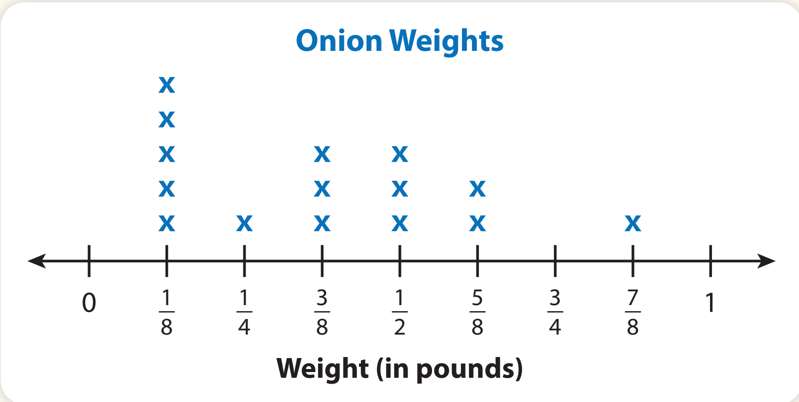
Make Line Plots and Interpret Data

LESSON 27

Dear Family,

This week your child is learning about line plots and about how to interpret data on line plots.

A **line plot** is a data display that shows data as marks above a number line. A line plot is useful for showing how data are grouped. The line plot below shows the weights of onions. Each onion is represented by an X on the line plot. Xs that are one above another represent onions that have the same weight. Weights are labeled beneath the number line.



The line plot shows how the data are grouped. You can describe the data by looking at the line plot. Most pieces of data on this line plot are grouped between $\frac{1}{8}$ and $\frac{1}{2}$.

You can also do mathematical operations with the data values to describe the data. For example, you can find the difference between the heaviest and lightest onions. The weights vary from $\frac{1}{8}$ pound to $\frac{7}{8}$ pound. The difference is $\frac{6}{8}$, or $\frac{3}{4}$, pound.

Using line plots can help your child ask and answer complex questions about data.

Invite your child to share what he or she knows about making line plots and interpreting data by doing the following activity together.

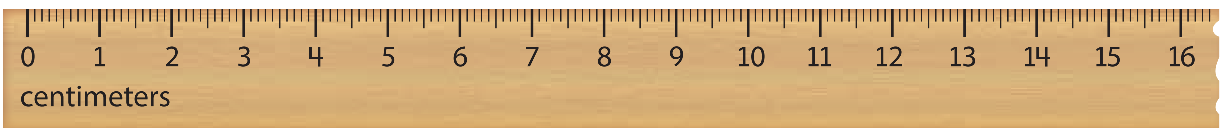
ACTIVITY MAKING A LINE PLOT

Do this activity with your child to make line plots and interpret data.

Materials centimeter ruler

Work with your child to make a line plot of the lengths of book covers.

- Gather several books. Measure the length of the cover of each book. Measure to the nearest centimeter. Use your own centimeter ruler or cut out and use the centimeter ruler below.
- Make a list of the lengths and use the data to make a line plot.
  - Use the number line below. Title the line plot "Lengths of Book Covers" and write the label "Length (in centimeters)" beneath the number line.
  - Decide what scale to use based on the measurements you collect. Then mark Xs to show the data.
- Describe how the data shown on the line plot are grouped.
- Do mathematical operations with the data values to describe the data. For example, find the difference between the length of the longest book cover and the length of the shortest book cover.



Explore Making Line Plots and Interpreting Data

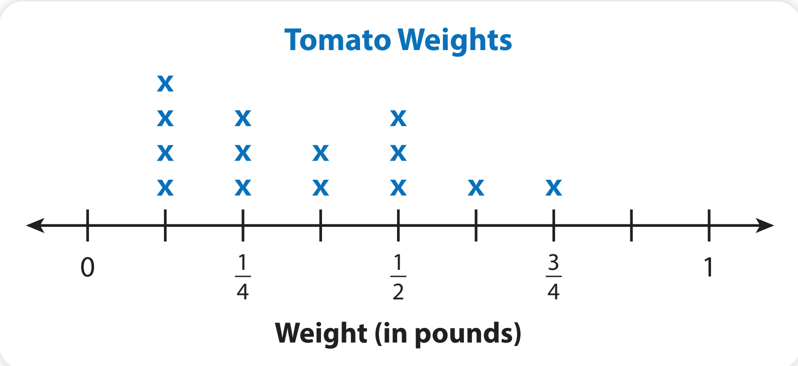
You have made and used line plots before. Now you will make line plots and use them to answer more complex questions about data. Use what you know to try to solve the problem below.

Learning Target

- Make a line plot to display a data set of measurements in fractions of a unit $\left(\frac{1}{2}, \frac{1}{4}, \frac{1}{8}\right)$. Use operations on fractions for this grade to solve problems involving information presented in line plots.

SMP 1, 2, 3, 4, 5, 6

Mrs. May's class weighs tomatoes of different sizes and types. They weigh each tomato to the nearest $\frac{1}{8}$ pound. The results are shown in the line plot below. What is the difference between the weights of the heaviest tomato and the lightest tomato?



TRY IT

Math Toolkit

- fraction tiles
- fraction circles
- fraction bars
- number lines

DISCUSS IT

Ask your partner: Why did you choose that strategy?

Tell your partner: I knew . . . so I . . .

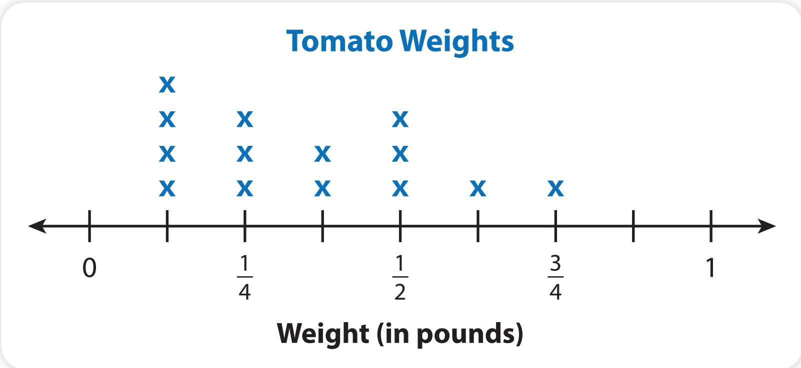
CONNECT IT

1 LOOK BACK

What is the difference between the weights of the heaviest tomato and the lightest tomato? Explain how you know.

2 LOOK AHEAD

Graphing data on a line plot helps you get a "picture" of the data and how the data are spread out or grouped.



a. The scale of a line plot is the value represented by the distance between one tick mark and the next on the number line.

Counting up, how many tick marks does it take to get from 0 to 1? ....

What fraction of the whole is the distance between tick marks? ....

So, the scale is .... pound.

b. How many data values are recorded on the line plot? Explain how you know.

c. What do the four Xs above $\frac{1}{8}$ represent?

3 REFLECT

If the scale of the line plot is $\frac{1}{8}$, why are the numbers $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, and 1 on the line plot?

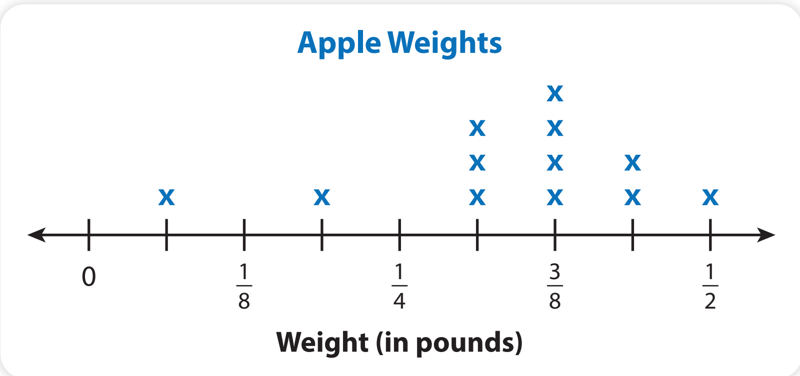
....

Prepare for Making Line Plots and Interpreting Data

1 Think about what you know about line plots. Fill in each box. Use words, numbers, and pictures. Show as many ideas as you can.

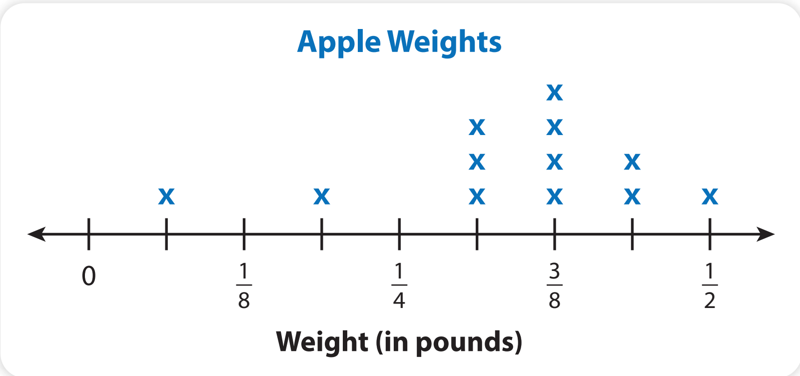
Word	In My Own Words	Example
line plot		
scale		
data		

2 Look at the line plot. What is the scale? How do you know?



3 Solve the problem. Show your work.

Mr. Lee's class weighs apples of different sizes and types. They weigh each apple to the nearest $\frac{1}{16}$ pound. The results are shown in the line plot below. What is the difference between the weights of the heaviest apple and the lightest apple?



Solution ....

4 Check your answer. Show your work.

Develop Making a Line Plot

Read and try to solve the problem below.

Keira bought 12 different types of stickers to decorate her scrapbook. She measured the width, in inches, of each type of sticker and wrote down the results. Make a line plot to organize and display Keira's data.

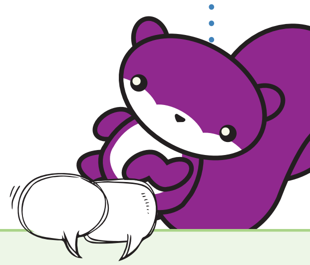
Sticker Widths (in inches)

$\frac{1}{4}$	$\frac{3}{4}$	$\frac{3}{8}$
$\frac{3}{4}$	$\frac{1}{4}$	$\frac{5}{8}$
$\frac{1}{8}$	$\frac{1}{2}$	$\frac{1}{2}$
$\frac{1}{2}$	1	1

TRY IT

Math Toolkit

- fraction tiles or circles
- fraction bars
- number lines
- rulers
- sticky notes



DISCUSS IT

Ask your partner: How did you get started?

