



# Representing Fractions on a Line Plot

## Standards

Addressing 5.MD.B.2, 5.NF.A.1  
Building Toward 5.MD.B.2

## Instructional Routines

- Which Three Go Together?

## Goals

- Interpret (orally and in writing) and create line plots with fractions and mixed numbers.

## Student Facing Learning Goals

- Let's make a line plot and analyze the data we collect.

## Lesson Purpose

The purpose of this lesson is for students to make and interpret line plots displaying fractions in eighths.

## Narrative

In this lesson, students use fraction arithmetic to solve problems about line plots. Students make line plots by generating data and using given data, and then they solve problems about the line plots. Students have worked with these line plots in a previous grade. The new part of the work in this lesson and the next is the level of complexity of the questions they answer. In this lesson, they perform arithmetic with the fractions and answer questions that involve thinking about all the data as a whole and certain measurements as a fraction of that whole (MP2).

## Access for Students with Disabilities

- Engagement

## Access for English Learners

- MLR8

## Required Materials

### Materials to Gather

- Paper clips: Activity 1
- Pencils: Activity 1

## Lesson Timeline

Warm-up	10 min
Activity 1	15 min
Activity 2	20 min
Synthesis Estimate	10 min
Cool-down	5 min

## Teacher Reflection Questions

How did students' work that you selected, particularly in the second activity, impact the direction of the discussion? What type of students' work might you pick next time if you taught the lesson again?



## Which Three Go Together: Line Plot

### Standards

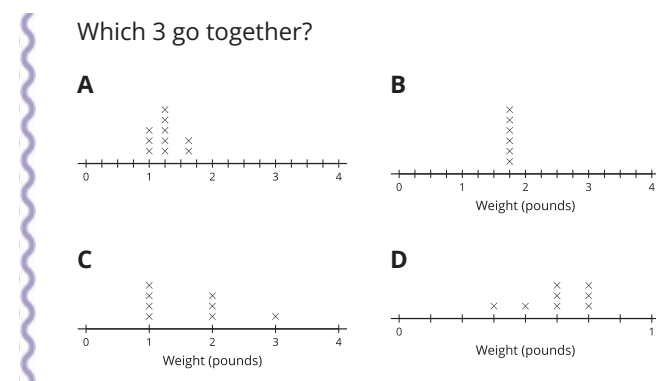
Building Toward 5.MD.B.2

### Instructional Routines

- Which Three Go Together?

This *Warm-up* prompts students to carefully analyze and compare the features of line plots. In making comparisons, students have a reason to use language precisely (MP6). The activity also enables the teacher to hear the terminology students use to talk about the characteristics of line plots with fractional measurements, which students have seen in prior courses. This prepares them to do more arithmetic with fractions, using the data from line plots in the next two lessons.

### Student Task Statement



### Launch

- Groups of 2
- Display the image.
- “Pick 3 line plots that go together. Be ready to share why they go together.”
- 1 minute: quiet think time

### Activity

- “Discuss your thinking with your partner.”
- 2–3 minutes: partner discussion
- Share and record responses.

### Student Response

Sample responses:

A, B, and C go together because:

- They have data values greater than or equal to 1.

A, B, and D go together because:

- They have fractional measurements.

A, C, and D go together because:

- They have different measurements.

B, C, and D go together because:

- They have titles.
- They show weight, in pounds.

### Activity Synthesis

- Display Line Plot D.
- “What does this line plot tell you about the data?” (A total of 8 items were weighed in pounds. All weights were less than 1 pound. Only 1 item weighed half a pound, and 1 item was less than half a pound. Most of the weights were more than half a pound.)
- If it doesn’t come up in the discussion, ask:
  - “How can we tell which fractions of a pound are shown in the marks of the diagram?” (The number line has 8 partitions, so it’s eighths. Each part represents one-eighth. The data shows  $\frac{3}{8}$ ,  $\frac{4}{8}$  or  $\frac{1}{2}$ ,  $\frac{5}{8}$ ,  $\frac{6}{8}$  or  $\frac{3}{4}$ .)
- “Today we are going to work with line plots with fractional data and use what we have learned about fractions to solve problems.”

# Activity 1

🕒 15 min

## Sums of Fractions

### 📖 Standards

Addressing 5.NF.A.1

Building Toward 5.MD.B.2

The purpose of this activity is for students to make a line plot and answer questions about the data collected. The numbers that students plot come from spinning a spinner twice and adding the fractions on the spinner. The denominators are chosen so that 8 can be used as a common denominator. Students observe and think about patterns and then discuss them during the *Activity Synthesis*.

