

# Kenmore-Town of Tonawanda UFSD

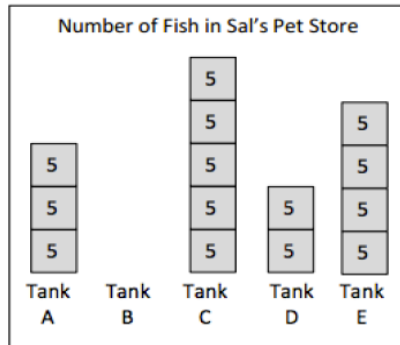
*We educate, prepare, and inspire all students to achieve their highest potential*



## **Grade 3 Module 6 Parent Handbook**

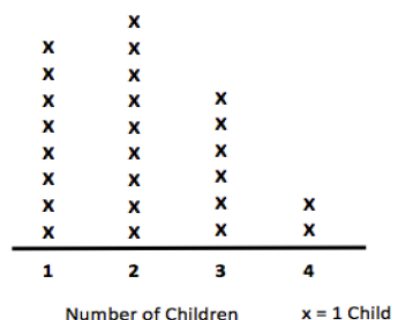
### Collecting and Displaying Data

In Module 6, we build on Grade 2 concepts about data, graphing, and line plots. We focus on generating and analyzing different types of data. By the end of the module, students are working with a mixture of scaled picture graphs, bar graphs, and line plots to problem solve using categorical and measurement data.



A vertical tape diagram, similar to a bar graph

Number of Children in Third-Grade Families



A line plot

**What Came Before this Module:** Students extended and deepened understanding of fractions as equal parts of a whole, using area models and the number line.

**What Comes After this Module:** In Module 7, students get intensive practice with word problems, as well as hands-on investigation experiences with geometry and perimeter.

### Key Terms and Ideas

**Axis:** vertical or horizontal scale in a graph

**Bar graph:** graph generated from categorical data with bars to represent a quantity

**Fraction:** numerical quantity that is not a whole number, e.g.,  $1/3$

**Frequent:** most common measurement on a line plot

**Line plot:** display of measurement data on a horizontal line

**Measurement data:** e.g., length measurements of a collection of pencils

**Picture graph:** graph generated from categorical data with graphics to represent a quantity

**Scaled graphs:** bar or picture graph in which the scale uses units with a value greater than 1

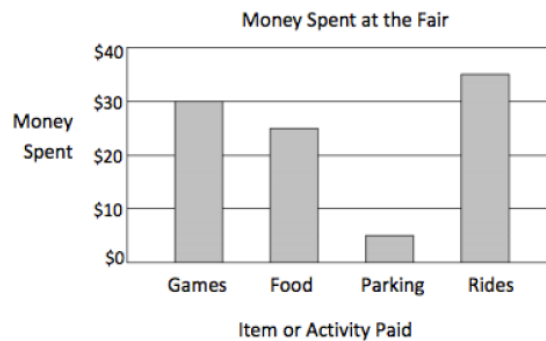
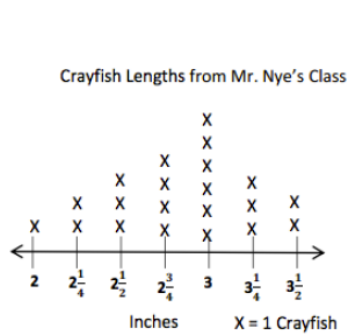
**Survey:** collecting data by asking a question and recording responses

### + How You Can Help at Home:

- Ask your student to help interpret the data when you see simple graphs and charts in books, newspapers, or product packaging.
- Continue to practice and encourage measurement around the house, especially with inches, and parts of an inch.

## Key Common Core Standards:

- **Represent and Interpret Data.**
  - Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories.
  - Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units.



Students will learn when a line plot or a bar graph is a more appropriate way to display data.

Spotlight on Math Skills:

Displaying Data

Students will work with data in various ways in *A Story of Units*.