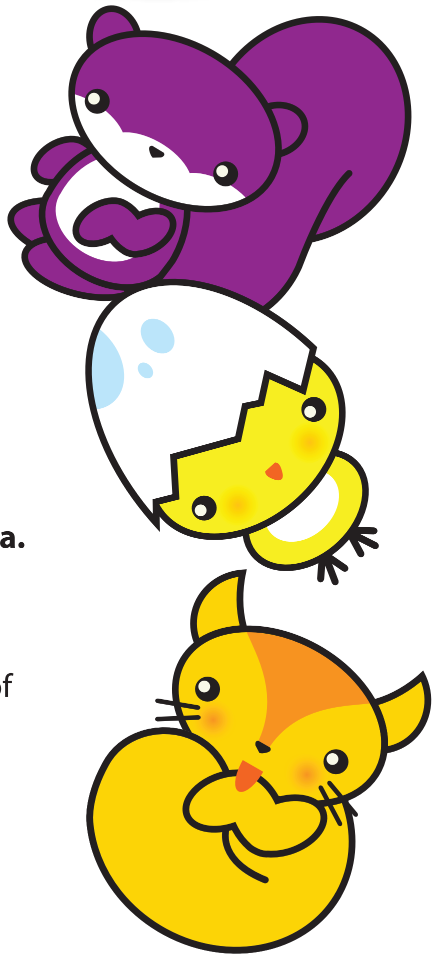
Tell your partner: I started by . . .

Explore different ways to understand making a line plot.

Keira bought 12 different types of stickers to decorate her scrapbook. She measured the width, in inches, of each type of sticker and wrote down the results. Make a line plot to organize and display Keira's data.

Sticker Widths (in inches)

$\frac{1}{4}$	$\frac{3}{4}$	$\frac{3}{8}$
$\frac{3}{4}$	$\frac{1}{4}$	$\frac{5}{8}$
$\frac{1}{8}$	$\frac{1}{2}$	$\frac{1}{2}$
$\frac{1}{2}$	1	1



MODEL IT

List what you know and plan how to make the line plot.

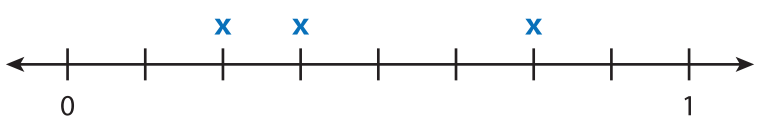
- The fractions are in eighths, fourths, and halves.
- The narrowest sticker is $\frac{1}{8}$ inch. The widest sticker is 1 inch.
- The line plot will start at 0 and go up to 1 inch.
- The line plot will show an X for each of the 12 stickers.
- The line plot will have a title and scale label.

MODEL IT

Use your plan to start labeling and marking the line plot to display the data.

Draw a number line from 0 to 1. Choose an appropriate scale for the data.

Graph each data value. The line plot below shows the first row from Keira's list of sticker widths.



CONNECT IT

Now you will use the problem from the previous page to help you understand how to make a line plot.

1. Look at the first **Model It**. Why is it a good plan to go from 0 up to 1 inch for the line plot?

2. What scale is used for the line plot in the second **Model It**? Explain.

3. Why does this scale make sense for the data?

4. The tick marks in the second **Model It** are not labeled with fractions. Do they have to be? How can you locate data points with Xs when the tick marks are not labeled with numbers?

5. Complete the line plot in the second **Model It**. Include the rest of the data, a title above the line plot, and a label for the scale below the line plot.

6. How do you use a line plot to organize measurement data?

7. ## REFLECT

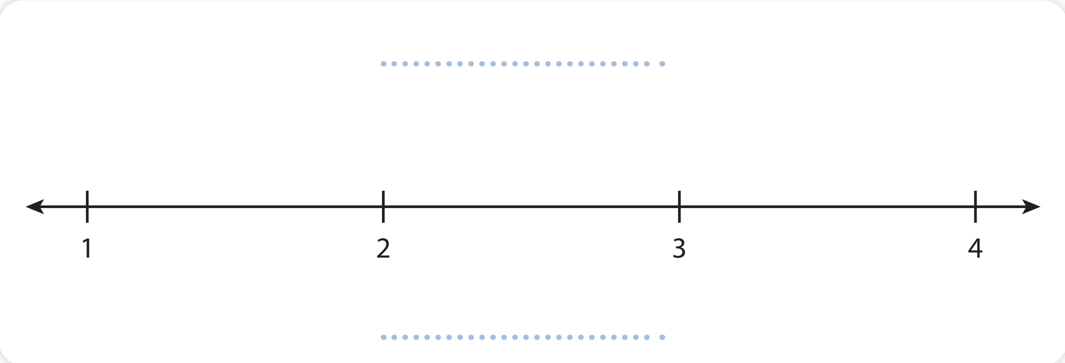
   Look back at your **Try It**, strategies by classmates, and **Model Its**. Which models or strategies do you like best for making line plots? Explain.

APPLY IT

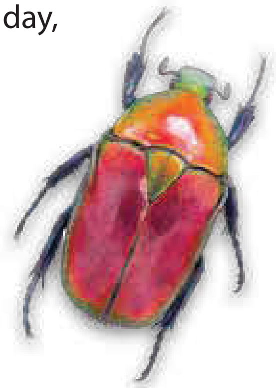
Use what you just learned to solve these problems.

8 Shawn records the lengths in inches of several bugs he collects for a science project. Complete the line plot of the data.

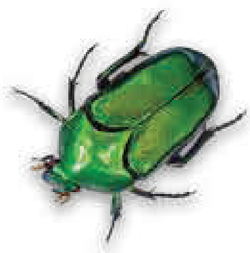
$1\frac{5}{8}$, $3\frac{1}{4}$, $1\frac{3}{4}$, $2\frac{7}{8}$, $1\frac{3}{4}$, $3\frac{1}{4}$, $1\frac{5}{8}$, $2\frac{3}{8}$, 1, $1\frac{3}{4}$



9 Dolores trains for a 5-mile race. She keeps track of the distances she runs each day, in miles, in a training log. Use the data to make a line plot. Show your work.



Distance Run Each Day (miles)							
	Mon	**Tues**	**Wed**	**Thurs**	**Fri**	**Sat**	**Sun**
Week 1	$7\frac{1}{4}$	5	$6\frac{1}{2}$	$5\frac{1}{2}$	5	7	6
Week 2	$4\frac{1}{4}$	$6\frac{1}{2}$	$5\frac{1}{2}$	5	$7\frac{1}{4}$	$6\frac{1}{4}$	$4\frac{3}{4}$



Practice Making Line Plots

Study the Example showing how to make a line plot. Then solve problems 1–4.

EXAMPLE

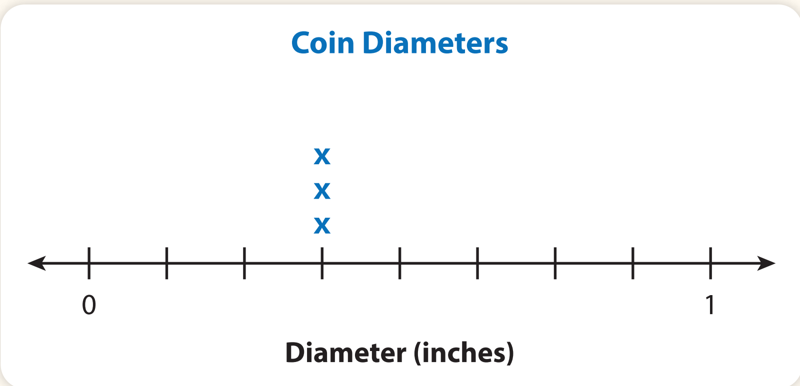
Rosa's grandfather gives her a box of old foreign coins. She measures the diameter of each coin. Then she makes a list that shows the diameters. How can Rosa show the data in a line plot?

Coin Diameters (inches)

$\frac{3}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	$\frac{5}{8}$	$\frac{3}{8}$	$\frac{3}{4}$
$\frac{7}{8}$	$\frac{7}{8}$	$\frac{5}{8}$	$\frac{7}{8}$	$\frac{3}{8}$	$\frac{7}{8}$

Begin making the line plot by marking a number line from 0 to 1 in eighths.

Make one X to stand for each coin in the table. The line plot below shows three of the 12 data values in Rosa's list.



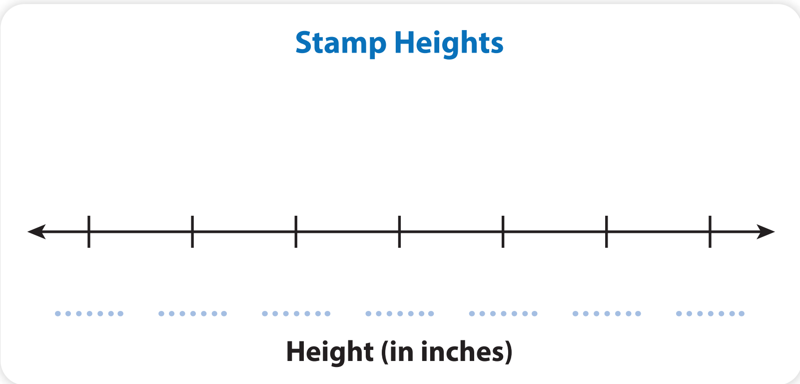
1 Which data values do the three Xs Rosa draws represent?

2 Graph the rest of the data from the list in the Example on the line plot.

3 Gabe has a collection of stamps. He records the heights of the stamps in inches.

$\frac{1}{2}$, 1, $1\frac{1}{2}$, $2\frac{1}{2}$, 3, 2, 2, $\frac{1}{2}$, 1, 1, $2\frac{1}{2}$, 2, $1\frac{1}{2}$, 1, $2\frac{1}{2}$

Complete a line plot of Gabe's data. Label each tick mark for this line plot.



4 Gabe also records the widths of some of the stamps in inches.

$\frac{3}{4}$, 1, $1\frac{1}{2}$, $1\frac{1}{4}$, $1\frac{1}{2}$, 1, $1\frac{3}{4}$, $1\frac{3}{4}$, $1\frac{1}{2}$, $\frac{1}{2}$

Make a line plot of Gabe's data.

What scale did you use to make your line plot? Explain.

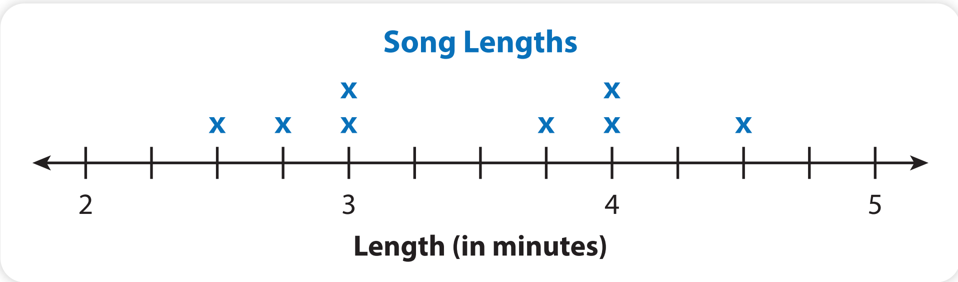
Vocabulary

scale (on a graph) the value represented by the distance between one tick mark and the next on a number line.

Develop Solving Problems Using Data in a Line Plot

Read and try to solve the problem below.

The line plot shows the lengths of songs, in minutes, on Ron's playlist.



Ron adds two new songs to his playlist. His new playlist is now 34 minutes in length. What are two possible lengths for the new songs?

TRY IT

Math Toolkit

- fraction tiles
- fraction circles
- fraction bars
- number lines

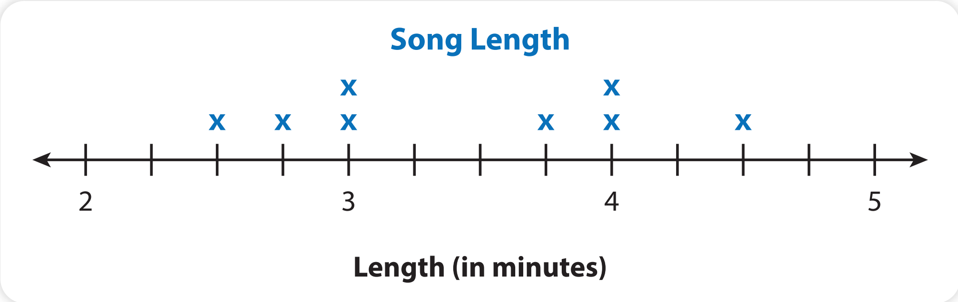
DISCUSS IT

Ask your partner: Do you agree with me? Why or why not?

Tell your partner: I disagree with this part because . . .

Explore different ways to understand solving a problem using data from the line plot.

The line plot shows the lengths of songs, in minutes, on Ron's playlist.

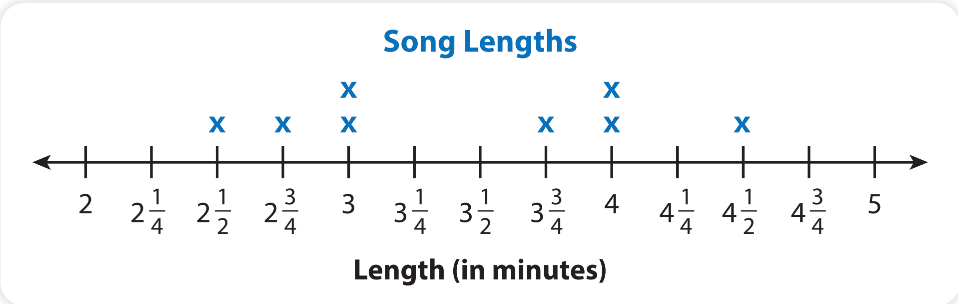


Ron adds two new songs to his playlist. His new playlist is now 34 minutes in length. What are two possible lengths for the new songs?

PICTURE IT

You can use a picture to help understand the data in the problem.

Label the tick marks in the line plot to show the song lengths.



MODEL IT

You can use equations to help understand the problem.

Write an equation to find *m*, the length in minutes of Ron's original playlist.

$$m = 2\frac{1}{2} + 2\frac{3}{4} + 3 + 3 + 3\frac{3}{4} + 4 + 4 + 4\frac{1}{2}$$

Write an equation that shows how to find the total number of minutes, *t*, that the new songs add to the length of Ron's playlist.

$$t = 34 - m$$

Find two songs that add to the number of minutes, *t*.

CONNECT IT

Now you will use the problem from the previous page to help you understand how to solve a problem using data in a line plot.

