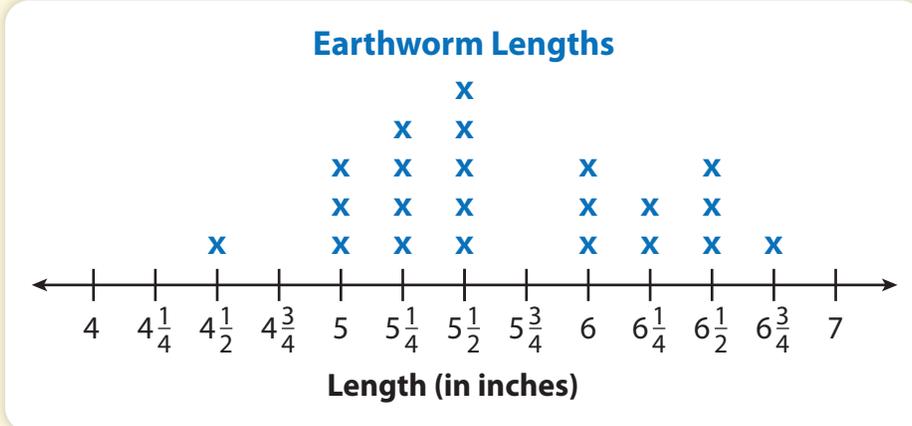




 Use What You Know

You already know how to make line plots. Now you will make line plots with fractions and use them to solve problems. Take a look at this problem.

Emma's class has a jar of earthworms in their classroom. The class measures the length of each earthworm and records the data in a line plot. What is the difference between the lengths of the shortest and the longest earthworms?



- What do the numbers below the number line represent?

- How do you know which are the longest and shortest earthworms?

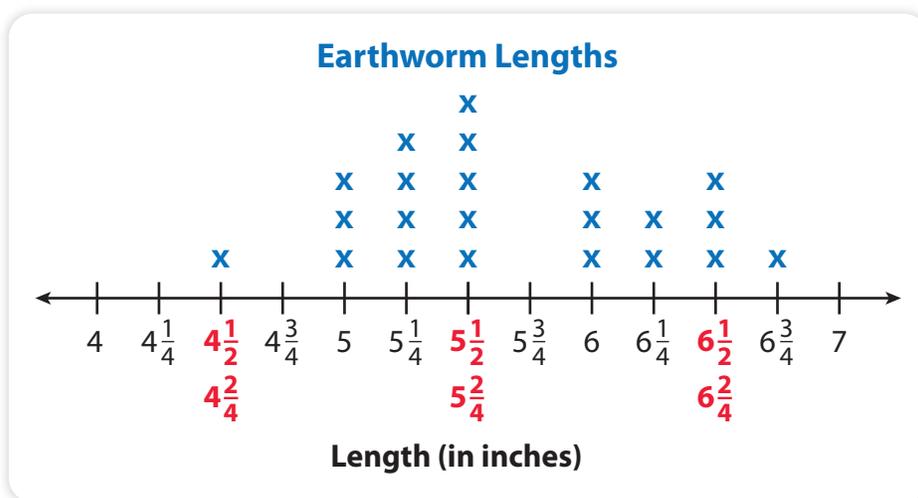
- What are the lengths of the longest and shortest earthworms?
longest earthworm _____ shortest earthworm _____
- Explain how to find the difference between the lengths of the shortest and longest earthworms. _____



Find Out More

To find the difference between the lengths of the longest and shortest earthworms on the previous page, you have to subtract $6\frac{3}{4} - 4\frac{1}{2}$. The fractions have different denominators. But, you can write equivalent fractions on the number line so that all the fractions have the same denominator.

The number line is labeled with halves and fourths. You can see that the distance between two whole numbers is divided into 4 equal sections. So, the number line can be labeled with fourths.



Now you can see that the difference between the lengths of the longest and shortest earthworms is $6\frac{3}{4} - 4\frac{2}{4}$, or $2\frac{1}{4}$ inches.