## *A Story of Units* exposes students to several key skills that will be used throughout the elementary years.

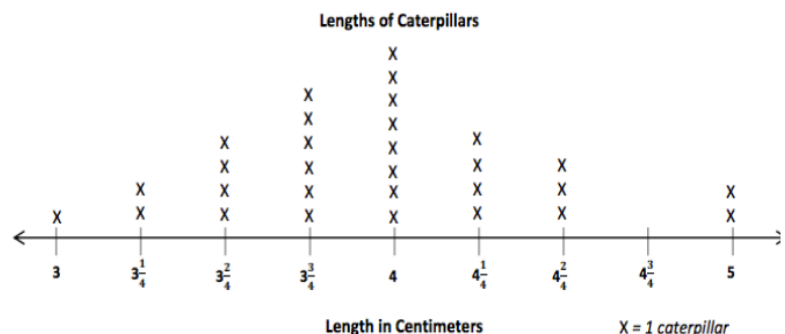
Learning how to gather, record, and display data is an important group of mathematical skills that students will use their whole lives. Our work with data in *A Story of Units* began in kindergarten with simple bar graphs of categorical data. Now, we gather more complex data, both categorical and measurement, and display it in more sophisticated ways.

This module will also include a discussion of when either bar graphs or line plots are a good choice to display a particular set of data. Students will learn that bar graphs are used to compare things between different groups, and line plots are used to show frequency of data (how many times a certain thing happens) along a number line.

Sample Problem from Module 6:  
(Example taken from Module 6, Lesson 6)

Using the line plot to the right, students answer various questions:

- How many caterpillars did the class measure? How do you know?
- Cara says that there are more caterpillars  $3\frac{3}{4}$  centimeters long than caterpillars that are  $3\frac{2}{4}$  and  $4\frac{1}{4}$  centimeters long combined. Is she correct?



# Collecting and Displaying Data

## OVERVIEW

This 10-day module builds on Grade 2 concepts about data, graphing, and line plots. Topic A begins with a lesson in which students generate categorical data, organize it, and then represent it in a variety of forms. Drawing on Grade 2 knowledge, students might initially use tally marks, tables, or graphs with one-to-one correspondence. By the end of the lesson, they show data in tape diagrams where units are equal groups with a value greater than 1. In the next two lessons, students rotate the tape diagrams vertically so that the tapes become the units or bars of scaled graphs (**3.MD.3**). Students understand picture and bar graphs as vertical representations of tape diagrams and apply well-practiced skip-counting and multiplication strategies to analyze them. In Lesson 4, students synthesize and apply learning from Topic A to solve one- and two-step problems. Through problem solving, opportunities naturally surface for students to make observations, analyze, and answer questions such as, "How many more?" or "How many less?" (**3.MD.3**).

In Topic B, students learn that intervals do not have to be whole numbers but can have fractional values that facilitate recording measurement data with greater precision. In Lesson 5, they generate a six-inch ruler marked in whole-inch, half-inch, and quarter-inch increments, using the Module 5 concept of partitioning a whole into parts. This creates a conceptual link between measurement and recent learning about fractions. Students then use the rulers to measure the lengths of precut straws and record their findings to generate measurement data (**3.MD.4**).

Lesson 6 reintroduces line plots as a tool for displaying measurement data. Although familiar from Grade 2, line plots in Grade 3 have the added complexity of including fractions on the number line (**2.MD.9, 3.MD.4**). In this lesson, students interpret scales involving whole, half, and quarter units in order to analyze data. This experience lays the foundation for them to create their own line plots in Lessons 7 and 8. To draw line plots, students learn to choose appropriate intervals within which to display a particular set of data. For example, to show measurements of classmates' heights, students might notice that their data fall within the range of 45 to 55 inches and then construct a line plot with the corresponding interval.

Students end the module by applying learning from Lessons 1–8 to problem solving. They work with a mixture of scaled picture graphs, bar graphs, and line plots to problem solve using both categorical and measurement data (**3.MD.3, 3.MD.4**).

