

Objective

Make and interpret a line plot for measurements involving fractions of units.

Common Core State Standards

- **5.MD.2** Make a line plot to display a data set of measurements in fractions of a unit ($\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$). Use operations on fractions for this grade to solve problems involving information presented in line plots. *For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally.*

Measurement and Data

Make and Use a Line Plot

Given a data set of measurements in fractions of units, students will make a line plot and use operations on fractions to solve problems involving the information given. Students will use what they have learned about making equivalent fractions and adding, subtracting, multiplying, and dividing fractions. Using concrete models will help students visualize the information so they can manipulate it.

Try It! Perform the Try It! activity on the next page.

Talk About It

Discuss the Try It! activity.

- Draw the line plot on the board. **Say:** *The second part of the question wants us to find the total amount of solution and redistribute it equally to the 10 groups.*
- **Say:** *Let's use the line plot to convert the fractions to eighths and add them.* Have students write the equation and add: $\frac{2}{8} + \frac{6}{8} + \frac{16}{8} + \frac{10}{8} + \frac{6}{8} = \frac{40}{8}$. Have students change the improper fraction to a whole number and write $\frac{40}{8} = 5$.
- **Ask:** *How much solution is left over in all? If the 5 cups of solution were redistributed equally to the 10 groups, how much would each group get?*

Solve It

With students, reread the problem. Have students draw a line plot to represent the problem and write the equation to add the data. Then have them divide the total amount by the number of groups.

More Ideas

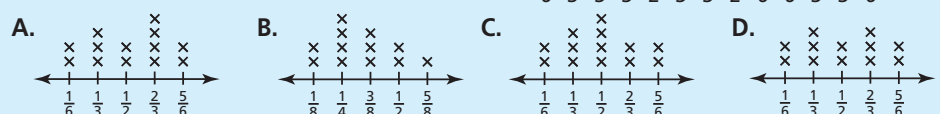
For other ways to teach about using line plots with measurements in fractions of units—

- Have students use Centimeter Cubes in place of the X's on a line plot to represent the data in the following problem: The 15 students in the Running Club each ran a fraction of a mile before school. The following are the distances they ran: $\frac{3}{10}$, $\frac{2}{5}$, $\frac{1}{2}$, $\frac{3}{5}$, $\frac{2}{5}$, $\frac{1}{2}$, $\frac{7}{10}$, $\frac{2}{5}$, $\frac{2}{5}$, $\frac{1}{2}$, $\frac{3}{5}$, $\frac{2}{5}$, $\frac{1}{2}$, $\frac{7}{10}$, and $\frac{3}{5}$. What was the average distance they ran?
- Have students use Fraction Tower® Equivalency Cubes or Cuisenaire® Rods to make a line plot of how far the fifth graders walk to school: 8 students walk $\frac{1}{8}$ mile, 6 walk $\frac{3}{8}$ mile, 7 walk $\frac{1}{4}$ mile, 7 walk $\frac{1}{2}$ mile, and 3 walk $\frac{3}{4}$ mile. How many students walk $\frac{1}{2}$ mile or less?

Formative Assessment

Have students try the following problem.

Which line plot represents the following data: $\frac{1}{6}$, $\frac{2}{3}$, $\frac{1}{3}$, $\frac{2}{3}$, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{2}{3}$, $\frac{1}{2}$, $\frac{5}{6}$, $\frac{1}{6}$, $\frac{2}{3}$, $\frac{1}{3}$, $\frac{5}{6}$?



Try It! 20 minutes | Groups of 4

Here is a problem about using line plots with measurements in fractions of units.

The fifth grade students used a saline solution in a science experiment. Afterward, each of the 10 groups had some solution left. The amounts of solution left over (in cups) were: $\frac{1}{2}$, $\frac{3}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{1}{4}$, $\frac{5}{8}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, and $\frac{1}{2}$. Make a line plot of these amounts. Then find the amount of solution each group would have if the total amount was redistributed equally.

Introduce the problem. Then have students do the activity to solve the problem. Distribute Fraction Tower Equivalency Cubes, paper, and pencils to students.