Reflect

- 1 Which is the most common length of earthworm in Emma's class? What is the difference between this length of earthworm and the length of the shortest earthworm? Explain how you found your answer.

Learn About Representing Data on a Line Plot

Read the problem below. Then explore different ways to help make a line plot.

The students in Mrs. Holbrook's class are growing plants. One day they measured the heights of the plants in inches. The heights are shown below. Make a line plot to represent the data.

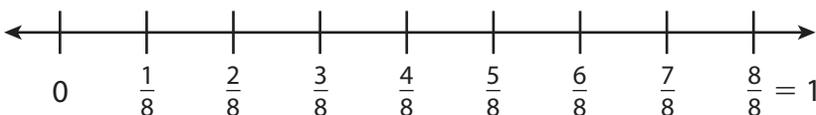
| | | | | | | | | | |
|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| $2\frac{5}{8}$ | $2\frac{1}{8}$ | $2\frac{3}{8}$ | $2\frac{7}{8}$ | 2 | $1\frac{1}{4}$ | $1\frac{1}{2}$ |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

Model It You can count by fractions to help label a number line.

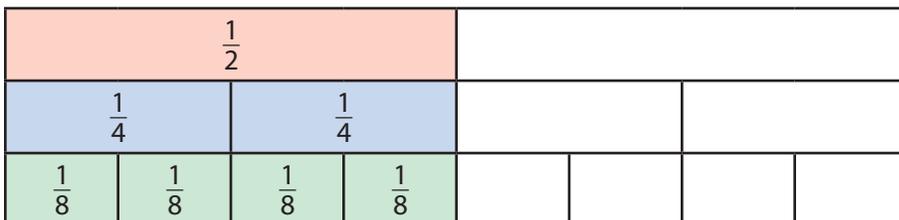
The fractions in the data are in units of $\frac{1}{2}$, $\frac{1}{4}$, and $\frac{1}{8}$. Use the smallest unit, $\frac{1}{8}$, to label the number line. Divide the number line into 8 equal sections.

Count by eighths:

1 eighth, 2 eighths, 3 eighths, 4 eighths, 5 eighths, 6 eighths, 7 eighths, 8 eighths



Picture It You can use fraction bars to find equivalent fractions.



The fraction bars show that the following fractions are equivalent:

$$\frac{1}{2} = \frac{2}{4} \text{ and } \frac{1}{2} = \frac{4}{8}$$

$$\frac{1}{4} = \frac{2}{8}$$

Connect It Now you will make a line plot to show the plant heights on the previous page.

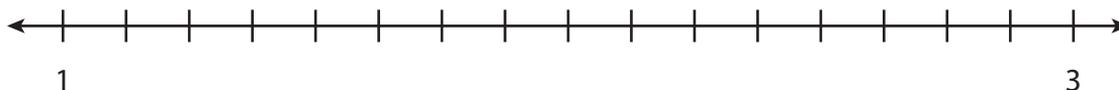
2 Use *Picture It* to help you write these fractions as eighths.

$$\frac{1}{2} = \frac{\square}{8}$$

$$\frac{1}{4} = \frac{\square}{8}$$

$$\frac{3}{4} = \frac{\square}{8}$$

3 Label the number line by eighths.



4 Use the number line in problem 3. Make a line plot of the plant heights below. Find equivalent fractions in eighths for data that include halves and fourths.

5 Describe how to make a line plot with data that include fractions.

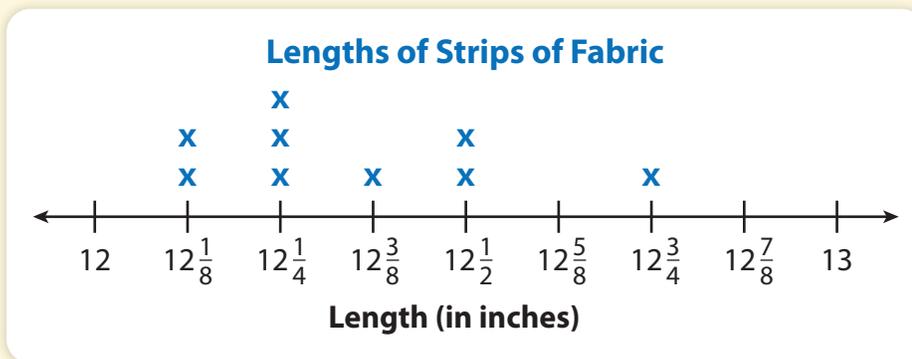
Try It Use what you just learned to solve this problem. Show your work on a separate sheet of paper.