# Terminology

## New or Recently Introduced Terms

- Frequent (most common measurement on a line plot)
- Key (notation on a graph explaining the value of a unit)
- Measurement data (e.g., length measurements of a collection of pencils)
- Scaled graphs (bar or picture graph in which the scale uses units with a value greater than 1)

## Familiar Terms and Symbols

- Bar graph (graph generated from categorical data with bars to represent a quantity)
- Data (information)
- Fraction (numerical quantity that is not a whole number, e.g.,  $\frac{1}{3}$ )
- Line plot (display of data on a horizontal line)
- Picture graph (graph generated from categorical data with graphics to represent a quantity)
- Scale (a number line used to indicate the various quantities represented in a bar graph)
- Survey (collecting data by asking a question and recording responses)

## Suggested Tools and Representations

- Bar graph
- Grid paper
- Line plot
- Picture graph
- Rulers (measuring in inches, half inches, and quarter inches)
- Sentence strips
- Tape diagram

# Grade 3 Module 6 Topic A

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## Generate and Analyze

### Categorical Data

#### Focus Standard:

- 3.MD.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step “how many more” and “how many less” problems using information presented in scaled bar graphs. *For example, draw a bar graph in which each square in the bar graph might represent 5 pets.*

#### Instructional Days Recommended: 4

Drawing on prior knowledge from Grade 2, students generate categorical data from community-building activities. In Lesson 1, they organize the data and then represent them in a variety of ways (e.g., tally marks, graphs with one-to-one correspondence, or tables). By the end of the lesson, students show data as picture graphs where each picture has a value greater than 1.

Students rotate tape diagrams vertically in Lesson 2. These rotated tape diagrams with units of values other than 1 help transition students toward creating scaled bar graphs in Lesson 3. Bar and picture graphs are introduced in Grade 2; however, Grade 3 adds the complexity that one unit—one picture or unit on the bar— can have a whole number value greater than 1. Students practice familiar skip-counting and multiplication strategies with rotated tape diagrams to bridge understanding that these same strategies can be applied to problem solving with bar graphs.

In Lesson 3, students construct the scale on the vertical axis of a bar graph. One rotated tape becomes one bar on the bar graph. As with the unit of a tape diagram, one unit of a bar graph can have a value greater than 1. Students create number lines with intervals appropriate to the data.

Lesson 4 provides an opportunity for students to analyze graphs and to solve more sophisticated one- and two-step problems, including comparison problems. This work highlights Mathematical Practice 2 as students re-contextualize their numerical work to interpret its meaning as data.

*\*The sample homework responses contained in this manual are intended to provide insight into the skills expected of students and instructional strategies used in Eureka Math.*

# Lesson 1

Objective: Generate and organize data.

## Homework Key

1. 22
2. Answer provided; 4 circles; 2 circles; 8 circles; 2 circles
  - a. Fish; lizards
  - b. 8
  - c. 2
3. 3 rectangles; 2 rectangles; 1 rectangle; 4 rectangles; 1 rectangle
  - a. 2 students
  - b. 10 students;  $5 \times 2 = 10$
  - c.  $3; 8 - 2 = 6$

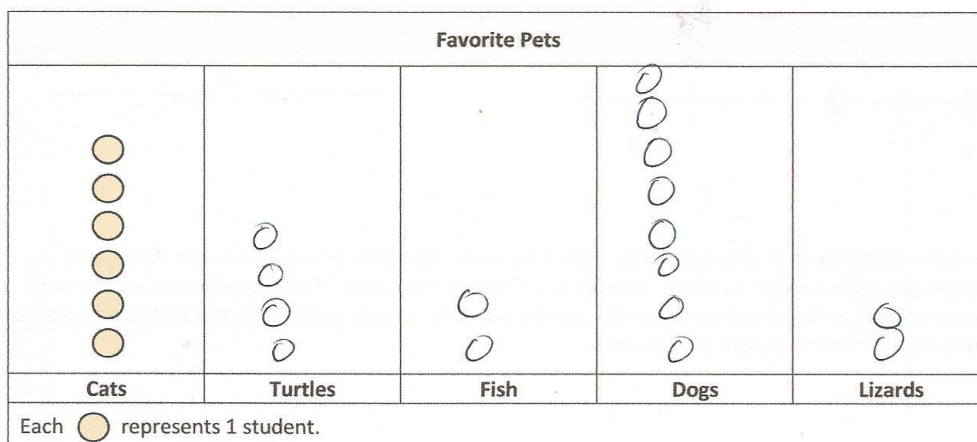
## Homework Sample

1. The tally chart below shows a survey of students' favorite pets. Each tally mark represents 1 student.

Favorite Pets	
Pets	Number of Pets
Cats	### I
Turtles	////
Fish	//
Dogs	### III
Lizards	//

The chart shows a total of 22 students.