1. How many minutes, *m*, is Ron's original playlist? Explain how you know.

2. How many minutes, *t*, do the two new songs add to Ron's playlist? Explain.

3. What are two possible lengths for the new songs? Is more than one correct answer possible? Explain.

4. How did the line plot help you solve the problem?

5. How did you use operations with fractions to solve the problem?

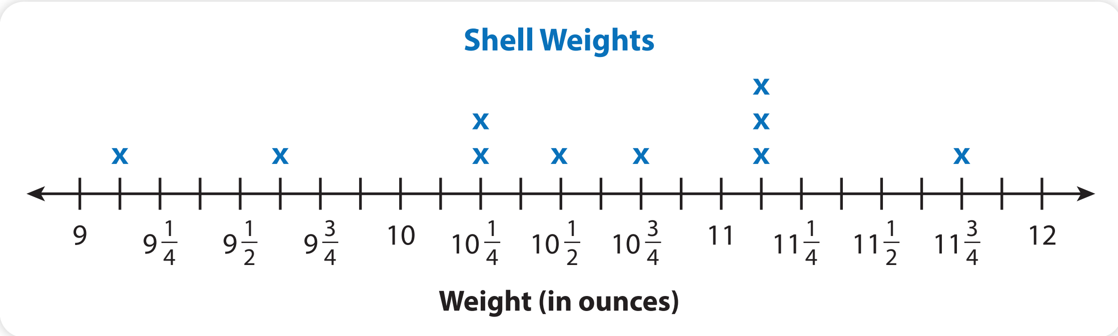
6. **REFLECT**

   Look back at your **Try It**, strategies by classmates, and **Picture It** and **Model It**. Which models or strategies do you like best for solving problems using data in a line plot? Explain.

APPLY IT

Use what you just learned to solve these problems.

Renaldo collects 10 shells at the beach and weighs each of them. He uses the line plot below to display the data.



7 What is the difference between the weights of the lightest and heaviest shells Renaldo collected? Show your work.

Solution ....

8 What is the total weight of the shells Renaldo collected that weigh less than $10\frac{1}{2}$ ounces? Show your work.

Solution ....

9 What is the total weight of the shells Renaldo collected most often?

Ⓐ $11\frac{3}{4}$ ounces

Ⓑ $22\frac{1}{4}$ ounces

Ⓒ $33\frac{3}{8}$ ounces

Ⓓ $33\frac{3}{4}$ ounces

Name: ______________________________

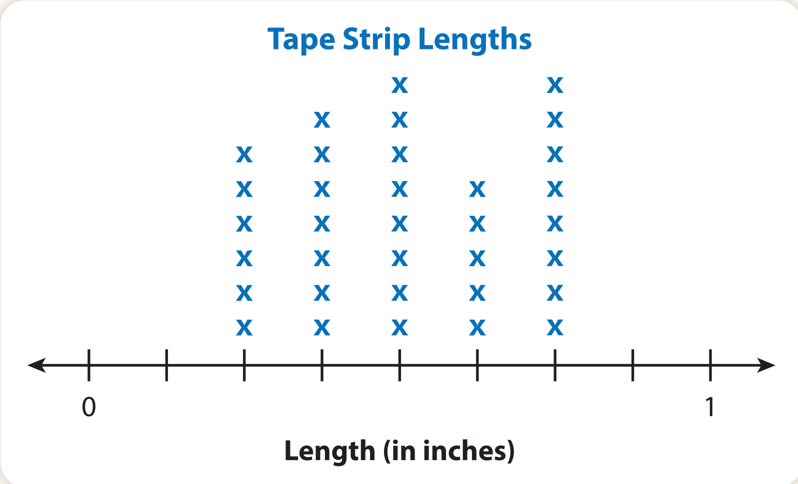
Practice Solving Problems Using Data in a Line Plot

Study the Example showing how to solve a problem using data in a line plot. Then solve problems 1–6.

EXAMPLE

Miguel has strips of colored tape that he uses to decorate his model planes. The line plot shows how many strips he has in several different lengths.

If Miguel places all of the $\frac{1}{4}$-inch strips in a row, how long is the line that he would make?



The tick marks divide the distance from 0 to 1 into eighths. The second tick mark to the right of 0 is $\frac{2}{8}$, or $\frac{1}{4}$.

There are six $\frac{1}{4}$-inch strips, and $6 \times \frac{1}{4} = \frac{6}{4}$, or $1\frac{1}{2}$. The line would be $1\frac{1}{2}$ inches long.

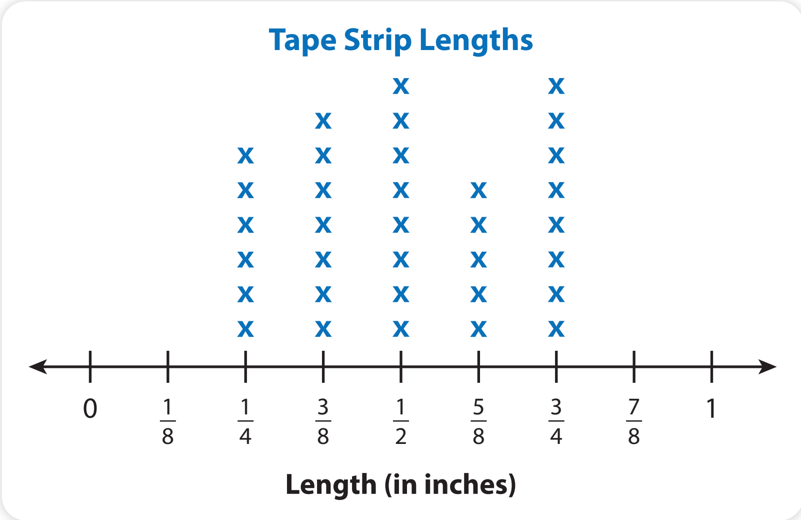
1 How long a line can Miguel make using all the $\frac{3}{8}$-inch strips? Show your work.