6 Al records the length of some fish in inches: $9\frac{1}{4}$, $10\frac{1}{2}$, $10\frac{5}{8}$, $9\frac{3}{4}$, $9\frac{7}{8}$, 10, $10\frac{1}{8}$, $9\frac{3}{4}$, $10\frac{3}{8}$.
Make a line plot of the data.

Learn About  **Adding with Line Plots**

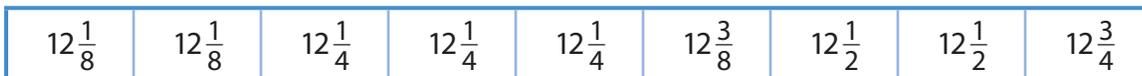
Read the problem below. Then explore different ways to solve addition problems with line plots.

Sophia is making a border for a quilt. She wants to use leftover strips of fabric that are all 2 inches wide. She measures the length of each strip and records the information in a line plot. If Sophia puts all the strips together, what will be the total length?



Picture It You can use a picture to help solve addition problems with line plots.

The picture shows the strips of fabric placed next to one another to make one long strip.



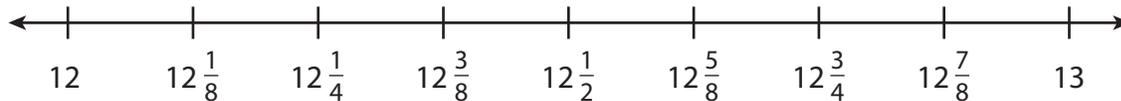
Model It You can break up the whole numbers and fractions to help you add the lengths.

Add the whole numbers first: $12 + 12 + 12 + 12 + 12 + 12 + 12 + 12 + 12$

Then add the fractions: $\frac{1}{8} + \frac{1}{8} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{3}{8} + \frac{1}{2} + \frac{1}{2} + \frac{3}{4}$

Connect It Now you will solve the problem on the previous page.

7 Write the fractions on the number line in eighths. Why should you do this?



8 Write an expression to find the total length if Sophia puts all the strips together. Write each fraction in eighths.

9 What is the sum of the whole numbers? _____ What is the sum of the fractions? _____ Write the sum of the fractions as a mixed number. _____ What is the total length of all the strips? _____

10 How do you solve a problem about adding fractions or mixed numbers in a line plot?

Try It Use what you just learned to solve these problems. Use the line plot on the previous page. Show your work on a separate sheet of paper.

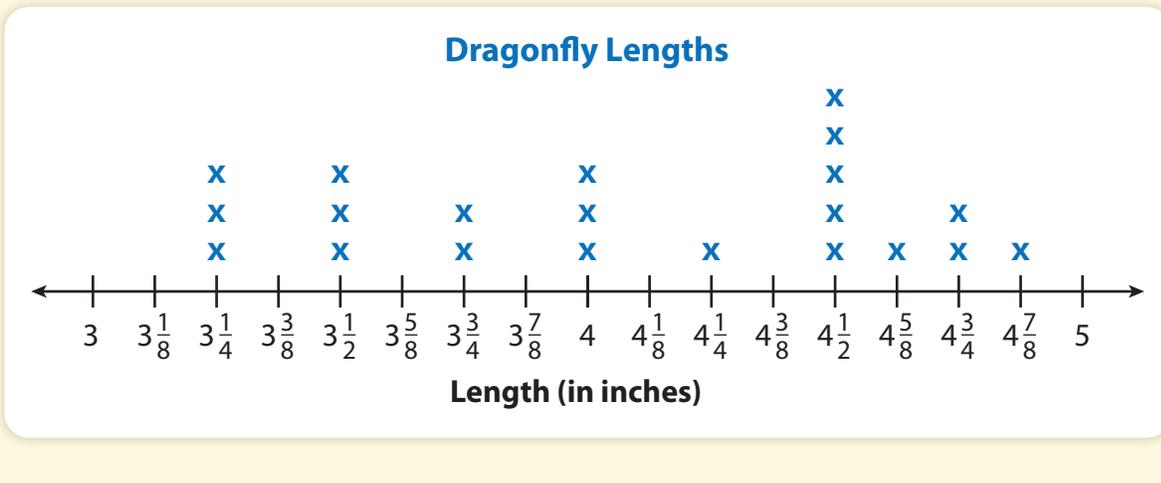
11 What is the length of all the $12\frac{1}{2}$ -inch strips combined? _____