2. Use the tally chart in Problem 1 to complete the picture graph below. The first one has been done for you.



- a. The same number of students picked fish and lizards as their favorite pet.
- b. How many students picked dogs as their favorite pet? 8
- c. How many more students chose cats than turtles as their favorite pet? 2

## Lesson 2

Objective: Rotate tape diagrams vertically.

### Homework Key

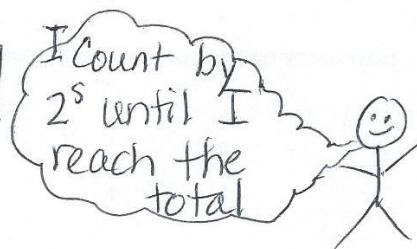
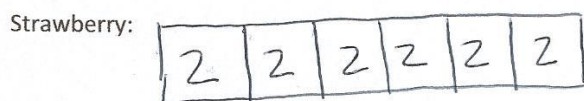
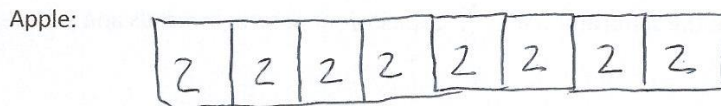
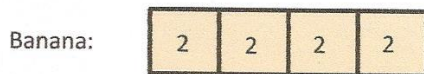
1. Answer provided; 8 units of 2 drawn; 6 units of 2 drawn; 2 units of 2 drawn
2. Answers will vary.
3.
  - a. Answer provided; 8 units of 2 drawn; 6 units of 2 drawn; 2 units of 2 drawn
  - b. Answer provided; 4 units of 4 drawn; 3 units of 4 drawn; 1 unit of 4 drawn
  - c. Answers will vary.
  - d. Answers will vary.
  - e.  $6 \times 2 = 12$
  - f.  $3 \times 4 = 12$
  - g. Number and size of units; explanations will vary.

### Homework Sample

1. Adi surveys third graders to find out their favorite fruits. The results are in the table below.

Favorite Fruits of Third Graders	
Fruit	Number of Student Votes
Banana	8
Apple	16
Strawberry	12
Peach	4

Draw units of 2 to complete the tape diagrams to show the total votes for each fruit. The first one has been done for you.





# Lesson 3

Objective: Create scaled bar graphs.

## Homework Key

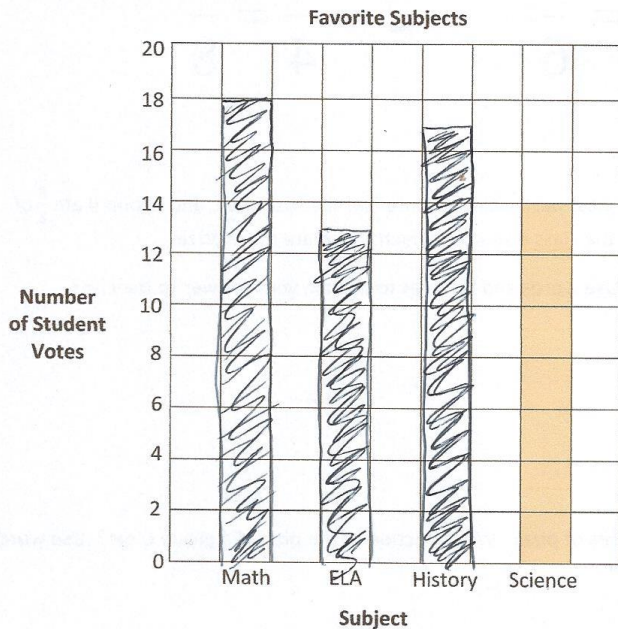
- 14
  - 4;  $18 - 14 = 4$
  - $18 + 13 = 31$  and  $17 + 14 = 31$ ; They get the same number of votes.
- Week 4; Week 3
  - 15 liters
  - $50\text{ L} + 40\text{ L} = 90\text{ L}$
  - 210 liters
  - $60 + 60 + 60 + 60 = 240$ ; More
- Week 1: 55 liters; Week 2: 50 liters; Week 3: 40 liters; Week 4: 65 liters

## Homework Sample

- This table shows the favorite subjects of third graders at Cayuga Elementary.

Favorite Subjects	
Subject	Number of Student Votes
Math	18
ELA	13
History	17
Science	?

Use the table to color the bar graph.



- How many students voted for science? 14
- How many more students voted for math than for science? Write a number sentence to show your thinking.  $4$   $14 + 4 = 18$
- Which gets more votes, math and ELA together or history and science together? Show your work.

$$18 + 13 = 31$$

$$17 + 14 = 31$$

They are equal.

# Lesson 4

Objective: Solve one- and two-step problems involving graphs.

## Homework Key

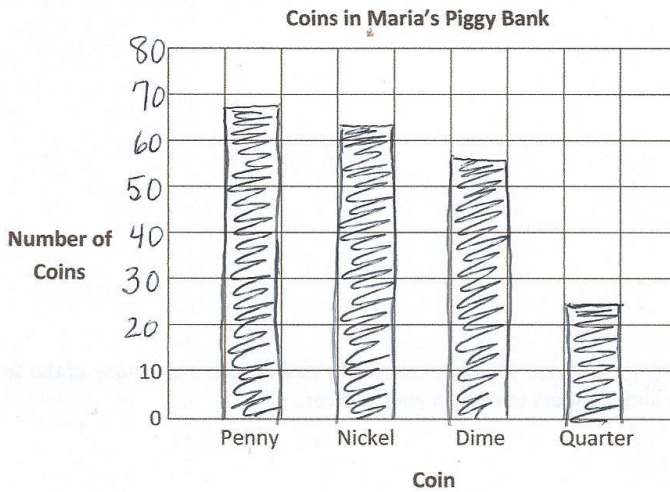
1. 68; 62; 57; 24
  - a. Bar graph drawn correctly with scale labeled appropriately by 10
  - b. 11
  - c. 171; work shown correctly
2.
  - a. 5
  - b. \$118
  - c. 11

## Homework Sample

1. Maria counts the coins in her piggy bank and records the results in the tally chart below. Use the tally marks to find the total number of each coin.

Coins in Maria's Piggy Bank		
Coin	Tally	Number of Coins
Penny	### ### ### ### ### ### ### ### ### ### ### ### ### III	68
Nickel	### ### ### ### ### ### ### ### ### ### ### ### II	62
Dime	### ### ### ### ### ### ### ### ### ### ### II	57
Quarter	### ### ### ### IIII	24

- a. Use the tally chart to complete the bar graph below. The scale is given.



- b. How many more pennies are there than dimes? *There are 11 more pennies than dimes.*

- c. Maria donates 10 of each type of coin to charity. How many total coins does she have left? Show your work. *58 + 52 + 47 + 14 = 171 coins will be left.*

# Grade 3 Module 6 Topic B

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## Generate and Analyze Measurement Data

### Focus Standard:

- 3.MD.4 Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters.

### Instructional Days Recommended: 5

In Lesson 5, students use the method of partitioning a whole into equally spaced increments using the number line as a measurement tool (Module 5, Lesson 30) to partition a six-inch strip into 6 equal increments. They repeat the process by partitioning the same strip into 12 equal increments and determine that it shows half-inch intervals. Finally, students partition the strip into 24 equal increments to determine that they have created quarter-inch intervals. The three measurements on the paper strip respectively measure in whole inch, half-inch, and quarter-inch measurements.

Students use their paper strip as a ruler to measure pre-cut straws that are less than six inches long. As they measure, they make predictions about which of their measurements gives the most accurate data, eventually concluding that it is typically the quarter-inch measurement.

Lesson 6 reintroduces the line plot as a tool for displaying measurement data. While students are familiar with line plots from Grade 2, using fractional values on the line plot is a new concept in this lesson. To prepare students for creating their own line plots in Lessons 7 and 8, Lesson 6 builds foundational experience with representations given in fractional intervals. Students understand the conventions of line plots with fractions and learn to interpret data from them.

In Lessons 7 and 8, students apply the conventions of constructing line plots with fractions to display measurement data. They learn how to represent data when the data set has values of mixed units (i.e., double-digit whole numbers and a fraction). The process of representing their data on line plots naturally evokes student observations about the distribution of the data and leads to solving comparative problems.

In Lesson 9, students analyze both categorical and measurement data to solve problems. Students also explore the functions of different representations—graphs, charts, and line plots—and discuss the appropriateness of each type of representation for different types of data.

This is a perfect opportunity to take advantage of measuring for science-related purposes. For example, if students are germinating and growing bean plants, they may start by measuring the bean seed and then take regular measurements of the plant as it grows. Students might also collect objects from the playground, such as leaves from the same tree or blades of grass. They could talk about why someone might want to measure these objects (e.g., to analyze the health of the tree).

*\*The sample homework responses contained in this manual are intended to provide insight into the skills expected of students and instructional strategies used in Eureka Math.*

## Lesson 5

Objective: Create ruler with 1-inch,  $\frac{1}{2}$  inch and  $\frac{1}{4}$  inch intervals, and generate measurement data.

### Homework Key

- Red pencil;  $6\frac{3}{4}$
  - Green pencil; explanations will vary.
- Whole and half inches labeled on paper strip
  - 2; 4; 2; 1
- Explanations will vary.

### Homework Sample

- Travis measured 5 different-colored pencils to the nearest inch,  $\frac{1}{2}$  inch, and  $\frac{1}{4}$  inch. He records the measurements in the chart below. He draws a star next to measurements that are exact.

Colored Pencil	Measured to the nearest inch	Measured to the nearest $\frac{1}{2}$ inch	Measured to the nearest $\frac{1}{4}$ inch
Red	7	$6\frac{1}{2}$	$6\frac{3}{4}$
Blue	5	5	$5\frac{1}{4}$
Yellow	6	$5\frac{1}{2}$ ★	$5\frac{1}{2}$ ★
Purple	5	$4\frac{1}{2}$	$4\frac{3}{4}$
Green	2	3	$1\frac{3}{4}$

- a. Which colored pencil is the longest? The red pencil is longest.  
It measures  $6\frac{3}{4}$  inches.

- b. Look carefully at Travis's data. Which colored pencil most likely needs to be measured again? Explain how you know. The green pencil because 3 is too much if the pencil was about  $1\frac{3}{4}$  inches long.

## Lesson 6

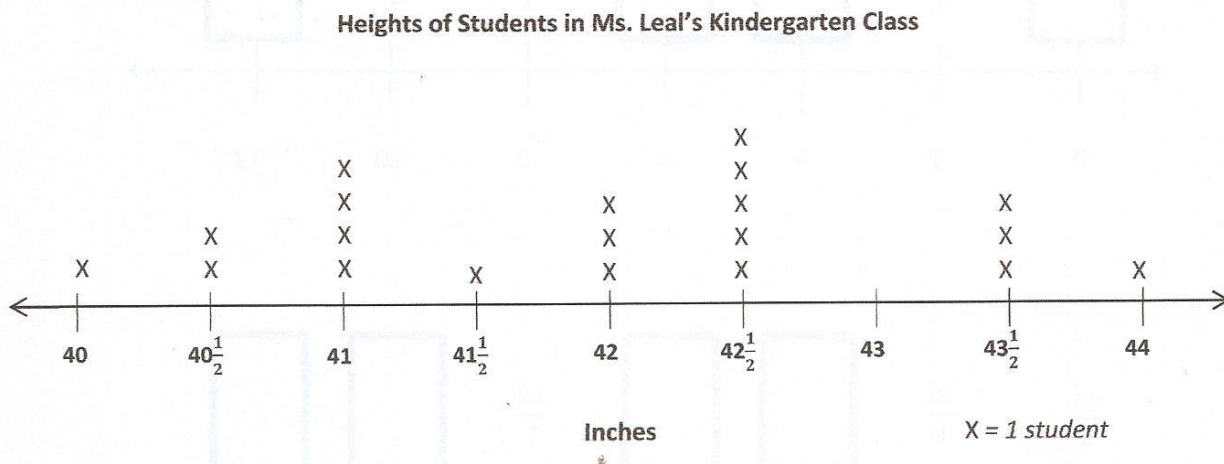
Objective: Interpret measurement data from various line plots.