### 🧑 Access for Students with Disabilities

- Engagement: Provide Access by Recruiting Interest. Synthesis: Revisit math-community norms to prepare students for the whole-class discussion.
- Supports accessibility for: Attention, Social-Emotional Functioning

## Required Materials

### Materials to Gather

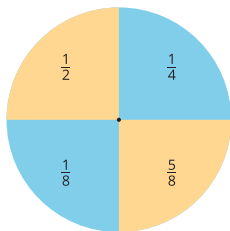
- Paper clips: Activity 1
- Pencils: Activity 1

## Required Preparation

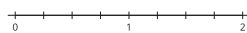
- Each group of 2 students needs 1 paper clip and 1 pencil.

### 🧑 Student Task Statement

1. Play Sums of Fractions with your partner.



- Spin the spinner twice.
- Add the 2 fractions.
- Record the sum on the line plot.
- Take turns until you and your partner together have 12 data points.



### Launch

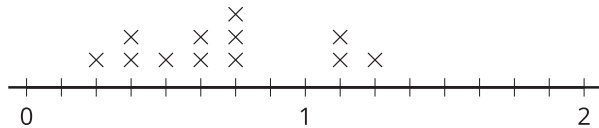
- Groups of 2
- Display the number line image from the student book.
- “You are going to play a game with your partner. You will use a paper clip and a pencil to make a spinner out of the image in your book. Let’s practice.”
- Demonstrate how to use the pencil and the paper clip to make a spinner. Spin twice and record the fractions you landed on for all to see.
- “I need to find the value of the sum of these two fractions.”
- Demonstrate how to record the sum on the number line, with an X.
- “Which number do you think will have the most Xs if



- How did you know where to plot the sums of eighths?
- What is the difference between your greatest and least numbers?
- What do you notice about the data you collected?

## Student Response

- Sample response:



- Sample response: I partitioned the number line plot into a total of 8 parts and used the numerator of each sum to decide where to plot each sum. Sometimes I had to think about equivalent fractions.
- Sample response:  $1\frac{2}{8} - \frac{2}{8} = 1$
- Sample responses:
  - Some sums were more common than others.
  - Most of the sums were less than 1.
  - All the sums could be written as some number of eighths. I never got  $\frac{7}{8}$ .

you spin the spinner a lot of times? Why?"

- 1–2 minutes: partner discussion

## Activity

- 1–2 minutes: quiet think time
- 6–8 minutes: partner work time
- Monitor for students who:
  - Partition the number line into eighths.
  - Use common denominators to convert fractions with unlike denominators to fractions with like denominators.

## Activity Synthesis

- Ask previously identified students to share their thinking.
- “Did anyone record a 1? What did you spin?” (I got  $\frac{1}{2}$  on both spins.)
- “Is there any other way to get 1 as a sum?” (No, I would need to add  $\frac{3}{4}$  to  $\frac{1}{4}$ ,  $\frac{7}{8}$  to  $\frac{1}{8}$ , and  $\frac{3}{8}$  to  $\frac{5}{8}$ , and none of those is possible.)
- “What is the greatest number you recorded?” ( $1\frac{2}{8}$ ,  $1\frac{1}{8}$ )
- “Is it possible to get more than  $1\frac{2}{8}$ ?” (No, the biggest number is  $\frac{5}{8}$ , and two of those is  $1\frac{2}{8}$ .)
- “Name a fraction that would have made the game more challenging if it were on the number mat. Why would this have made the game more challenging?” ( $\frac{2}{3}$ ,  $\frac{4}{5}$ , or any other fraction with a denominator that is not a factor or a multiple of 8. It would be more challenging because we could not use 8 as a common denominator to easily add the fractions.)

## Activity 2

A Lot of Eggs

### Standards

Addressing 5.MD.B.2

The purpose of this activity is for students to use measurement data to make a line plot, and then to solve problems



about the data presented in the line plot (MP2). The line plot is blank, so students will choose which whole numbers to label and which fractions to label in between. They will use their understanding of equivalent fractions (halves, quarters, and eighths) to accurately make the line plot. Jada’s statement about the eggs that weigh  $1\frac{7}{8}$  ounces is interesting because it uses two fractions referring to different quantities:  $\frac{1}{4}$  is a fraction of the eggs and  $1\frac{7}{8}$  is their weight in ounces. The focus of the *Activity Synthesis* is on how students reason about Jada’s statement. As students reason through Jada’s statement, they critique the reasoning of others (MP3).