12 What is the length of all the $12\frac{1}{4}$ -inch strips combined? _____

Learn About Subtracting with Line Plots

Read the problem below. Then explore different ways to solve subtraction problems with line plots.

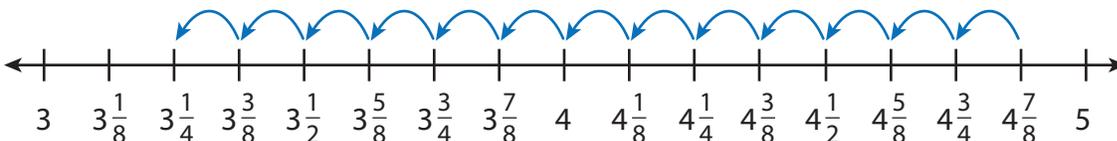
There are many kinds of dragonflies that are different in length. A scientist measured the lengths of different kinds of dragonflies and made a line plot to show the measurements. What is the difference between the lengths of the longest dragonfly and the shortest dragonfly?



 **Picture It** You can use a picture to help solve subtraction problems with line plots.

| | |
|--|------------------------------|
| Length of longest dragonfly: $4\frac{7}{8}$ in. | |
| Length of shortest dragonfly: $3\frac{1}{4}$ in. | Difference in lengths: ? in. |

 **Model It** You can use a number line to solve subtraction problems with line plots.



Connect It Now you will solve the problem on the previous page.

13 Length of the longest dragonfly: _____

Length of the shortest dragonfly: _____

14 Write an expression that can be used to find the difference between the two lengths. _____

15 Look at *Model It* on the previous page. Explain how you could use the number line with arrows to find the difference between the two lengths.

16 Describe another way to subtract the two lengths by first writing the numbers with the same denominator.

Try It Use what you just learned to solve this problem. Use the line plot on the previous page. Show your work on a separate sheet of paper.

17 What length are the greatest number of dragonflies? What is the difference between this length and the shortest length?



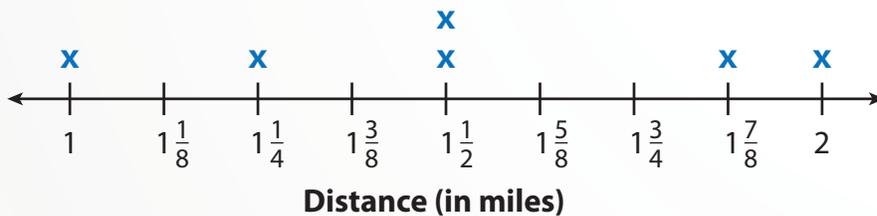
Practice Solving Problems with Line Plots

Study the example below. Then solve problems 18–20.

Example

Sue recorded the distances she ran in one week. How far did she run altogether?

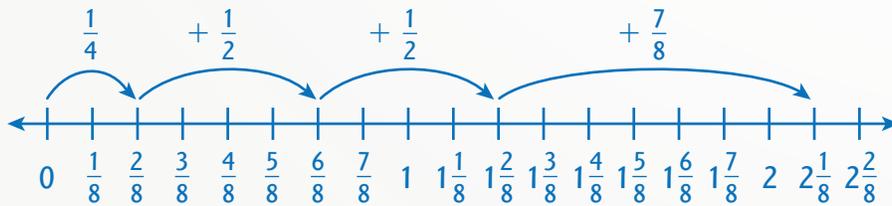
Running Distances



Look at how you could show your work using a number line.