### Homework Key

- 4
  - 20; explanations will vary.
  - 9
  - 9
- 24, explanations will vary.
  - No, explanations will vary.
  - Yes, explanations will vary.

### Homework Sample

- Ms. Leal measures the heights of the students in her kindergarten class. The heights are shown on the line plot below.



- How many students in Ms. Leal's class are exactly 41 inches tall? *4 students are 41" tall.*
- How many students are in Ms. Leal's class? How do you know? *20 because I counted the X's.*
- How many students in Ms. Leal's class are more than 42 inches tall? *9 students are more than 42" tall.*
- Ms. Leal says that for the class picture students in the back row must be at least  $42\frac{1}{2}$  inches tall. How many students should be in the back row? *9 students will be in the back row.*

# Lesson 7 - 8

Objective: Represent measurement data with line plots.

## Homework Key (7)

- a. Line plot completed; Heights of Buildings; inches; values for X may vary
- b. 2
- c. 7
- d. 25; explanations will vary.
- e. No; explanations will vary.

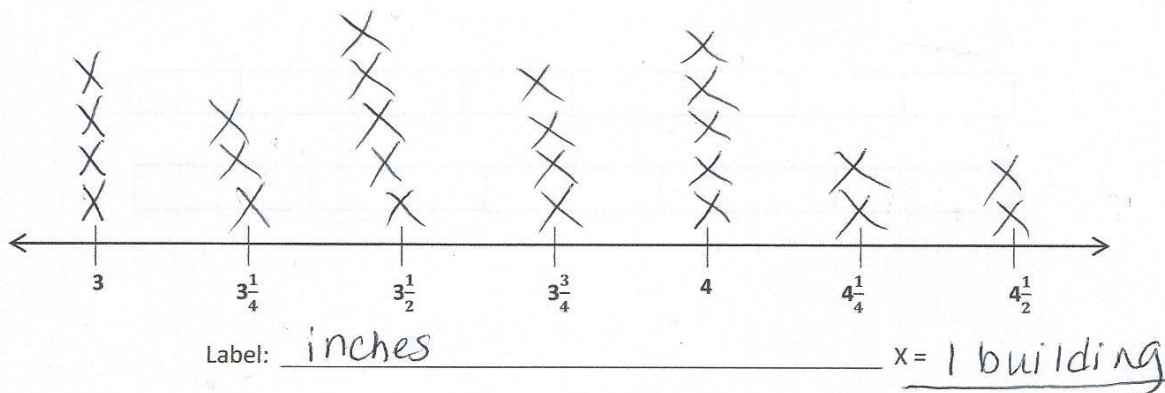
## Homework Sample

Mrs. Felter's students build a model of their school's neighborhood out of blocks. The students measure the heights of the buildings to the nearest  $\frac{1}{4}$  inch and record the measurements as shown below.

