they feel the statement is false, they should show thumbs-down. Then read the statements one at a time (Teacher Resource 2). Allow students time to evaluate each statement. These statements are meant to be a bit shocking. After each statement, tell the students whether it is true or false.
- Exploration
Introduce the lesson by telling the students that over the next three days they will be using data to determine if their country, their teachers, and their school grounds represent The Trash Talking Litter Bugs or The Clean, Green Earth-Saving Machines. Create student groups of 2 or 3 and distribute cards (Student Resource 2A-B) to each group. Teacher should pre-cut these cards and place in baggies. Fold on the bold lines to create a tent. Tell students to line up the cards on their desk in order from least to greatest. Tell them these numbers represent the average amount of trash produced per person per day in the top trash-producing countries in the world. Ask: What number do you think best represents the amount of trash you use per day? Give each student a post-it note and have them

write a prediction. Collect these notes and organize them so like answers are together. Point out the amount most students think represents the amount of trash they produce.

○ Explanation

Prior to the lesson, tie a string about 7 feet long somewhere across the classroom. One option is to tie the string on either end of the back of two chairs. Choose a location that will allow visibility to all students. Use the tent cards (Teacher Resource 3A-E) to place cards in order from least to greatest on the string. Students should direct where each card should be placed based on the work they did in the exploration. Notice that these cards are labeled with the country that they represent. Be sure to read the label for each as you place it on the number line. Direct students to write the same information on the note page (Student Resource 6A) as they list the data in order from least to greatest. Data found at:

http://www.nationmaster.com/graph/env_mun_was_gen-environment-municipal-waste-generation

Continue to have students record information in the note page as you teach each vocabulary word and skill. Ask: What is the greatest number? Record it on the board. Ask: What is the least number? Record it underneath the other number on the board. Explain that to determine the *range* of the data, you need to subtract the greatest and the least number. Ask: What is the range of this data? (4.58 - 2.47 = 2.11 lbs) Ask: What number appears most often in this set of data? (3.38 lbs) Explain: The number that appears most often in a set of data is called the *mode*. Record this data on the board. Explain that some sets of data do not have a mode. Mode is just one way of determining what is typical. Next tell students that you want to determine what the middle data point is. To do this, slide the tent cards down left and right starting at either end point so that eventually you isolate the center data point (3.38 lbs) Explain: The middle data point is called the median. To demonstrate how to find the mean, tell the students first you are going to demonstrate what “finding the mean” really means. Make a grid listing all countries discussed on cards and use centimeter cubes to create a bar graph of the data, rounded to the nearest whole number. Explain: To find the mean, we need to reorganize the data so that each country has the same amount of trash. Reorganize the counters to demonstrate about three in each. Tell the students that the mean isn’t mean, it shares. Next tell the students that to determine the mean using numbers you must add all the numbers together and divide by the total number of data points. Calculate the mean using the country trash data with the students (51.34/15 = 3.42 rounded to the nearest hundredth).

○ Application

Ask students to use the information presented to determine whether Americans as a whole are Trash-Talking Litter Bugs or Clean Green Earth-Saving Machines (Americans are part of the Trash Talking Litter Bugs). Distribute Student Resource 3a-b and discuss the fact that China’s population is four times that of the United States. Use this to explain why there are 3 samples from the United States and 12 samples from China.

This resource has a representation and comparison of the population of China and the United States. China has about 4 times the number of people than the United States, yet China is not one of the top 15 trash producing countries in the world. Direct students to work with a partner to determine the range, median, mode, and mean of the trash produced weekly from a sample of people from the United States and China, and answer the questions that follow in the activity. Answer Key can be found on Teacher Resource 4.

- Differentiation
 - Reteach
If students struggle with the application, pull a small group and use Student Resource 4 to manipulate the people for the group that represents China.
 - Enrich
Give Student Resource 5 to students who demonstrate understanding. Students will be asked to use their deductive reasoning skills and what they know about range, median, mode, and mean to determine the best way to use the numbers in the trash can to complete a story. Answer Key can be found on Teacher Resource 5.
- Assessment
Give the Exit Ticket (Student Resource 6B) to assess students understanding of mean, median, mode and range. Answer Key can be found on Teacher Resource 6.

Day 2

- Engagement
Say: Yesterday you learned that the average American produces 4.5 lbs of trash a day. Can you think of an object or objects that would equal 4.5lbs? Either prior to the lesson or during the lesson using a scale, create sandbags that equal 4.5 lbs. Another option would be to bring in dumbbells or use a textbook per pound. Then ask: Based on the number of people in this classroom, how many pounds of trash do we produce in a day? (Optional: Prior to the lesson create a sandbag that adds up to the approximate amount of pounds created ($4.5 \times \text{the number of students and teachers in your classroom}$)). Allow the students to feel just how much weight this really is.
- Exploration
Tell the students you did some research yesterday and recorded the amount of handouts given out by each teacher in your school daily. You changed their names in order to protect their identity. Display the transparency (Teacher Resource 7A) to show the data that you collected. Ask: If I wanted to show this data without revealing the teacher's name, what type of graph could I use? This type of graph could also help find the typical amount of handouts a teacher in our school uses daily. Give

students Student Resource 7 to record their answers. They can then Think, Pair, Share as a class. Answer key can be found on Teacher resource 7B.

- Explanation
Use the Day 2 Note page (Student Resource 9) to explain how to create a line plot. Prior to the lesson cut out the teacher trash cards on Student Resource 8A-C. Give each student a card. Tell the students that you have been rummaging in the teachers' trashcans to try to find out who was a Trash Talking Litter Bug and who was a Clean, Green Earth-Saving Machine. Each student has a card to represent the teachers' garbage habits. On the board, draw a line for a line plot. Explain that a line plot is a way to display data with a small range. Discuss that a small range is an amount that can fit on your paper. Give the line plot a title. Explain that the title should tell exactly what the data is about. It should not be cute or silly. Label the bottom axis "Pounds of Trash Used." Number the line 1-6 by intervals of .5. Then have students mark an X for the data represented on their cards. Make sure students are making their X's the same size. To help ensure their X's are the same size they can use post-it notes and mark an X from corner to corner. Use this data to find the range, median, mode, and mean. You can refer back to Day One's lesson. Answer key can be found on Teacher Resource 8a-b.
- Application
Give the students Student Resource 10 and have the students create a line plot for the amount of trash recycled by the teachers. As they are plotting, the students should be recording the data on their resource sheet as well. Have a discussion to compare the two plots. If the teachers individually produce the amount of trash they do but recycle ___% of it, which label should we use to describe them: Trash Talking Litter Bugs or Clean, Green Earth-saving Machines?
- Differentiation
 - Reteach
For students that struggled to create a line plot, create a small group. Cut a piece of string and lay it out on the table. Put X's on the back of the cards, prior to the lesson. Determine the range for the data. Write this piece of the number line on a sentence strip and place it under the string. Then look at each card. Place the card over the corresponding data point, turning it over to show the X side. Do this for all the points. Use a sentence strip to write a title. Then use the cards to demonstrate range, median, mode, mean as necessary.
 - Enrich
Give Student Resource 11A-B. Students will determine how much trash is actually produced by each teacher after they recycle to determine their trash footprint. Answer key can be found on Teacher Resource 9A-B.

- Assessment
Give an Exit Ticket to assess student understanding of the concept (Student Resource 12). Answer key can be found on Teacher Resource 10.

Day 3

- Engagement
Prior to the lesson, collect samples of recyclable and non-recyclable goods. Be sure to have a good representation of plastics, paper, cardboard, and aluminum. Many students do not understand that cellophane is not a recyclable plastic so be sure to have some of this in your sample. If you are unable to gather these materials, you can use the picture cards (Teacher Resource 11A-D). Allow various students to come up and pick an item out of the trash bag. Then have each student determine if it is recyclable or non-recyclable. If it is recyclable, place it in the recycle bin. If it is non-recyclable place it in the trash can. If you are using the picture cards, you can use the large picture cards of the trash can and recycle bin for sorting, it may be a good idea to put magnets on the back of your pictures. Answer Key can be found on Teacher Resource 12.
- Exploration
Divide students into pairs. Explain that they will be going outside to collect trash and record data. Be sure to explain the safety rules of being outside. Prior to the lesson, determine a location on your school yard where students can go out and hunt for litter. If it would rain or you would not be able to do the “trash collecting” portion of this activity, a back-up data set has been included on Student Resource Sheet* Before the students go outside, they will need to decide who will be the collector and who will be the recorder. Provide the collector with a pair of gloves and two bags: one marked “recyclable” and one marked “non-recyclable.” Provide each pair of students with a clipboard and Student Resource 13. As they collect, they should determine the proper place for the piece of litter, tally it and place it in the correct bag.
- Explanation
Come back inside and explain that you will use the data collected to create a stem-and-leaf plot for the amount of non-recyclable items collected. Provide the students with the Day 3 Note Page (Student Resource 14) Explain the idea behind a stem-and-leaf plot by first doing a model example of your own to show how tens are separated from ones and all numbers within a range should be listed. In order to show the range you need to determine the least amount of non-recyclables collected by a group and the most. Then have students come up to the board and plot their data according to their findings. Use the data to determine mode, median, mean, and range.
- Application
On the board, record the amount of recyclable trash items collected. With their partner, have students create a stem-and-leaf plot for this data. Their purpose for doing this second stem-and-leaf plot is to then compare the

recyclable versus non-recyclable. Present the fact that 80% of all trash is recyclable but only 33% is actually recycled.

[<http://www.environmentalistseveryday.org/solid-waste-management/garbage-trash-waste-facts.php>] Compare how their data matches this statistic. Ask: If the litter on the school yard represents the students garbage habits, would you say the students of (*Name of Your School*) are Trash Talking Litter Bugs or Clean, Green Earth-saving Machines?

○ Differentiation

▪ Reteach

For those students that struggled to create a stem-and-leaf plot as presented, provide a template write data points on separated index cards. Cut the tens place value digit to show how you can sort all common tens together.

▪ Enrich

Make a transparency of Teacher Resource 13 and direct students to complete a back to back stem and leaf plot to show both sets of data collect on one graph.

Summative Assessment

Use Student Resource 15A-C as a summative assessment for the concepts that were taught in this unit.

Answer Key can be found on Teacher Resource 14A-C

Authors:

Tiffany Stuber
Cedarmere Elementary
Baltimore County

Jennifer Dingle
Glyndon Elementary
Baltimore County

Bar Graph	Bar Graph	Bar Graph	Bar Graph
Stem- and-Leaf	Stem- and-Leaf	Stem- and-Leaf	Stem- and-Leaf
Line Plot	Line Plot	Line Plot	Line Plot
Graph	Graph	Graph	Graph
Mode	Mode	Mode	Mode
Median	Median	Median	Median
Range	Range	Range	Range
Mean	Mean	Mean	Mean

4.58 lbs



4.16 lbs



2.47 lbs



3.07 lbs



4.58 lbs

Of trash per person per day



4.16 lbs

Of trash per person per day



2.47 lbs

Of trash per person per day



3.07 lbs

Of trash per person per day

3.38 lbs



3.92 lbs



3.38 lbs



2.77 lbs



3.38 lbs

Of trash per person per day



3.92 lbs

Of trash per person per day



3.38 lbs

Of trash per person per day



2.77 lbs

Of trash per person per day

3.01 lbs



3.85 lbs



3.25 lbs



3.97 lbs



3.01 lbs

Of trash per person
per day



3.85 lbs

Of trash per person
per day



3.25 lbs

Of trash per person
per day



3.97 lbs

Of trash per person
per day

3.74 lbs



3.38 lbs



2.40 lbs



3.74 lbs

Of trash per person
per day



3.38 lbs

Of trash per person
per day



2.40 lbs

Of trash per person
per day

Has the United States Gone Green?

Name: _____

Date: _____

Common sense tells us that the more people a country has, the more trash that country will produce. Currently China is the most populated country on Earth, making up about 20% of its population. The United States makes up about 5% of Earth's population.

Below is a population sample of weekly trash generated per person in the two countries.

United States	China
Range: _____ Median: _____ Mode: _____ Mean: _____	Range: _____ Median: _____ Mode: _____ Mean: _____

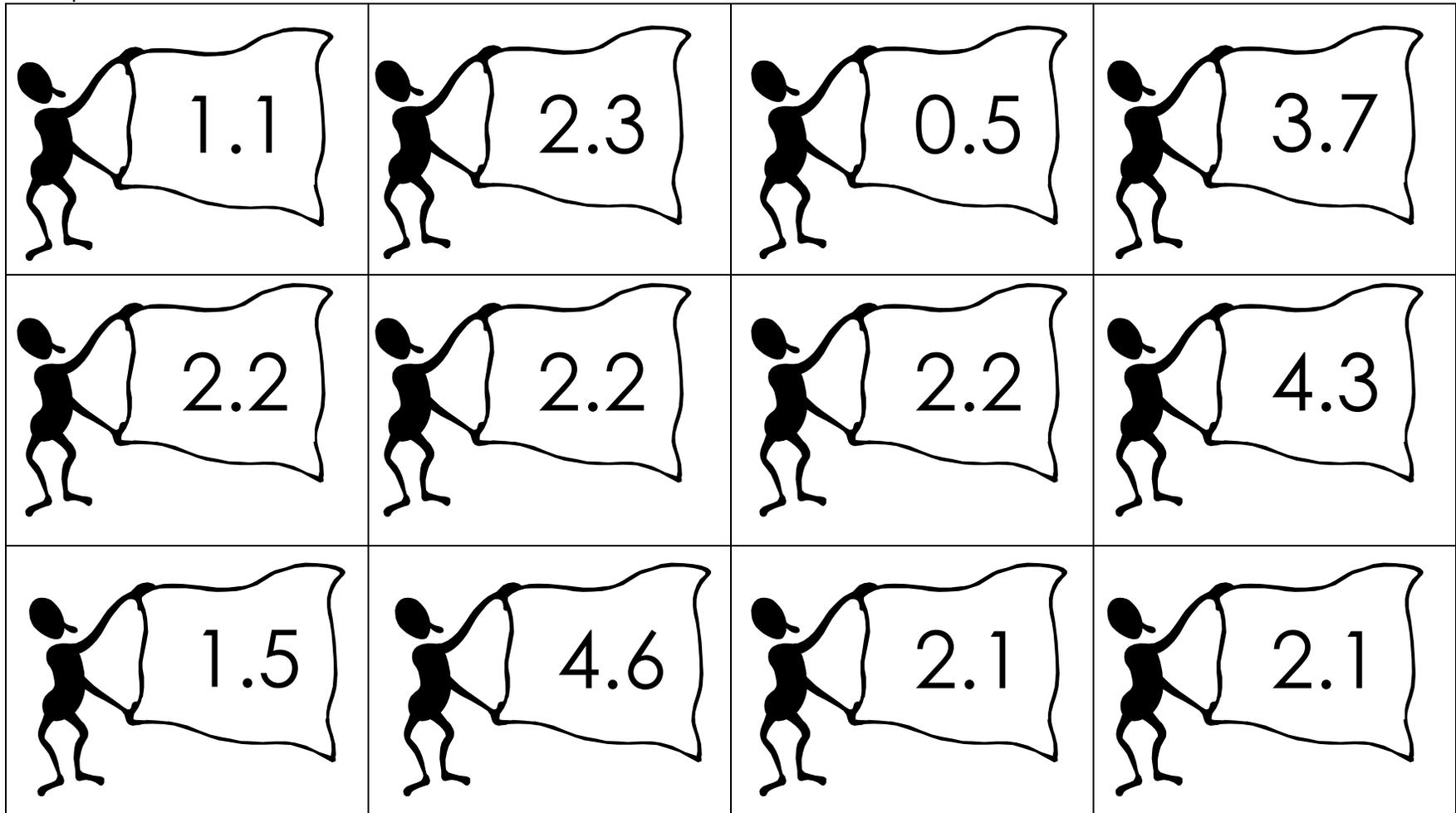


If we sampled three different people in the United States, what could each of their possible wastes per day be, based on the mean you found above? (There is more than one right answer!) Use what you know about mean to explain how you determined your answer.



Reteach People Cards

Cut prior to the lesson.



Student Resource 4

Recycle the Numbers

Use the numbers in the trash can below and what you know about mean, median, mode and range to fill in the blanks. You may only use each number once. The story must make number sense.



A sample was taken of _____ people living in Ireland.
(1)

From least to greatest, the amount of garbage per person per day is 1.2 lbs, _____ lbs, _____ lbs, _____ lbs, 5.6 lbs. The
(2) (3) (4)

median amount of trash per person per day is _____ lbs. The
(5)

mean amount of trash per person per day is _____ lbs. The
(6)

range of trash per day per person is _____ lbs.
(7)

Part A:

Scientists just discovered Planet Googalyglack. Data was collected from five areas of this new planet. Use the chart to find the range, median, mode and mean of trash produced in this new planet.

Planet Googalyglack Trash Consumption	
Fanswitch Forest	3.02 pounds
Snopsville Plain	2.18 pounds
Booplerstown	1.60 pounds
Targred Mountain	0.53 pounds
Hansher Valley	1.25 pounds

_____ Range _____ Median _____ Mode _____ Mean

Planet Earth Trash Consumption

Range = 2.11 Median = 3.38 Mode = 3.38 Mean = 3.42

Part B:

Use the above information about Planet Googalyglack to compare their trash consumption to that of the top 15 trash producers on Earth. Be sure to use what you know about range, median, mode and mean in your explanation.

Do Our Teachers Love Trash or Trees More?

Name: _____

Date: _____

I did some research this past week and recorded the amount of worksheets given out by each teacher in the school. If I wanted to create a graph that displays the typical amount of handouts given daily, what type of graph should I use? Explain your answer.

Types of Graphs:

Line Graph
Bar Graph
stem-and-leaf plot
Line Plot

I think the best type of graph to display this data would be a _____ because _____



<p>Mrs. Can</p>	<p>Mr. Dump</p>	<p>Miss Plastic</p>
 <p>Trash: 5 lbs Recycles: 2 lbs</p>	 <p>Trash: 6 lbs Recycles: 0 lbs</p>	 <p>Trash: 3.5 lbs Recycles: 1 lb</p>
<p>Mr. Fastfood</p>	<p>Mr. Dirty</p>	<p>Mrs. Waste</p>
 <p>Trash: 4 lbs Recycles: .5 lbs</p>	 <p>Trash: 5 lbs Recycles: 2 lbs</p>	 <p>Trash: 5 lbs Recycles: 1 lbs</p>
<p>Ms. Lid</p>	<p>Mrs. Paper</p>	<p>Mr. Glass</p>
 <p>Trash: 3 lbs Recycles: 1 lb</p>	 <p>Trash: 1.5 lbs Recycles: .5 lbs</p>	 <p>Trash: 1.5 lbs Recycles: .5 lbs</p>
<p>Mrs. Garbage'</p>	<p>Miss Compost</p>	<p>Mr. T. Rash</p>
 <p>Trash: 5 lbs Recycles: 0 lbs</p>	 <p>Trash: 1.5 lbs Recycles: 1 lb</p>	 <p>Trash: 5 lbs Recycles: 2.5 lbs</p>

<p>Mrs. Smell</p>	<p>Mr. Green</p>	<p>Mrs. Eco</p>
 <p>Trash: 3 lbs Recycles: 2 lb</p>	 <p>Trash: 1 lb Recycles: .5 lb</p>	 <p>Trash: 2 lbs Recycles: 2 lbs</p>
<p>Mr. Luminum</p>	<p>Mrs. Tin</p>	<p>Miss Landfill</p>
 <p>Trash: 3.5 lbs Recycles: 1 lb</p>	 <p>Trash: 4 lbs Recycles: 1.5 lb</p>	 <p>Trash: 5 lbs Recycles: 0 lb</p>
<p>Ms. Planet</p>	<p>Mrs. McClean</p>	<p>Mr. Bottle</p>
 <p>Trash: 2.5 lbs Recycles: 1.5 lbs</p>	 <p>Trash: 2 lbs Recycles: 1 lb</p>	 <p>Trash: 4 lbs Recycles: 1 lb</p>
<p>Ms. Jar</p>	<p>Mrs. Litter</p>	<p>Ms. N. Vironment</p>
 <p>Trash: 4 lbs Recycles: 2 lbs</p>	 <p>Trash: 4.5 lbs Recycles: 0 lb</p>	 <p>Trash: 1 lb Recycles: 1 lb</p>

<p>Mrs. Energy</p>  <p>Trash: 2 lbs Recycles: .5 lb</p>	<p>Miss Helper</p>  <p>Trash: 3 lbs Recycles: 1.5 lbs</p>	<p>Mr. Collector</p>  <p>Trash: 3 lbs Recycles: 3 lbs</p>
<p>Mrs. Nature</p>  <p>Trash: 2 lbs Recycles: 1 lb</p>	<p>Ms. Junk</p>  <p>Trash: 6 lbs Recycles: 2 lbs</p>	<p>Mrs. G. Patch</p>  <p>Trash: 5 lbs Recycles: 0 lb</p>

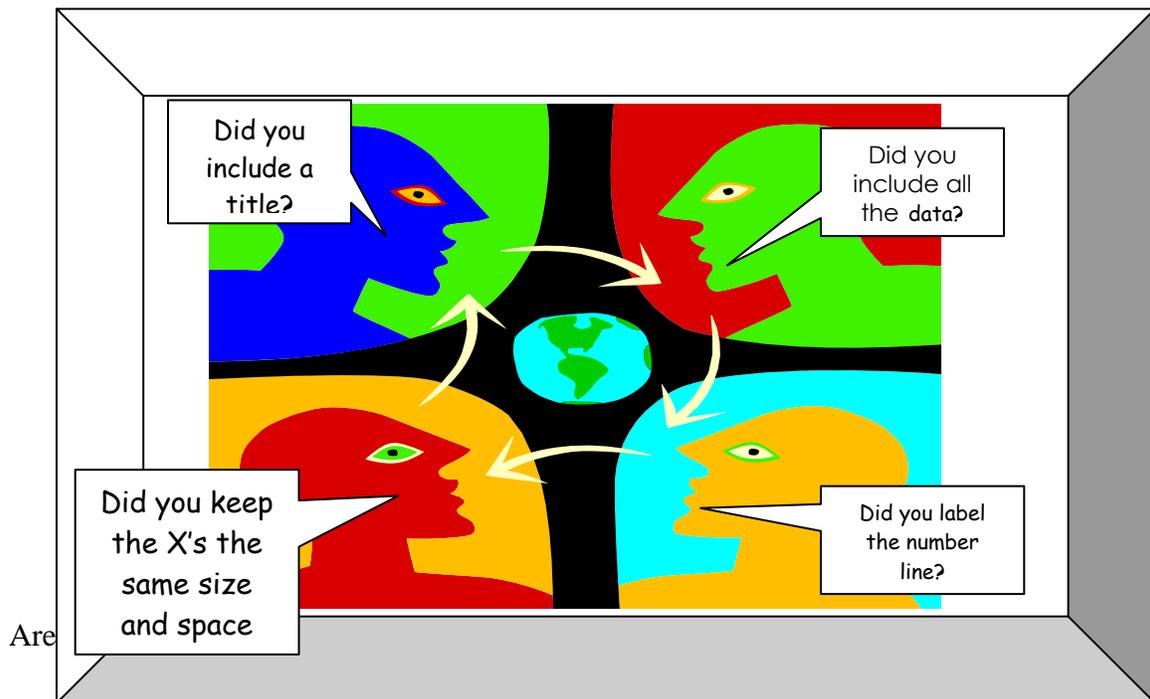
Note Page: Line Plots

Daily Handouts Given by Teachers

Teacher's Name	# of Handouts Given To Each Student Daily
Mrs. Can	11
Mr. Dump	7
Miss Plastic	9
Mr. Fastfood	10
Mr. McDirty	8
Mrs. Waste	7
Ms. Lid	6
Mrs. Paper	6
Mr. Glass	7
Mrs. Garbage'	10
Miss Compost	8
Mr. T. Rash	10
Mrs. Smell	8
Mr. Green	8
Mrs. Eco	5
Miss Landfill	15
Mr. Tin	9
Mr. Luminum	11

To Make a Line Plot

1. Determine the least and greatest numbers. Use these numbers to determine your range and write them under the line.
2. Write a title and label your x-axis.
3. Use an x to plot each data point. Be sure all your x's are the same size!





Trash Footprint

Complete the chart below to figure out each teacher's actual trash footprint. To do this you need to subtract the amount they recycle from the amount of trash they used. Then answer the questions on the back of this paper.

Teacher	Trash Used	Trash Recycled	Trash Footprint
Mrs. Can	5 lbs	2 lbs	
Mr. Dump	6 lbs	0 lb	
Miss Plastic	3.5 lbs	1 lb	
Mr. Fastfood	4 lbs	.5 lb	
Mr. Dirty	5 lbs	2 lb	
Mrs. Waste	5 lbs	1 lb	
Ms. Lid	3 lbs	1 lb	
Mrs. Paper	1.5 lbs	.5 lb	
Mr. Glass	1.5 lbs	.5 lb	
Mrs. Garbage'	5 lbs	0 lb	
Miss Compost	1.5 lbs	1 lb	
Mr. T. Rash	5 lbs	2.5 lbs	
Mrs. Smell	3 lbs	2 lbs	
Mr. Green	1 lb	.5 lb	
Mrs. Eco	2 lbs	2 lbs	
Mr. Luminum	3.5 lbs	1 lb	
Mrs. Tin	4 lbs	1.5 lbs	
Miss Landfill	5 lbs	1 lb	
Ms. Planet	2.5 lbs	1.5 lbs	
Mrs. McClean	2 lbs	1 lb	
Mr. Bottle	4 lbs	1 lb	
Ms. Jar	4 lbs	2 lbs	
Mrs. Litter	4.5 lbs	0 lb	
Ms. N. Vironment	1 lb	1 lb	
Mrs. Energy	2 lbs	.5 lbs	
Miss Helper	3 lbs	1.5 lbs	
Mr. Collector	3 lbs	3 lbs	
Mrs. Nature	2 lbs	1 lb	
Ms. Junk	6 lbs	2 lbs	
Mrs. G Patch	5 lbs	0 lb	

Use the chart the help you answer the following questions.

1. Who created the smallest trash footprint?

- Miss Helper
- Mrs. Eco
- Mr. Fastfood
- Mr. Bottle

2. Who created the largest trash footprint?

- Mr. Dump
- Mrs. Waste
- Mrs. McClean
- Miss Landfill

3. What is the mean trash footprint of all teachers? (HINT: Use a calculator to find the answer)

- 3.9 lbs
- 6.4 lbs
- 3.1 lbs
- 2.3 lbs

4. Using what you know about mean, pick three teachers you would remove from your data set to make the overall trash footprint mean lower and explain your choice.



Pounds of Recycled Material Collected in Trashy Town

	x			
	x	x		
x	x	x		
x	x	x	x	X
3	4	5	6	7

Number of pounds collected

Uh-oh! The environmental waste management crew for Trashy Town missed 3 pick-ups. If they collected 5 pounds at each house, how would this affect the data? Plot the new data above. Then, use what you know about mean, median, and mode to explain your answer.

Trash Collection Data Sheet

Partner 1: _____ **Partner 2:** _____

Now it's time to see how eco-friendly the students at your school are by collecting litter found around the school.

You will work with a partner for this task.

-  Both of you will look for litter and decide if it is recyclable or non-recyclable.
-  Partner 1 will pick up the item and place it in the appropriate bag.
-  Partner 2 will record a tally mark to indicate the type of trash collected.
-  Be sure to count the tally marks when you are all done and mark the frequency.

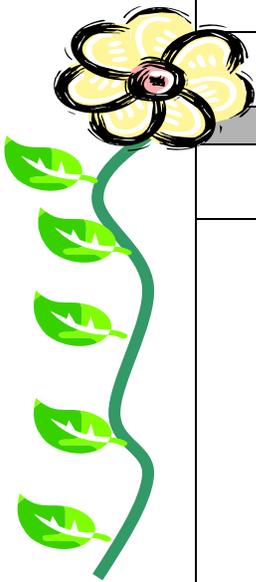


Type of Trash	Tally Marks	Frequency
Recyclable		
Non-recyclable		



“Rainy Day” Community Trash Collecting Data

Team	Number of Non-Recyclable Items Collected	Number of Recyclable Items Collected
Team 1	12	18
Team 2	20	10
Team 3	16	22
Team 4	12	23
Team 5	14	30
Team 6	22	31
Team 7	12	15
Team 8	15	22
Team 9	25	18
Team 10	31	18
Team 11	20	20
Team 12	12	51



Example Stem and Leaf Plot	Practice Stem and Leaf Plot
Number of Non-Recyclable Items Collected	Number of Recyclable Items Collected

To Create a Stem and Leaf Plot:

Put all the numbers in order from least to greatest.

1. Determine the range
2. List the tens place digit for the smallest data point on your “stem” side.
3. List the ones place digit for the smallest data point on your “leaf” side.
4. Continue in the same way to include all data point.

Name: _____

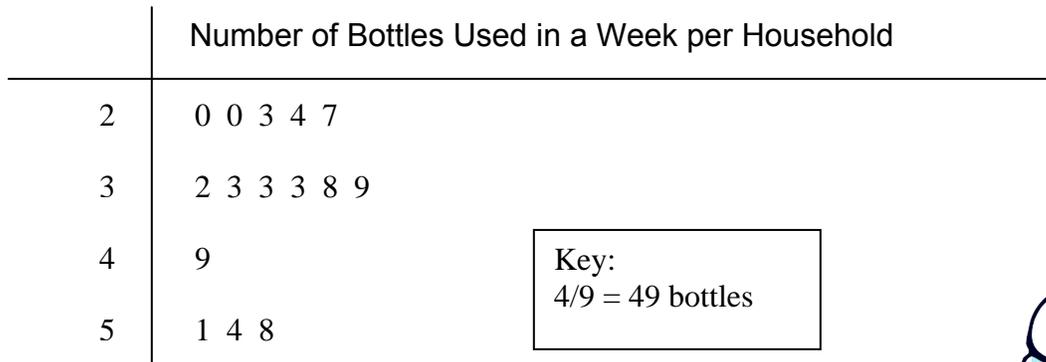
Date: _____

1. How many pounds of garbage does an average American family of four produce in a week if each person produces 4.5 lbs a day.

- 126 lbs
- 1,206 lbs
- 18 lbs
- 31.5 lbs



The EPA (Environmental Protection Agency) surveyed 15 households in Trashy Town and collected the data displayed in the Stem-and-Leaf Plot below. Use it to answer questions 2 – 3.