## Access for English Language Learners

*MLR8 Discussion Supports.* Prior to solving the problems, invite students to make sense of the situations and take turns sharing their understanding with their partner. Listen for and clarify any questions about the context.

*Advances: Reading, Representing*

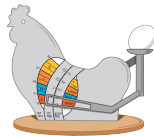
## Student Task Statement

- Here are the weights of some eggs, in ounces. Use them to make a line plot.

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

$$1\frac{7}{8} \quad 2\frac{1}{4} \quad 1\frac{6}{8} \quad 2\frac{1}{8} \quad 1\frac{7}{8}$$

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- Jada says that  $\frac{1}{4}$  of the eggs weigh  $1\frac{7}{8}$  ounces. Do you agree? Explain or show your reasoning.
- How much heavier is the heaviest egg than the lightest egg? Explain or show your reasoning.

## Launch

- Groups of 2
- Display the image.
- “What do you notice?” (It is a chicken. There is an egg. There are numbers and units.)
- “What do you wonder?” (What is it for? Is it a scale? Why does it say small, medium, large, X-Large?)
- “This is an egg scale. It is used to weigh eggs. What can you say about the egg on the scale?” (It’s small. It weighs less than 2 ounces.)
- “Now you will make a line plot and answer questions about the egg weights.”

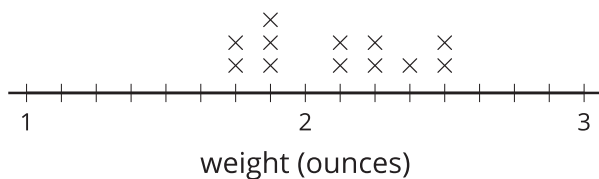
## Activity

- 5 minutes: independent work time
- 5 minutes: partner work time
- Monitor for students who use either of these expressions to determine if Jada is correct:
  - $\frac{1}{4} \times 12 = 3$
  - $12 \div 4 = 3$

## Student Response

1.

Chicken Eggs



- Yes. Sample response: There are 3 eggs that weigh  $1\frac{7}{8}$  ounce.  $\frac{1}{4} \times 12 = 3$  or  $12 \div 4 = 3$ .
- $\frac{6}{8}$  ounce (or equivalent). Sample response: The heaviest egg is  $2\frac{4}{8}$  ounces and the lightest is  $1\frac{6}{8}$

## Activity Synthesis

- Ask previously selected students to share their response to Jada’s statement.
- “How did you know how many eggs Jada weighed?” (I could count the measurements or the marks on the graph.)
- “How did you decide if her statement was correct?” (I found  $\frac{1}{4}$  of 12 and then counted the number of eggs



ounces. I added  $\frac{2}{8}$  to  $1\frac{6}{8}$  to get 2, and then  $\frac{4}{8}$  more to get  $2\frac{4}{8}$ .

that weighed  $1\frac{7}{8}$  ounces. Both were 3, so Jada is correct.)

- If students do not write an equation matching Jada's response, consider displaying the equations  $\frac{1}{4} \times 12 = 3$  and  $12 \div 4 = 3$ .
- "How do these equations represent Jada's reasoning?" (Both show that  $\frac{1}{4}$  of the 12 egg measurements is 3 eggs. One equation uses multiplication and the other equation uses division.)

## Lesson Synthesis

"Today we made line plots and answered questions about the data in line plots."

Display line plots from the *Student Responses* for the two activities, or use student-generated examples.

"How are the line plots the same?" (They both show data that is measured in fractions. All fractions are eighths. There are 12 measurements in each line plot.)

"How are the line plots different?" (The numbers for the game are just numbers. The other ones are weights. The numbers for the game only go up to  $\frac{10}{8}$ . There is more variation in the weights of the eggs.)

## Suggested Centers

- Creating Line Plots (2–5), Stage 4: Eighth Inches, Add, Subtract, and Multiply (Addressing)
- Rectangle Rumble (3–5), Stage 4: Whole Number and Fraction Factors (Supporting)

## Cool-down

🕒 5 min

A Dozen Eggs

### