

# Bugs, Giraffes, Elephants, and More

## 4<sup>th</sup> Grade—Teacher Notes

Overview	
Students will interpret line plots with scales written to the nearest quarter of a unit.	<b>Prerequisite Understandings</b> <ul style="list-style-type: none"><li>• Experience making line plots, interpreting line plots, and using the quarter unit.</li><li>• Ability to estimate a variety of measurements.</li></ul>

Curriculum Content	
<b>CCSSM Content Standards</b>	<b>4.MD.4:</b> Make a line plot to display a data set of measurements in fractions of a unit ( $\frac{1}{2}$ , $\frac{1}{4}$ , $\frac{1}{8}$ ). Solve problems involving addition and subtraction of fractions by using information presented in line plots. For example, from a line plot find and interpret the difference in length between the longest and shortest specimens in an insect collection.
<b>CCSSM Mathematical Practices</b>	<b>2. Reason abstractly and quantitatively:</b> Students look at the data in the context of the field trip and reason to match the information. <b>3. Construct viable arguments and critique the reasoning of others:</b> Students argue and explain their selections for the data.

Task	
<b>Supplies</b> <ul style="list-style-type: none"><li>• Rulers and yard sticks</li><li>• Access to the Internet or resources to research measurements</li></ul>	<b>Core Activity</b> <p>Students should work with a partner to research measurements and make decisions.</p>
<b>Launch</b> <p>Make sure that the students have created accurate line plots. Review reading rulers to the nearest quarter inch. Collect some data from the students and make a line plot. Talk about each X representing a data value.</p>	<b>Extension(s)</b> <p>Students can research the measure of an object, to the nearest quarter of a unit and create their own line plots. Post the line plots around the room, list the topics, and ask students to match the topics to the plots.</p>

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## Launch

### Length of Our Pencils

Ask students to get out a ruler and measure the length of one of their pencils to the nearest quarter of an inch. Have the students select pencils that they have been using so there will be variability. Check the measurement with a partner and then put all of the measurements on the board. After arranging the data from least to greatest, the group will create a line plot to the nearest quarter of an inch. Time should be spent discussing how it is created, what the data mean, and how the plot can be interpreted.

Questions to ask: If we were to select two pencils and place them end-to-end, what are some of the lengths we could obtain? What is the shortest length? What is the longest? What length came up the most (mode)? What is the difference between the longest and shortest pencil (range)? Why do you think there are so many different lengths?

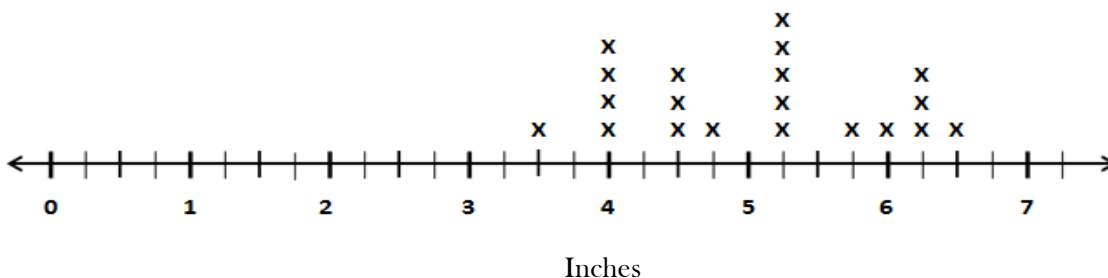
### Objects in Our Classroom

Pair the students and ask them to select two items in the classroom that are each less than one foot long. Each of the partners should measure the item to the nearest quarter of an inch. Once they have agreed on the length, they should put the name of the object and its length on the board. Partners should then work together to create a line plot of the whole class's data. Partners could then compare their plots with another pair of students. Each pair would then create questions for the other students in the class to answer based on the line plot. Spend time sharing and answering the questions.

### Read my Plot

Show your students the plot below. Ask students to write down the value of all of the numbers on the plot and then answer Questions 1-6.

Length of an Earthworm in Inches



1. How many worms were measured?
2. List all the lengths of the worms.
3. What was the shortest worm? The longest worm?
4. What is the difference between the longest and shortest worm?
5. List 3 different lengths you could get if you put two worms end to end and measured them. Show your work.
6. Why are the worm lengths so different?

**Activity Instructions**

Start the activity by allowing the students to look at all the graphs on the worksheet and to discuss ideas for the missing information in small groups. Next, pass out the question sheets for the students to complete with a partner or individually.

Make sure they discuss their choices and are able to support the choices they make with facts. If they are having trouble making decisions, they could use the research materials to help investigate measurements.

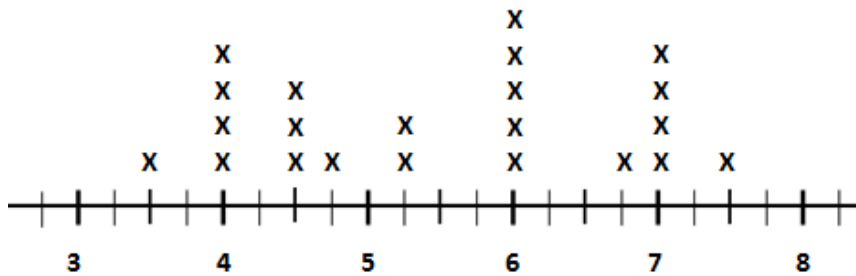
Make sure students understand how to define “individuals” and values as they relate to the line plots. The task requires students to calculate with fractions and leads to creating a foundation for basic statistics that will be assessed at the next grade level.

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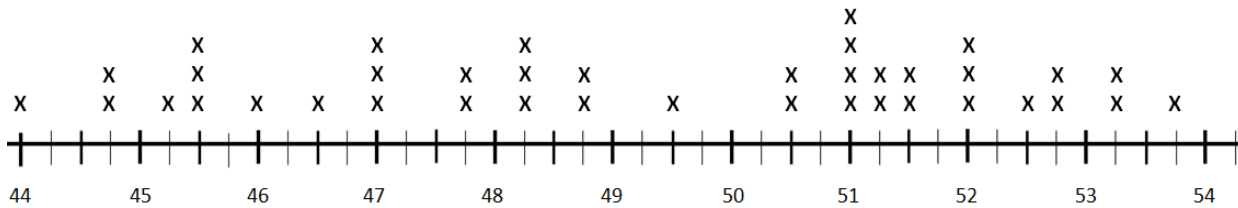
## Activity

Look at the five line plots below. The line plots contain data collected during a field trip to the zoo. Each plot is missing important information: what is being measured and the unit of measure being used.



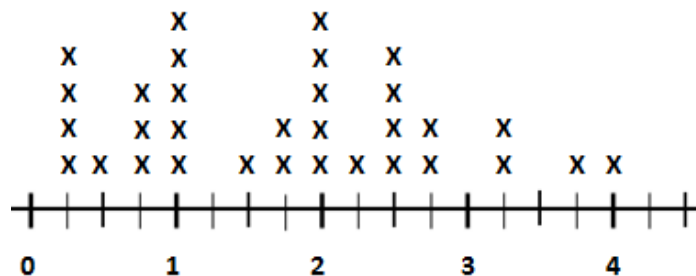
Plot 1

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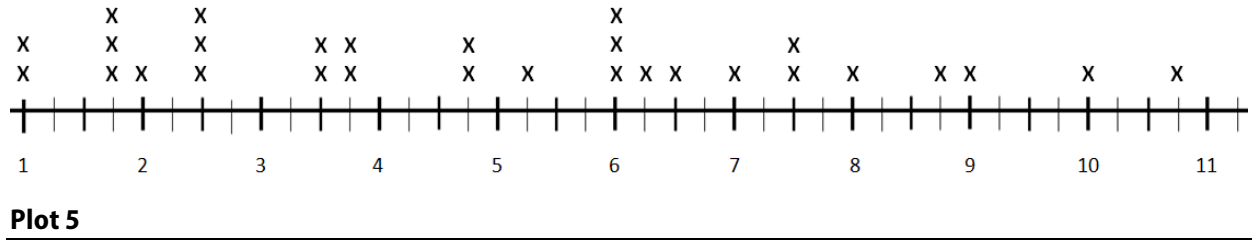
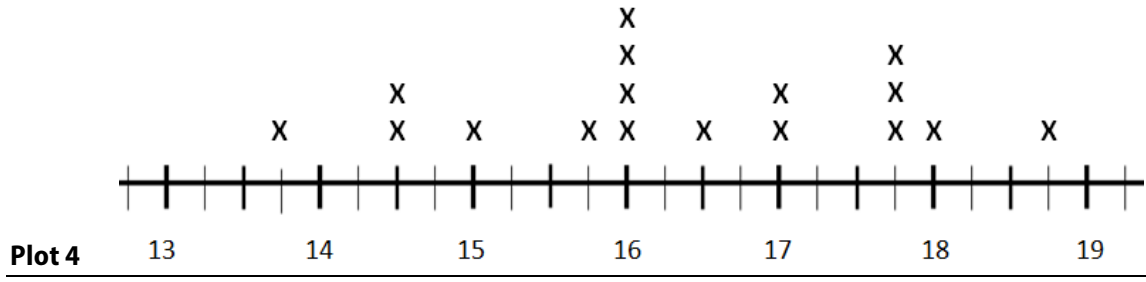
Plot 2

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Plot 3

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## Activity

- Which of the plots do you think shows (write the number of the plot in the blank):
  - The length in cm of bugs collected on the last field trip? \_\_\_\_\_
  - The height in feet of adult giraffes? \_\_\_\_\_
  - The height in inches of fourth graders? \_\_\_\_\_
  - The weight in tons of adult elephants? \_\_\_\_\_
- Explain why you think the plot you picked for 1c above is the one that shows the heights of fourth graders.
- Why do you think the other plots do not show the heights of fourth graders?
- Which plot was not used? \_\_\_\_\_ What do you think this plot data could be about? Explain.
- Look at Plot 1.
  - How many individuals are represented? \_\_\_\_\_
  - What is the largest value? \_\_\_\_\_
  - What is the smallest value? \_\_\_\_\_
  - Find the difference between the largest and smallest individuals. \_\_\_\_\_ Explain what this tells you.
  - What value has the most individuals? \_\_\_\_\_ How many? \_\_\_\_\_
- Look at Plot 4.
  - How many individuals are represented? \_\_\_\_\_
  - What is the largest value? \_\_\_\_\_
  - What is the smallest value? \_\_\_\_\_
  - Find the difference between the largest and smallest individuals. \_\_\_\_\_ Explain what this tells you.
  - What value has the most individuals? \_\_\_\_\_ How many? \_\_\_\_\_

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## Results from the Classroom

### Holly

Holly was comfortable with the first task of identifying the plots with the information provided; however, later on, she had the same difficulty as most students. All of the students featured here selected Plot 5 for part d instead of Plot 1. The data in Plot 5 contains the possible elephant weights but it goes beyond feasible weights for mature elephants.

Holly had problems with units in many of the answers too. She does not know how to explain why she chose a plot based on the units when asked in Question 2. When asked what plot was not used, her answer focused only on the unit and not the type of data.

When she was reading the data, she clearly struggled with the concept of quarter inches as in her answer for the largest data point in graph 4. Holly is trying to use some type of decimal system with an answer 18.03 rather than  $18 \frac{3}{4}$ . She understands that it is three sections over, but she does not know how to label it. When answering the other plot questions, she had no trouble with the half-unit measurements.

- Which of the graphs do you think shows:
  - The length of bugs in cm. collected on the last field trip? graph 3
  - The height of adult giraffes in feet? graph 4
  - The height of fourth graders in inches? graph 2
  - The weight in tons of adult elephants? graph 5
- Explain why you think the graph you picked for c is the one that shows the heights of fourth graders. I picked graph 2 because these using inches but not feet.
- Why do you think that other graphs don't show the fourth graders heights? The other graphs don't work because there either to high or to low
- Which graph was not used? graph 1 What data do you think is shown? Explain. I think graph 1 because I think its cm.
- Look at graph 4.
  - How many individuals are represented? 17
  - What is the largest measured individual? 18.03
  - What is the smallest? 13.03
  - Find the difference between the largest and the smallest? 5 more whole feet
  - What value has the most individuals? 16 feet How many? 4
- Look at graph 1.
  - How many individuals are represented? 22
  - What is the largest measured individual? 7 1/2
  - What is the smallest? 3 1/2
  - Find the difference between the largest and the smallest? 4 legs
  - What value has the most individuals? 6 feet How many? 5

## Khaled

Khaled has a more complete explanation for his plot selection and why none of the other plots will work. His answers are accurate, and his selection of snakes for the remaining plot shows creativity and understanding of the question. Khaled has no problem with the rest of the task and has demonstrated his ability to work with line plots to the quarter unit.