2. How many households used more than 38 bottles in a week?

- 6 households
- 5 households
- 10 households
- 4 households

3. What is the mean number of bottles used in a week per Trashy Town household? Round to the nearest whole number. (You may use a calculator to find the mean.)

- 33 bottles
- 52 bottles
- 534 bottles
- 36 bottles

BCR #1

We surveyed 25 students in 3rd grade and 25 students in 11th grade to find out how many cans of soda they drank a day.

Step A

Use the data below to create a line plot for each set of data.



3 rd Grade Class Data					11 th Grade Class Data				
4	3	1	1	1	3	2	2	1	2
0	1	0	2	2	1	3	4	3	3
1	0	3	0	3	1	0	3	4	0
1	2	3	3	0	5	2	3	4	3
0	0	0	1	1	1	3	2	2	0



Create a line plot to display the information for the 3rd Grade Class.

Create a line plot to display the information for the 11th Grade Class.

Step B:

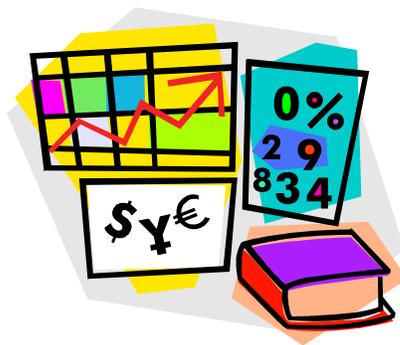
Use what you know about range, median, mode, and mean to draw a conclusion about the number of cans of sodas consumed daily by elementary students verses high school students.

Extension (Optional): These past few days you have explored data that represents various groups in your community (your country, your household, your teachers, and your fellow students). Think about a particular person or group that you would like to write to in order to convince that group or person to changes their ways towards eco-friendliness. Remember that using facts in your argument will make your case stronger. (Use an extra sheet of paper if you need more space)



Questions for Pinch Cards

1. This is used to represent a set of data in a visual way. This makes it easier to interpret data. (Graph)
2. This type of graph would be used to compare categories of data. (Bar Graph)
3. This number tells the difference between the largest value and smallest value in a set of data. (Range)
4. This number tells the data value that occurs most often in a set of data. (Mode)
5. This type of graph is a display of responses along a number line. X's recorded above the responses indicate the number of times the response occurred. (Line Plot)
6. This is the middle number in an ordered set of data. (Median)
7. This number is found by adding all the data and dividing by the total number of data points. (Mean)
8. This is a graph that arranges data by place value. (Stem-and-Leaf Plot)



Quick Stats Engagement

1. The Great Pacific Garbage Patch is considered the largest landfill in the world. It is about twice the size of Texas and is home to millions of pounds of trash...90% of it is plastic. <http://science.howstuffworks.com/great-pacific-garbage-patch.htm> (True)
2. Every year, Americans throw away enough office and writing paper to build a wall 12 feet high, stretching from Los Angeles to New York City. (www.fairfaxcounty.gov) <http://www.environmentalisteveryday.org/solid-waste-management/garbage-trash-waste-facts.php> (True)
3. Recycling just one aluminum can saves enough energy to power an iPod for an hour. (False – actually recycling just one aluminum can saves enough energy to power a TV for 3 hours.) <http://www.environmentalisteveryday.org/solid-waste-management/garbage-trash-waste-facts.php>
4. Every month we throw out enough glass bottles and jars to fill up a house. (False – actually we throw out enough glass bottles and jars to fill up a giant skyscraper) (www.recycling-revolution.com) <http://www.environmentalisteveryday.org/solid-waste-management/garbage-trash-waste-facts.php>
5. Everyday Americans buy 62 million newspapers and throw out 44 million. That's the equivalent of dumping 500,000 trees into a landfill every week. (www.colorado.edu/curecycling). (True)
6. It takes 10,000 years for a plastic bottle to decompose. (False – Actually we don't know exactly how long it takes for both plastic and Styrofoam to decompose because we simply haven't been around that long! As it appears now, these items may never fully decompose) <http://www.depweb.state.pa.us/greatpacleanup/cwp/view.asp?a=3&q=451671>

U.S.A.

4.58 lbs

Australia

4.16 lbs

Denmark

3.97 lbs

Switzerland
3.92 lbs

Canada
3.85 lbs

Norway
3.75 lbs

Austria

3.38 lbs

U.K.

3.38 lbs

Ireland

3.38 lbs

China

2.40 lbs

Germany

3.25 lbs

France

3.07 lbs

Italy

3.01 lbs

Finland

2.77 lbs

Japan

2.47 lbs



Has the United States Gone Green?

Name: _____

Date: _____

Common sense tells us that the more people a country has, the more trash that country will produce. Currently China is the most populated country on Earth, making up about 20% of its population. The United States makes up about 5% of Earth's population.

About how many times more people are in China than in the United States?
 ___ 4 ___ (Think $5 \times 4 = 20$)

United States	China
Range: <u>2.7</u> Median: <u>4.2</u> Mode: <u>None</u> Mean: <u>4.5</u>	Range: <u>4.1</u> Median: <u>2.2</u> Mode: <u>2.2</u> Mean: <u>2.4</u>

If we sampled three different people in the United States, what could each of their possible wastes per day be, based on the mean you found above? (There is more than one right answer!) **Students can answer any three numbers that have a sum of 13.5. They should explain that 13.5 is the goal sum because 13.5 divided by 3 data points will equal 4.5 which is the mean.**

Recycle the Numbers

Use the numbers in the trash can below and what you know about mean, median, mode and range to fill in the blanks. You may only use each number once. The story must make number sense.



A sample was taken of 5 people living in Ireland.
(1)

From least to greatest, the amount of garbage per person per

day is 1.2 lbs, 2.3 lbs, 2.7 lbs, 5.2 lbs, 5.6 lbs. The
(2) (3) (4)

median amount of trash per person per day is 2.7 lbs. The
(5)

mean amount of trash per person per day is 3.4 lbs. The
(6)

range of trash per day per person is 4.4 lbs.
(7)

Part A:

Scientists just discovered Planet Googalyglack. Data was collected from five areas of this new planet. Use the chart to find the range, median, mode and mean of trash produced in this new planet.

Planet Googalyglack Trash Consumption	
Fanswitch Forest	3.02 pounds
Snopsville Plain	2.18 pounds
Booplerstown	1.60 pounds
Targred Mountain	0.53 pounds
Hansher Valley	1.25 pounds

2.49 Range **1.60** Median **NA** Mode **1.72** Mean

Planet Earth Trash Consumption

Range = 2.11 Median = 3.38 Mode = 3.38 Mean = 3.42

Part B:

Use the above information about Planet Googalyglack to compare their trash consumption to that of the top 15 trash producers on Earth. Be sure to use what you know about range, median, mode and mean in your explanation.

Students should explain that Planet Googalyglack seems to be doing a better job with the amount of trash they consume than Earth. They should stated that Earth consumed an average of 3.42 lbs of trash per person per day, where as Planet Googalyglack consumed only 1.72 lbs per person per day.

Daily Handouts Given by Teachers

Teacher's Name	# of Handouts Given To Each Student Daily
Mrs. Can	11
Mr. Dump	7
Miss Plastic	9
Mr. Fastfood	10
Mr. McDirty	8
Mrs. Waste	7
Ms. Lid	6
Mrs. Paper	6
Mr. Glass	7
Mrs. Garbage'	10
Miss Compost	8
Mr. T. Rash	10
Mrs. Smell	8
Mr. Green	8
Mrs. Eco	5
Miss Landfill	15
Mr. Tin	9
Mr. Luminum	11

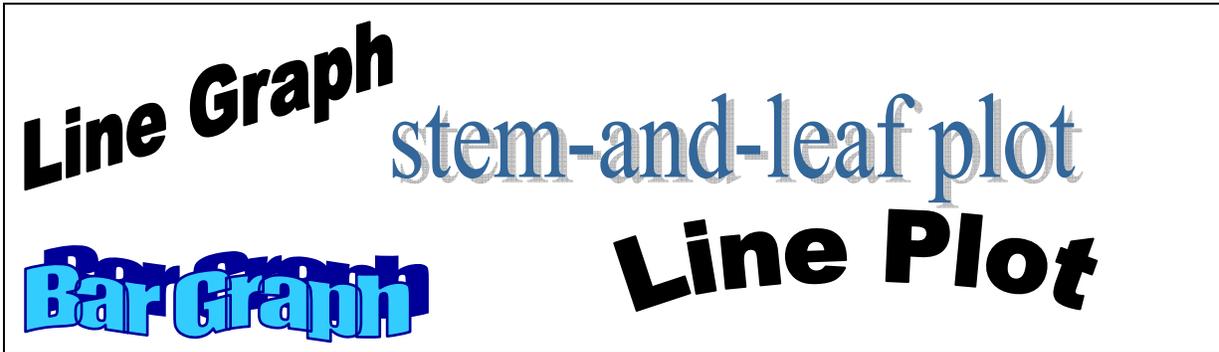
Do Our Teachers Love Trash or Trees More?

Name: _____

Date: _____

I did some research this past week and recorded the amount of worksheets given out by each teacher in the school. If I wanted to create a graph that displays the typical amount of handouts given daily, what type of graph should I use? Explain your answer.

Types of Graphs:



I think the best type of graph to display this data would be a line plot because a line plot displays numerical data that represents people (or their responses) using x's. Because the data collected is numerical data, where the data may often repeat, a line plot will represent this well. Some might think a bar graph would be the best type of graph but that would be incorrect because a bar graph shows categories and these teachers do not want their identities revealed. Also, unlike a line plot, a bar graph does not show the "typical" amount of handouts.



Trash Used Line Plot

Name: _____

Date: _____

Pounds of Trashed Used by Teachers Daily

Range:5 Median: 3.5 Mode:5 Mean: 3.45											
									X		
									X		
								X			
		X		X		X		X			
	X	X		X		X		X			
X	X	X		X	X	X		X		X	
X	X	X	X	X	X	X	X	X		X	
1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	

Pounds of Trash

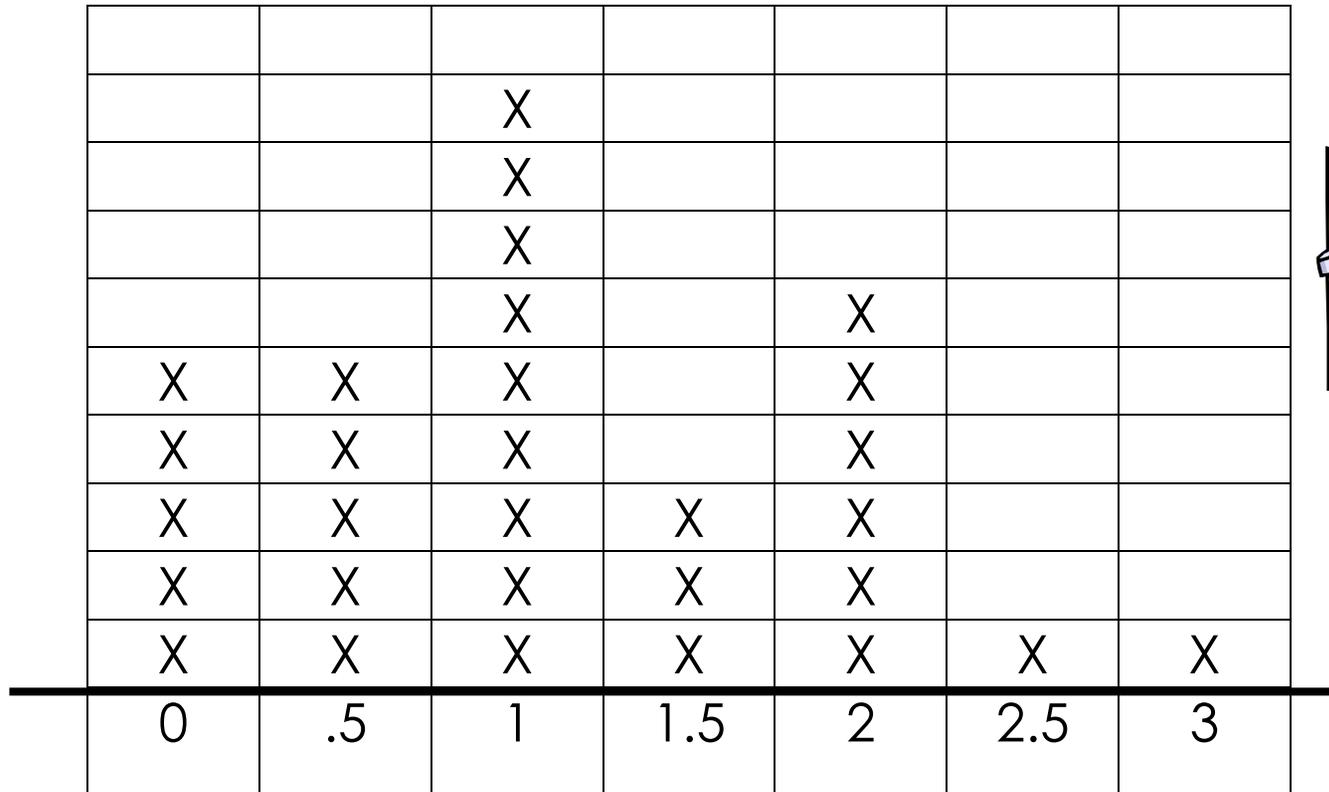
Recycle Line Plot (Application)

Name: _____

Date: _____

Pounds of Recycled Goods

Range: 3
 Median: 1
 Mode: 1
 Mean: 1.12



Pounds of Recycled Goods



Teacher Resource 8B
Answer Key



Trash Footprint

Complete the chart below to figure out each teacher's actual trash footprint. To do this you need to subtract the amount they recycle from the amount of trash they used. Then answer the questions on the back of this paper.

Teacher	Trash Used	Trash Recycled	Trash Footprint
Mrs. Can	5 lbs	2 lbs	3 lbs
Mr. Dump	6 lbs	0 lb	6 lbs
Miss Plastic	3.5 lbs	1 lb	2.5 lbs
Mr. Fastfood	4 lbs	.5 lb	3.5 lbs
Mr. Dirty	5 lbs	2 lb	3 lbs
Mrs. Waste	5 lbs	1 lb	4 lbs
Ms. Lid	3 lbs	1 lb	2 lbs
Mrs. Paper	1.5 lbs	.5 lb	1 lb
Mr. Glass	1.5 lbs	.5 lb	1 lb
Mrs. Garbage'	5 lbs	0 lb	5 lbs
Miss Compost	1.5 lbs	1 lb	.5 lbs
Mr. T. Rash	5 lbs	2.5 lbs	2.5 lbs
Mrs. Smell	3 lbs	2 lbs	1 lb
Mr. Green	1 lb	.5 lb	.5 lbs
Mrs. Eco	2 lbs	2 lbs	0 lb
Mr. Luminum	3.5 lbs	1 lb	2.5 lbs
Mrs. Tin	4 lbs	1.5 lbs	2.5 lbs
Miss Landfill	5 lbs	1 lb	4 lbs
Ms. Planet	2.5 lbs	1.5 lbs	1 lb
Mrs. McClean	2 lbs	1 lb	1 lb
Mr. Bottle	4 lbs	1 lb	3 lbs
Ms. Jar	4 lbs	2 lbs	2 lbs
Mrs. Litter	4.5 lbs	0 lb	4.5 lbs
Ms. N. Vironment	1 lb	1 lb	0 lb
Mrs. Energy	2 lbs	.5 lbs	1.5 lbs
Miss Helper	3 lbs	1.5 lbs	1.5 lbs
Mr. Collector	3 lbs	3 lbs	0 lb
Mrs. Nature	2 lbs	1 lb	1 lbs
Ms. Junk	6 lbs	2 lbs	4 lbs

Mrs. G Patch	5 lbs	0 lb	5 lbs
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Teacher Resource 9B

Use the chart the help you answer the following questions.

5. Who created the smallest trash footprint?

- Miss Helper Mrs. Eco
 Mr. Fastfood Mr. Bottle

6. Who created the largest trash footprint?

- Mr. Dump Mrs. Waste
 Mrs. McClean Miss Landfill

7. What is the mean trash footprint of all teachers? (HINT: Use a calculator to find the answer.)

- 3.9 lbs 6.4 lbs
 3.1 lbs 2.3 lbs

8. Using what you know about mean, pick three teachers you would remove from your data set to make the overall trash footprint mean lower and explain your choice.

Students should pick three teachers that have a high trash footprint and explain that the data linked to them causes the mean to rise because when you find the mean you add all the numbers and divide by the total number of data points.



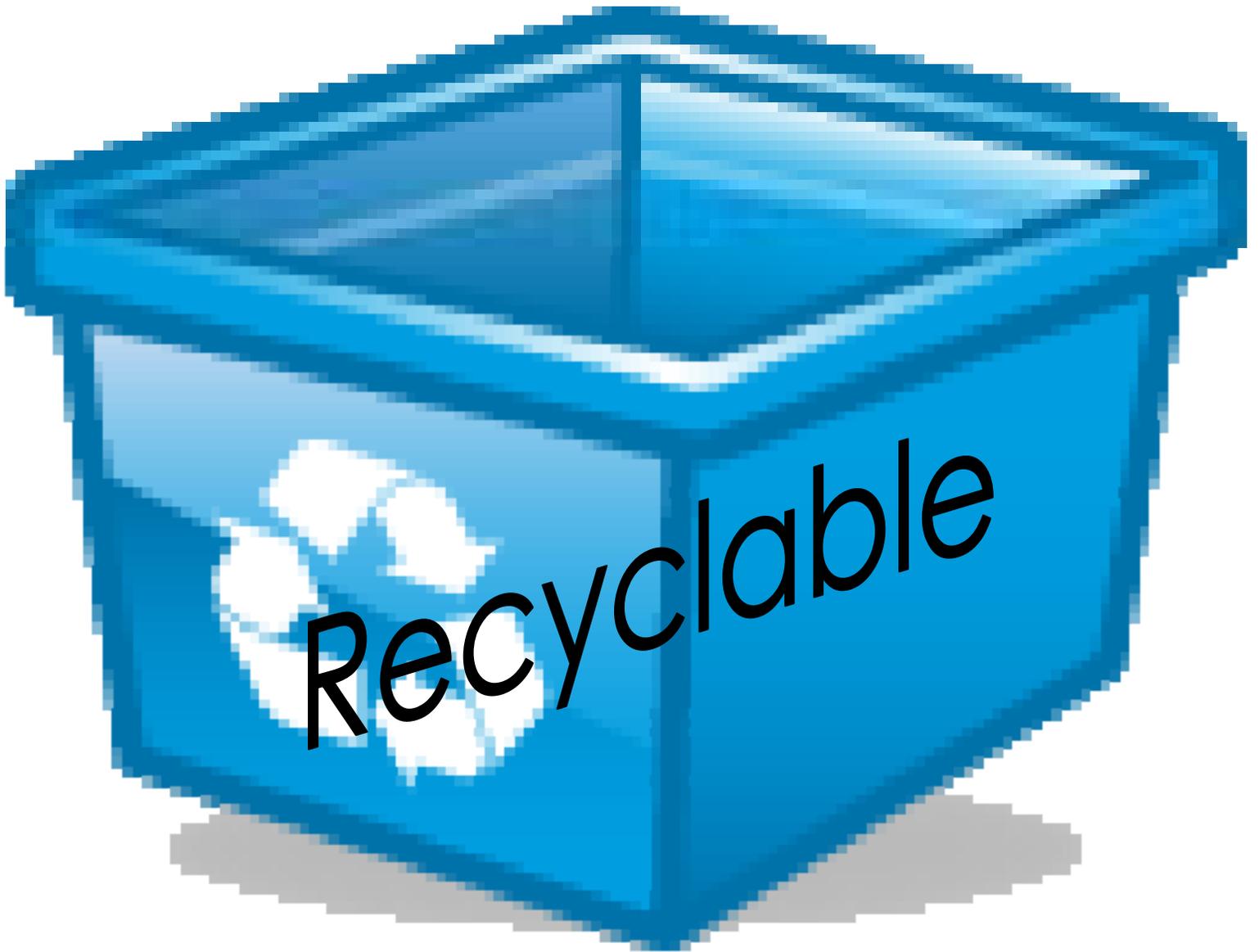
Pounds of Recycled Material Collected in Trashy Town

		ⓧ		
		ⓧ		
	x	ⓧ		
	x	x		
x	x	x		
x	x	x	x	x
3	4	5	6	7

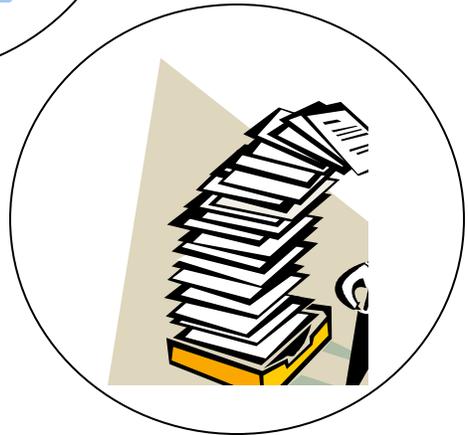
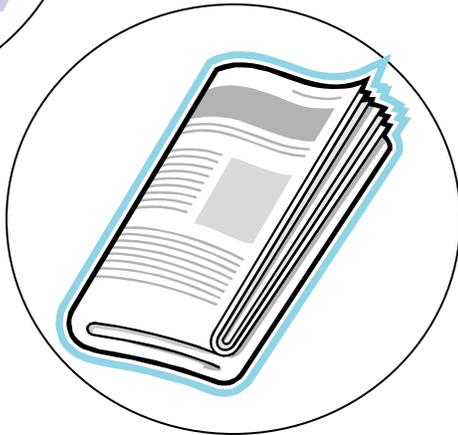
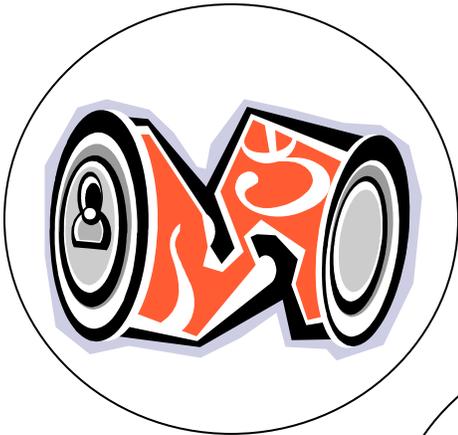
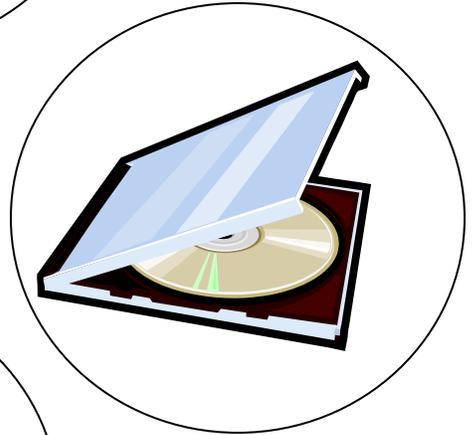
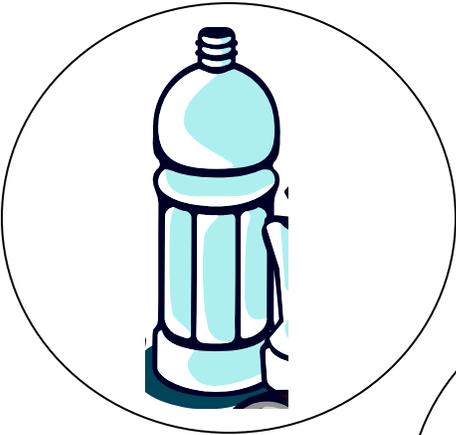
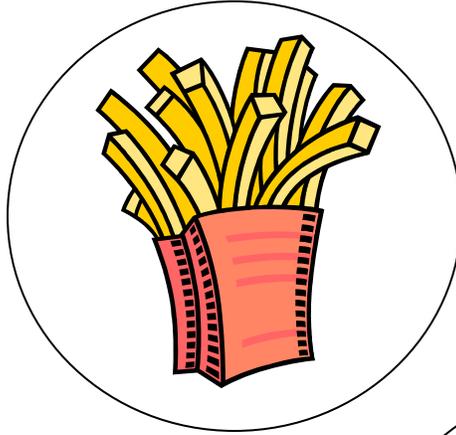
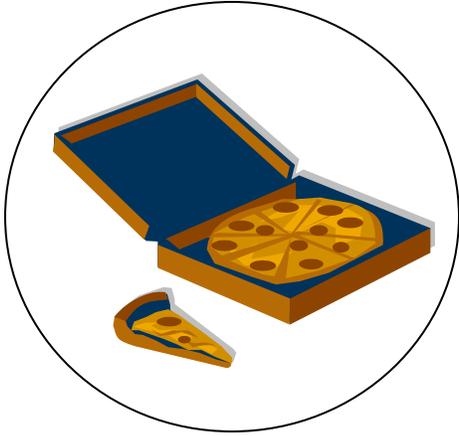
Number of pounds collected

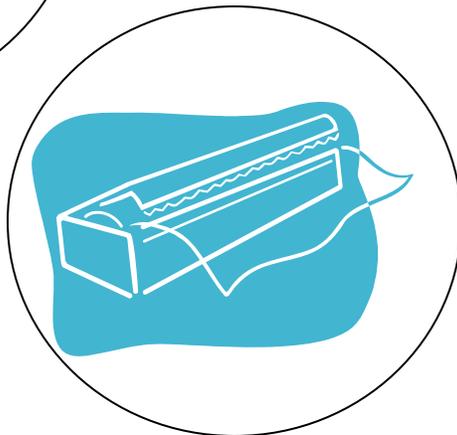
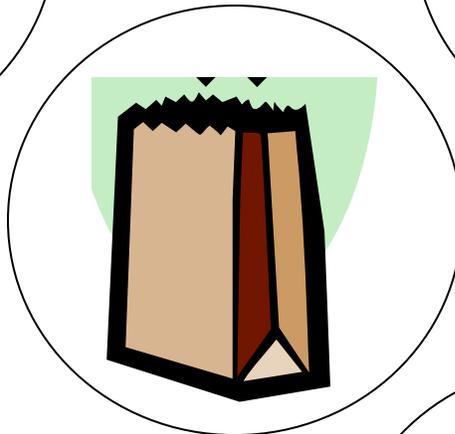
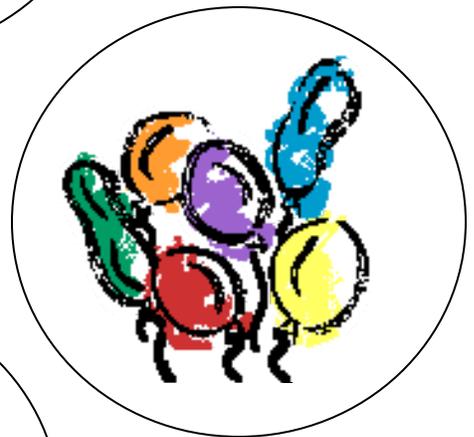
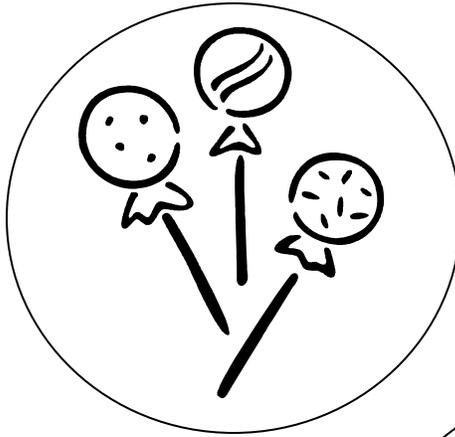
Uh-oh! The environmental waste management crew for Trashy Town missed 3 pick-ups. If they collected 5 pounds at each house, how would this affect the data? Plot the new data above. Then, use what you know about mean, median, and mode to explain your answer.

Students should add the three x's in the 5's column above. They should explain that, because of this new data, the mode changes from 4 pounds to 5 pounds. The median also changes from 4 pounds to 5 pounds. Before adding the three forgotten pick-ups, the mean was 4.5 pounds. After the data was added the mean is now 4.6 pounds. This means that, with the 3 forgotten pick-ups, we find out that typically in Trashy Town more recycled material is being collected than previously thought.







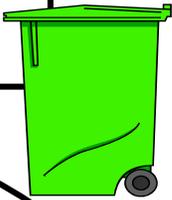


Sort Your Trash

 **Recyclable**



Non-Recyclable



Teacher Resource 12
Answer Key



Double Stem and Leaf Example



Example Data Set A (in lbs): 41, 47, 53, 53, 55, 59, 72, 84, 89, 90, 92, 96, 96

Example Data Set B (in lbs): 41, 53, 58, 61, 65, 66, 74, 77, 92, 99, 99, 99, 99

Data Set A				4	Data Set B			
		7	1	4	1			
9	5	3	3	5	3	8		
				6	1	5	6	
			2	7	4	7		
		9	4	8				
6	6	2	0	9	2	9	9	9

Key: 1/4/1 = 41 lbs

Try this!
Write what you think these two data sets could represent?

Name: _____

1. How many pounds of garbage does an average American family of four produce in a week if each person produces 4.5 lbs a day.

- 126 lbs
- 1,206 lbs
- 18 lbs
- 31.5 lbs



The EPA (Environmental Protection Agency) surveyed 15 households in Trashy Town and collected the data displayed in the Stem-and-Leaf Plot below. Use it to answer questions #2 – 3.

	Number of Bottles Used in a Week per Household
2	0 0 3 4 7
3	2 3 3 3 8 9
4	9
5	1 4 8

Key:
 $4/9 = 49$ bottles



2. How many households used more than 38 bottles in a week?

- 6 households
- 5 households
- 10 households
- 4 households

3. What is the mean number of bottles used in a week per Trashy Town household? Round to the nearest whole number. (You may use a calculator to find the mean.)

- 33 bottles
- 52 bottles
- 534 bottles
- 36 bottles

Step B:

Use what you know about range, median, mode, and mean to draw a conclusion about the number of cans of sodas consumed daily by elementary students verses high school students.

Third grade students tend to drink less soda than the typical 11th grade student. There is no mode for third graders but drinking 0 or 1 can of soda a day is most common. The mode for 11th grade students is 3 cans of soda per day. The median for third grade students is 1 can a day and 2 cans a day for the 11th grade students. The mean number of cans of soda for third graders is 1.3, which rounds to 1 and the mean for 11th graders is 2.3, rounding to 2. This means the typical 11th grade student drinks double the amount of soda as a third grader.