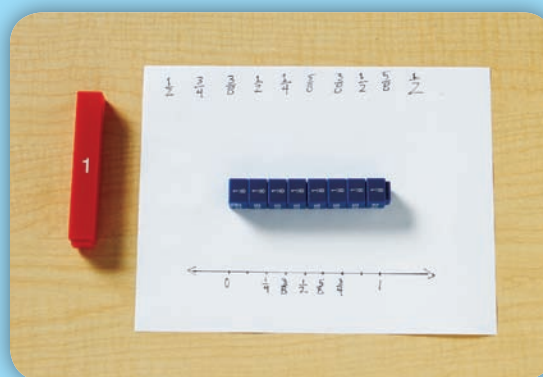
Materials

- Fraction Tower® Equivalency Cubes (1 set per group)
- paper (1 per group)
- pencils (1 per group)

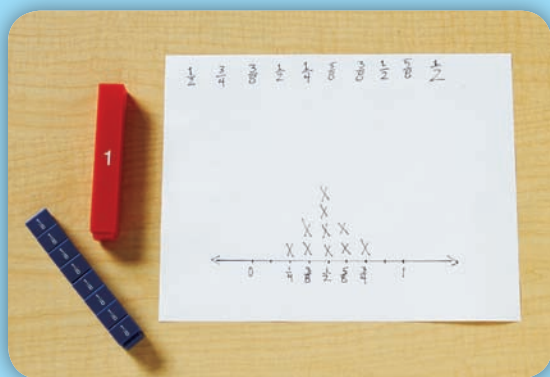


1. Say: Write the fractional amounts of solution left over on your paper. Find the common denominator of these fractions.

Ask: Which Fraction Tower shows the common denominator of these fractions?



2. Say: Lay the eighths tower horizontally and use it to draw a number line. Mark the number line with the fractional amounts of solution left over. Guide students as needed to mark $\frac{1}{4}$ at $\frac{2}{8}$, $\frac{1}{2}$ at $\frac{4}{8}$, and $\frac{3}{4}$ at $\frac{6}{8}$.



3. Say: Now plot the data. Use an X to represent each amount of solution. We have 10 fractions, so you should have 10 X's on your line plot. Guide students as necessary in marking 1 X for $\frac{1}{4}$, 2 X's for $\frac{3}{8}$, 4 X's for $\frac{1}{2}$, 2 X's for $\frac{5}{8}$, and 1 X for $\frac{3}{4}$.

Look Out!

Make sure students convert their fractions properly. Have them put the $\frac{1}{2}$ Fraction Tower and $\frac{3}{4}$ Fraction Tower next to a tower of eighths to be sure they use an equivalent fraction in eighths.

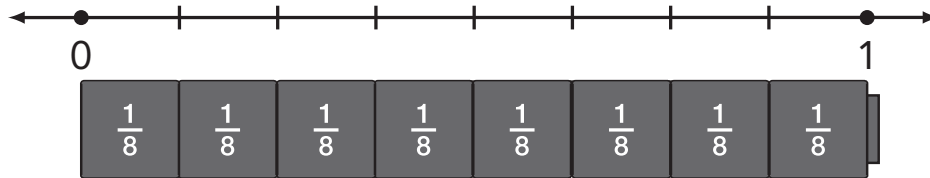


Use Fraction Towers to draw a line plot of the data.

Answer the question.

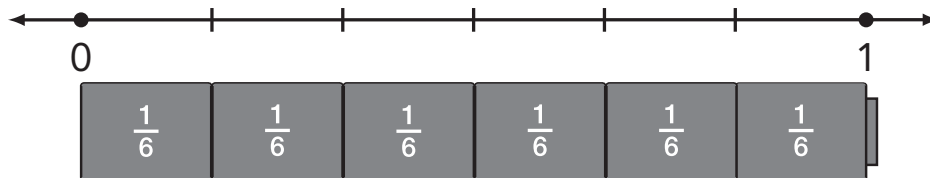
(Check students' work.)

1. Lisa is measuring pieces of ribbon in yards. They are $\frac{1}{4}$, $\frac{7}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, $\frac{5}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, and $\frac{5}{8}$. How many pieces are $\frac{1}{2}$ yard or longer?



11 pieces; Number line should be marked in eighths. Line plot should have 1 X at $\frac{1}{4}$, 4 X's at $\frac{1}{2}$, 3 X's at $\frac{5}{8}$, 3 X's at $\frac{3}{4}$, and 1 X at $\frac{7}{8}$.

2. After students finished planting their seedlings, they turned in the leftover soil. In cups, the amounts left over are $\frac{1}{3}$, $\frac{1}{2}$, $\frac{1}{6}$, $\frac{5}{6}$, $\frac{2}{3}$, $\frac{1}{2}$, $\frac{1}{6}$, $\frac{1}{3}$, $\frac{1}{2}$, $\frac{1}{6}$, $\frac{1}{3}$, $\frac{2}{3}$, $\frac{1}{3}$, $\frac{1}{2}$, and $\frac{1}{3}$. How much soil is left over?



$6\frac{1}{3}$ cups; Number line should be marked in sixths. Line plot should have 3 X's at $\frac{1}{6}$, 5 X's at $\frac{1}{3}$, 4 X's at $\frac{1}{2}$, 2 X's at $\frac{2}{3}$, and 1 X at $\frac{5}{6}$.

Draw a line plot to represent the data. Answer the question.

3. Miles walked: $\frac{1}{2}$, $\frac{3}{4}$, $\frac{5}{8}$, $\frac{7}{8}$, $\frac{3}{4}$, $\frac{5}{8}$, $\frac{7}{8}$, $\frac{1}{2}$, $\frac{3}{8}$, $\frac{1}{2}$, and $\frac{5}{8}$.

(Check students' models.)

7 miles; Number line should be marked in eighths. Line plot should have 1 X at $\frac{3}{8}$, 3 X's at $\frac{1}{2}$, 3 X's at $\frac{5}{8}$, 2 X's at $\frac{3}{4}$, and 2 X's at $\frac{7}{8}$.

How many miles were walked in all? _____

4. Data: $\frac{2}{5}$, $\frac{7}{10}$, $\frac{1}{2}$, $\frac{4}{5}$, $\frac{3}{5}$, $\frac{7}{10}$, $\frac{1}{2}$, $\frac{2}{5}$, $\frac{3}{5}$, $\frac{1}{2}$, $\frac{2}{5}$, $\frac{1}{2}$, and $\frac{3}{5}$.

$\frac{1}{2}$; Number line should be marked in tenths. Line plot should have 3 X's at $\frac{2}{5}$, 4 X's at $\frac{1}{2}$, 3 X's at $\frac{3}{5}$, 2 X's at $\frac{7}{10}$, and 1 X at $\frac{4}{5}$.

Which value occurs the most? _____

Answer Key

Challenge! Create a story context for Problem 4. How many of the data values are greater than $\frac{1}{2}$?

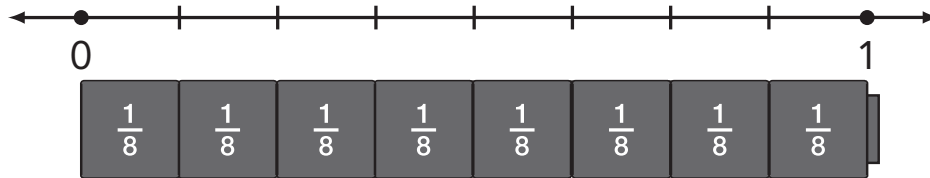
Challenge: Stories will vary. Six are greater than $\frac{1}{2}$.

This image shows a single sheet of white paper with horizontal blue ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

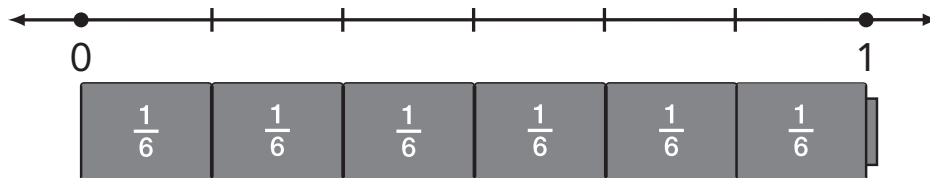
Use Fraction Towers to draw a line plot of the data.

Answer the question.

1. Lisa is measuring pieces of ribbon in yards. They are $\frac{1}{4}$, $\frac{7}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, $\frac{5}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, and $\frac{5}{8}$. How many pieces are $\frac{1}{2}$ yard or longer?



2. After students finished planting their seedlings, they turned in the leftover soil. In cups, the amounts left over are $\frac{1}{3}$, $\frac{1}{2}$, $\frac{1}{6}$, $\frac{5}{6}$, $\frac{2}{3}$, $\frac{1}{2}$, $\frac{1}{6}$, $\frac{1}{3}$, $\frac{1}{2}$, $\frac{1}{6}$, $\frac{1}{3}$, $\frac{2}{3}$, $\frac{1}{3}$, $\frac{1}{2}$, and $\frac{1}{3}$. How much soil is left over?



Draw a line plot to represent the data. Answer the question.

3. Miles walked: $\frac{1}{2}$, $\frac{3}{4}$, $\frac{5}{8}$, $\frac{7}{8}$, $\frac{3}{4}$, $\frac{5}{8}$, $\frac{7}{8}$, $\frac{1}{2}$, $\frac{3}{8}$, $\frac{1}{2}$, and $\frac{5}{8}$.

How many miles were walked in all? _____

4. Data: $\frac{2}{5}$, $\frac{7}{10}$, $\frac{1}{2}$, $\frac{4}{5}$, $\frac{3}{5}$, $\frac{7}{10}$, $\frac{1}{2}$, $\frac{2}{5}$, $\frac{3}{5}$, $\frac{1}{2}$, $\frac{2}{5}$, $\frac{1}{2}$, and $\frac{3}{5}$.

Which value occurs the most? _____

Name _____

Challenge! Create a story context for Problem 4. How many of the data values are greater than $\frac{1}{2}$?

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page. There are no margins, text, or other markings on the paper.