Solution ....

2 What is the difference in length between a line made with all the $\frac{3}{8}$-inch strips and a line made with all the $\frac{3}{4}$-inch strips? Show your work.

Solution ....

Use the data in the line plot to solve problems 3–6.



3. If Miguel uses 2 of each strip length that he has to make a line, how long would the line be? Show your work.

Solution ....

4. Miguel adds another data value so that the difference between the longest and shortest strip lengths is $\frac{3}{4}$ inch. What tape length did Miguel add? Explain.

5. If Miguel makes a line with all of the $\frac{5}{8}$-inch strips, what is the total length in inches? Show your work.

Solution ....

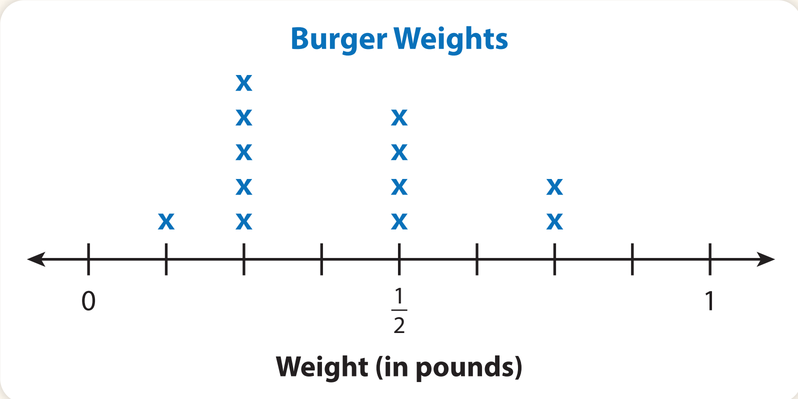
6. How could Miguel use strips of different lengths to make a 4-inch line?

Refine Making Line Plots and Interpreting Data

Complete the Example below. Then solve problems 1–7.

EXAMPLE

The line plot shows the weights of the burgers Mel made for a cookout. How many pounds of meat did she use to make all the burgers?



Look at how you could use the data in the line plot.

One $\frac{1}{8}$-lb burger: $\frac{1}{8}$

Five $\frac{1}{4}$-lb burgers: $5 \times \frac{1}{4} = 1\frac{1}{4}$

Four $\frac{1}{2}$-lb burgers: $4 \times \frac{1}{2} = 2$

Two $\frac{3}{4}$-lb burgers: $2 \times \frac{3}{4} = 1\frac{1}{2}$

Total: $\frac{1}{8} + 1\frac{1}{4} + 2 + 1\frac{1}{2}$

Solution ....

The student multiplied the number of burgers of each weight by the weight and then added the amounts to find the total.

PAIR/SHARE
Check your partner's answer using addition instead of multiplication.

APPLY IT

1 Use the line plot in the Example. Mel cuts the smallest burger in half. What is the weight of the meat in each half? Show your work.

Solution ....

What operations could you use to solve the problem?

PAIR/SHARE
Draw a picture to show how Mel cut the burger.

2 An animal doctor's scale weighs animals to the nearest $\frac{1}{4}$ pound. The list below shows the weights, in pounds, of the last 10 dogs the animal doctor saw.

$14\frac{1}{2}$, $17\frac{1}{2}$, $15\frac{1}{4}$, $17\frac{1}{4}$, $17\frac{1}{2}$, $15\frac{1}{4}$, $14\frac{1}{4}$, 16, $14\frac{3}{4}$, $15\frac{1}{4}$

Create a line plot to show the data.

How should the line plot's scale be labeled to show these data?

PAIR/SHARE
How is your line plot the same as your partner's? How is it different?

3 Look at the line plot for problem 2. Which statement about the data is true?

Ⓐ The heaviest dog is $4\frac{1}{4}$ pounds heavier than the lightest dog.

Ⓑ The three lightest dogs weigh $43\frac{1}{2}$ pounds combined.

Ⓒ The three heaviest dogs weigh $52\frac{1}{2}$ pounds combined.

Ⓓ The 16-pound dog is closer in weight to the lightest dog than to the heaviest dog.

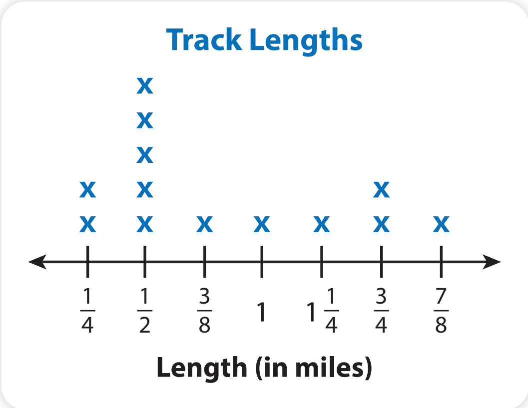
Michelle chose Ⓐ as the correct answer. How did she get that answer?

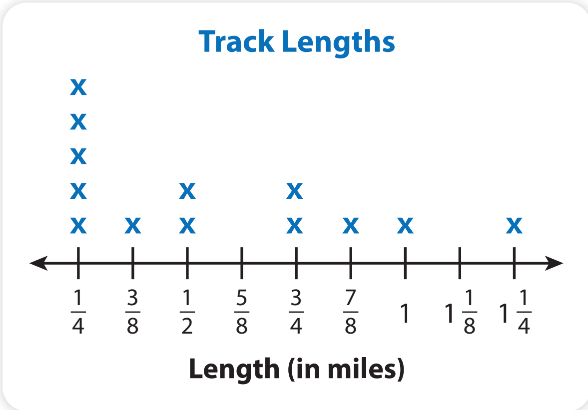
Read each statement carefully and check it against the data to see if it is true.

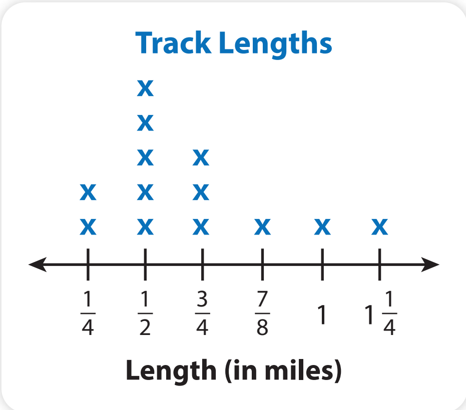
PAIR/SHARE
Does Michelle's answer make sense?

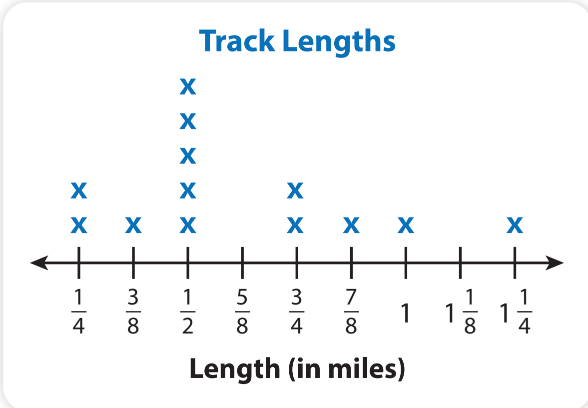
4 Juan drives a race car. The race tracks vary in length. To prepare for racing season, he records the lengths, in miles, of the tracks in the list shown below. Which line plot correctly shows the track data?

$\frac{1}{4}, \frac{1}{2}, \frac{3}{8}, \frac{1}{2}, \frac{1}{4}, \frac{1}{2}, 1, 1\frac{1}{4}, \frac{3}{4}, \frac{1}{2}, \frac{7}{8}, \frac{1}{2}, \frac{3}{4}$

Ⓐ


Ⓑ


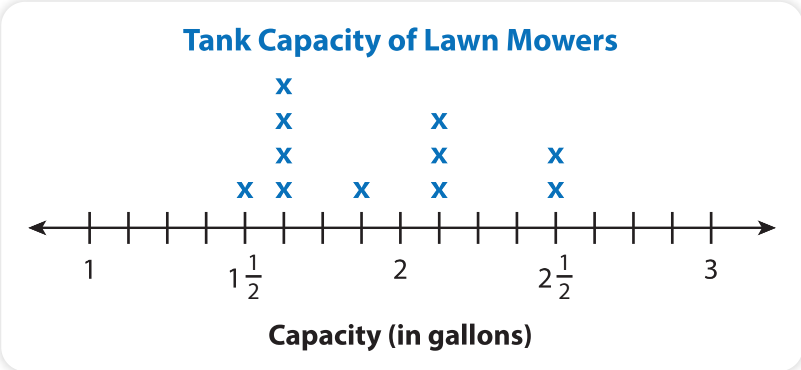
Ⓒ


Ⓓ


5 Look at the data for problem 4. Choose *True* or *False* for each statement.

	True	**False**
The longest track is 6 times the length of the shortest track.	Ⓐ	Ⓑ
The combined length of the three shortest tracks is $\frac{4}{8}$ mile.	Ⓒ	Ⓓ
The combined length of the three longest tracks is $3\frac{1}{8}$ miles.	Ⓔ	Ⓕ
Half the length of the shortest track is $\frac{1}{8}$ mile.	Ⓖ	Ⓗ

6 Sara owns Sara's Hardware. She made the line plot below to compare the fuel tank capacity of several lawn mowers she sells.



Part A What is the most common capacity of the mowers she sells? ....

Part B Marc buys the lawn mower with the smallest tank capacity. He uses 3 full tanks of gas mowing in the summer. How much fuel does he use? Show your work.

Solution ....

7 MATH JOURNAL

Jordan looks at the line plot above. He says the difference between the most common capacity and the least capacity is $\frac{1}{4}$ gallon. He says he knows the difference without subtracting. Explain Jordan's mistake. Then find the actual difference between the measurements.

SELF CHECK Go back to the Unit 4 Opener and see what you can check off.