Heights of Buildings (in Inches)				
<del><math>3\frac{1}{4}</math></del>	<del><math>3\frac{3}{4}</math></del>	<del><math>4\frac{1}{4}</math></del>	<del><math>4\frac{1}{2}</math></del>	<del><math>3\frac{1}{2}</math></del>
<del>4</del>	<del>3</del>	<del><math>3\frac{3}{4}</math></del>	<del>3</del>	<del><math>4\frac{1}{2}</math></del>
<del>3</del>	<del><math>3\frac{1}{2}</math></del>	<del><math>3\frac{3}{4}</math></del>	<del><math>3\frac{1}{2}</math></del>	<del>4</del>
<del><math>3\frac{1}{2}</math></del>	<del><math>3\frac{1}{4}</math></del>	<del><math>3\frac{1}{2}</math></del>	<del>4</del>	<del><math>3\frac{3}{4}</math></del>
<del>3</del>	<del><math>4\frac{1}{4}</math></del>	<del>4</del>	<del><math>3\frac{1}{4}</math></del>	<del>4</del>

a. Use the data to complete the line plot below.

Title: Heights of Buildings (in inches)



# Lesson 8

## Homework Key

- a. Line plot completed; Distance Traveled; inches; values for X may vary
- b. Answers will vary.
- c. 2
- d. Explanations will vary.

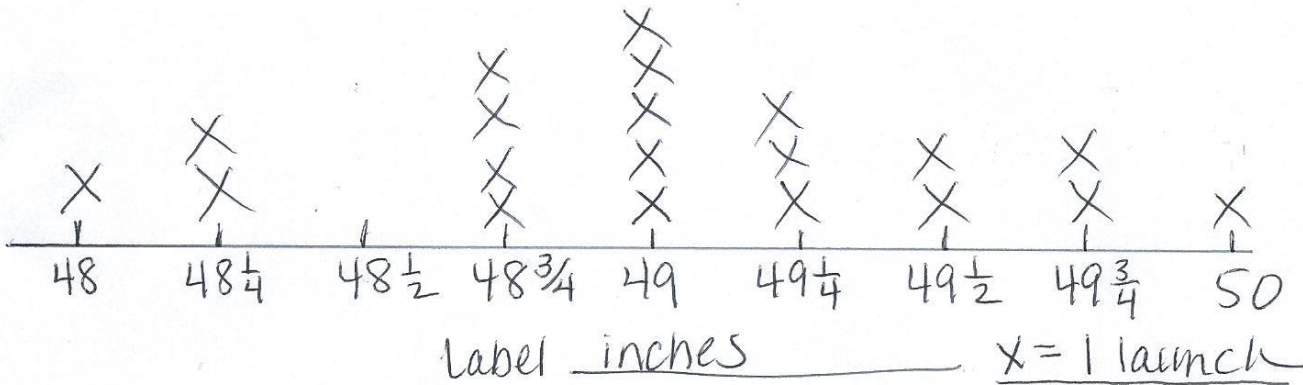
## Homework Sample

Mrs. Leah's class uses what they learned about simple machines to build marshmallow launchers. They record the distances their marshmallows travel in the chart below.

Distance Traveled (in Inches)				
<del><math>48\frac{3}{4}</math></del>	<del>49</del>	<del><math>49\frac{1}{4}</math></del>	<del>50</del>	<del><math>49\frac{3}{4}</math></del>
<del><math>49\frac{1}{2}</math></del>	<del><math>48\frac{1}{4}</math></del>	<del><math>49\frac{1}{2}</math></del>	<del><math>48\frac{3}{4}</math></del>	<del>49</del>
<del><math>49\frac{1}{4}</math></del>	<del><math>49\frac{3}{4}</math></del>	<del>48</del>	<del><math>49\frac{1}{4}</math></del>	<del><math>48\frac{1}{4}</math></del>
<del>49</del>	<del><math>48\frac{3}{4}</math></del>	<del>49</del>	<del>49</del>	<del><math>48\frac{3}{4}</math></del>

- a. Use the data to create a line plot below.

### Distance Traveled





# Lesson 9

Objective: Analyze data to problem solve.

## Homework Key

1. Picture graph completed; scale drawn
2. a. \$90  
b. \$36  
c. 7  
d. \$12

## Homework Sample

1. The table below shows the amount of money Danielle saves for four months.

Month	Money Saved
January	\$9
February	\$18
March	\$36
April	\$27

Create a picture graph below using the data in the table.