Add the whole numbers. $1 + 1 + 1 + 1 + 1 + 2 = 7$

Make a number line divided into eighths. Use it to add the fraction parts of each mixed number: $2\frac{1}{8}$.



Solution $7 + 2\frac{1}{8} = 9\frac{1}{8}$ miles



The student uses a number line to add the fraction part of each number.

 **Pair/Share**
How else could you solve the problem?

18 A marine biologist at an aquarium records the lengths of the dolphins in feet. Make a line plot of the data shown below.

$8\frac{3}{4}, 9\frac{1}{2}, 9\frac{1}{4}, 8\frac{1}{2}, 8\frac{7}{8}, 9\frac{1}{2}, 8\frac{1}{2}, 9\frac{1}{4}, 9\frac{5}{8}, 9\frac{1}{2}$

Show your work.



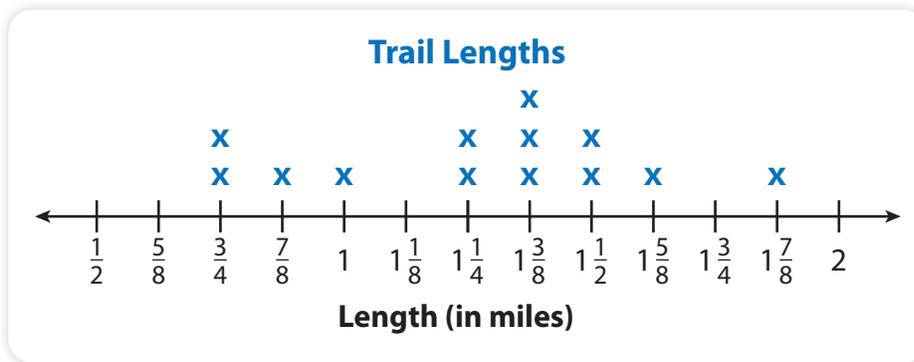
What are the shortest and longest lengths?

 **Pair/Share**
Explain the distance between tick marks.

- 19 A park has several trails of different lengths. The lengths of the trails are shown in the line plot. Ellie's family hiked all the trails that are $1\frac{3}{8}$ miles long. How far did they hike?



How many trails have a length of $1\frac{3}{8}$ miles?



Show your work.

Solution _____

Pair/Share

Describe all of the ways you can solve the problem. Which is your favorite? Why?

- 20 Use the line plot in problem 19.

What is the difference in length between the longest trail and the shortest trail? Circle the letter of the correct answer.

- A 1 mile
- B $1\frac{1}{8}$ miles
- C $1\frac{1}{2}$ miles
- D $2\frac{5}{8}$ miles

Tom chose **D** as the correct answer. How did he get that answer?



Will you add or subtract to find the difference?

Pair/Share

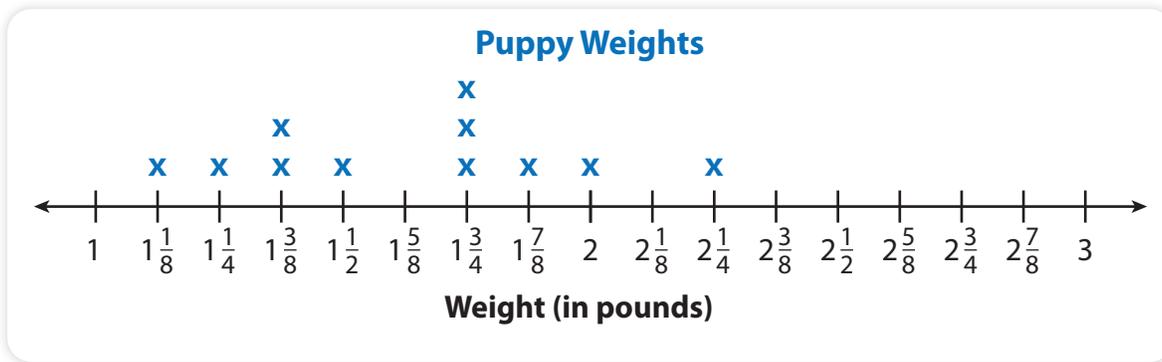
Does Tom's answer make sense?

Practice 

Solving Problems with Line Plots

Solve the problems.

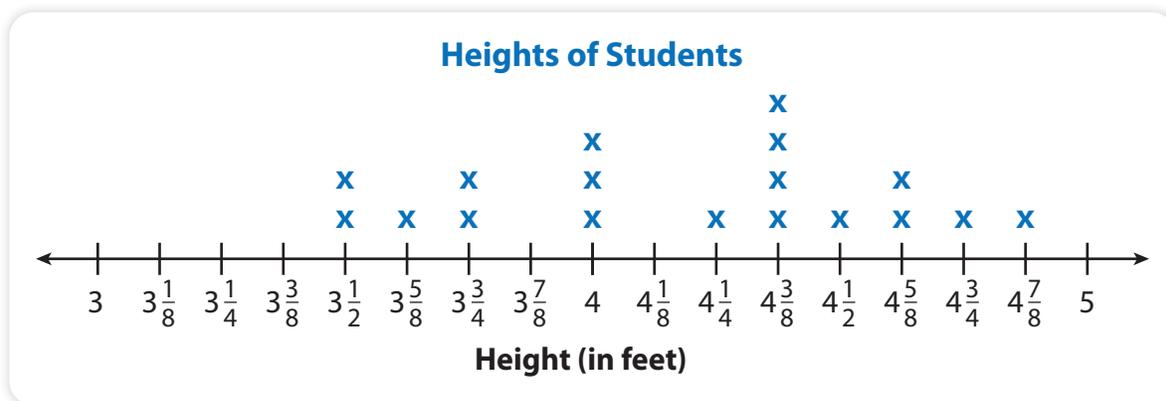
- 1** The veterinarian at an animal shelter weighs the puppies every day. One day she recorded the weights in a line plot.



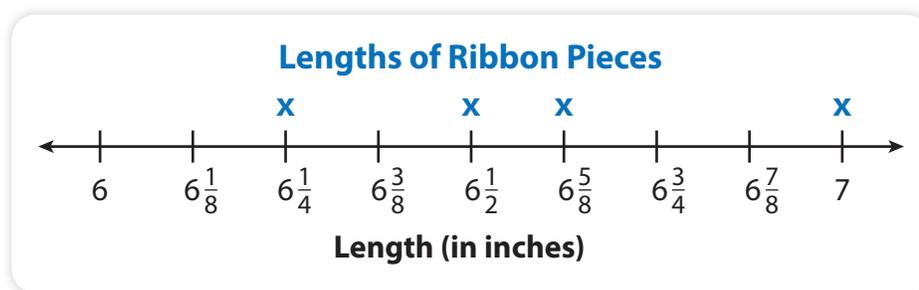
Use the line plot above to tell whether each sentence is *True* or *False*.

- a.** The difference between the two heaviest puppies is $\frac{1}{8}$ pound. True False
- b.** The combined weight of the two lightest puppies is $2\frac{2}{8}$ pounds. True False
- c.** The difference between the heaviest puppy and the lightest puppy is $1\frac{1}{8}$ pounds. True False
- 2** In the line plot from problem 1, there are three puppies that weigh the same amount. What is the combined weight of those three puppies?
-

- 3 The heights of the students in Mr. Wilson's class are shown in the line plot. What is the difference in the heights of the shortest student and the tallest student?



- A $\frac{1}{4}$ foot
 B $1\frac{1}{4}$ feet
 C $1\frac{3}{8}$ feet
 D $1\frac{3}{4}$ feet
- 4 Alexandra had a ribbon that was 50 inches long. She cut off four pieces. The line plot below shows the lengths of the pieces she cut off.



What is the total length of the four pieces?

Show your work.

Solution _____

✓ Self Check Go back and see what you can check off on the Self Check on page 249.