1.	Which of the graphs do you think shows:	
a.	The length of bugs in cm. collected on the last field trip?	<u>3</u>
b.	The height of adult giraffes in feet?	<u>4</u>
c.	The height of fourth graders in inches?	<u>2</u>
d.	The weight in tons of adult elephants?	<u>5</u>
2.	Explain why you think the graph you picked for c is the one that shows the heights of fourth graders.	<u>I picked this graph because when you measure someone in inches when you finish the 4<sup>th</sup> grader ends up being somewhere between 30 or 50 inches tall.</u>
3.	Why do you think that other graphs <b>don't</b> show the fourth graders heights?	<u>I don't think the other graphs worked because the numbers didn't go high enough for a fourth grader's height.</u>
4.	Which graph was not used? <u>1</u> What data do you think is shown? Explain.	<u>The data I think is shown is snakes. I think this because snakes can be very long so I think 3 feet to 8 feet is a good estimate for a snakes</u>
5.	Look at graph 4. <u>light</u>	
a.	How many individuals are represented?	<u>17</u>
b.	What is the largest measured individual?	<u>18 <math>\frac{3}{4}</math></u>
c.	What is the smallest?	<u>13 <math>\frac{1}{4}</math></u>
d.	Find the difference between the largest and the smallest?	<u>5</u>
e.	What value has the most individuals? <u>16</u> How many? <u>4</u>	
6.	Look at graph 1.	
a.	How many individuals are represented?	<u>22</u>
b.	What is the largest measured individual?	<u>7 <math>\frac{1}{2}</math></u>
c.	What is the smallest?	<u>3 <math>\frac{1}{2}</math></u>
d.	Find the difference between the largest and the smallest?	<u>4</u>
e.	What value has the most individuals? <u>6</u> How many? <u>5</u>	



**Cassandra**

Looking at Cassandra's work, we see she was very interested in the setting and as well as having solid answers. She demonstrates good reasoning skill when answering Questions 2-4.

1. Which of the graphs do you think shows:

a. The length of bugs in cm. collected on the last field trip? 3

b. The height of adult giraffes in feet? 4

c. The height of fourth graders in inches? 2

d. The weight in tons of adult elephants? 5

2. Explain why you think the graph you picked for c is the one that shows the heights of fourth graders.  
 I think graph 2 shows the heights of fourth graders because question c asks for heights in inches, not feet.

3. Why do you think that other graphs **don't** show the fourth graders heights?  
 I think that the other graphs don't show the fourth grader's heights because the other graph's numbers are pretty low. The fourth graders are measuring in inches.

4. Which graph was not used? 1 What data do you think is shown? Explain.  
 I think it shows the height of gorillas in feet because all the graphs shows animals and humans so I thought the

5. Look at graph 4. fourth graders took a trip to the zoo. Gorillas are usually human sized. So I thought graph 1 would make sense.

a. How many individuals are represented? 17

b. What is the largest measured individual? 18 $\frac{3}{4}$

c. What is the smallest? 13 $\frac{3}{4}$

d. Find the difference between the largest and the smallest? 5

c. What value has the most individuals? 16 How many? 4

6. Look at graph 1.

a. How many individuals are represented? 22

b. What is the largest measured individual? 7 $\frac{1}{2}$

c. What is the smallest? 3 $\frac{1}{2}$

d. Find the difference between the largest and the smallest? 4

e. What value has the most individuals? 6 How many? 5

## David

David struggles with all of the components of the task. His answers to the plot matching appear to be random. When students do not understand or do not have the skills to complete the problem, many are comfortable with any answer.

David does not have an understanding of the size of the measurements. His bugs would be very large; and while a student could successfully argue that Plot 4 would work for bugs, it would be difficult to support that the height of adult giraffes would range from  $3\frac{1}{2}$  to  $7\frac{1}{2}$  feet.

His reasoning for the selection of Plot 3 for the height of fourth graders is faulty. He might be confusing inches with feet or have little concept of the actual size of inches versus feet. He says that Plot 2 does not make sense for any of the options. The rest of his answers show a complete inability to read the line plots and support the need for interventions with this student.

1.	Which of the graphs do you think shows:	
a.	The length of bugs in cm. collected on the last field trip?	<u>4</u>
b.	The height of adult giraffes in feet?	<u>1</u>
c.	The height of fourth graders in inches?	<u>3</u>
d.	The weight in tons of adult elephants?	<u>5</u>
2.	Explain why you think the graph you picked for c is the one that shows the heights of fourth graders.	I think 4 because it is the smallest.
3.	Why do you think that other graphs don't show the fourth graders heights?	because it dosint make sense if a thng made it tons or 54
4.	Which graph was not used? <u>2</u> What data do you think is shown? Explain.	because graph 2 does not make sense for any of them.
5.	Look at graph 4.	
a.	How many individuals are represented?	<u>13</u>
b.	What is the largest measured individual?	<u>4</u>
c.	What is the smallest?	<u>3</u>
d.	Find the difference between the largest and the smallest?	<u>3</u>
e.	What value has the most individuals? <u>2</u> How many? <u>54</u>	
6.	Look at graph 1.	
a.	How many individuals are represented?	<u>22</u>
b.	What is the largest measured individual?	<u>34</u>
c.	What is the smallest?	<u>17</u>
d.	Find the difference between the largest and the smallest?	<u>4</u>
e.	What value has the most individuals? <u>2</u> How many? <u>54</u>	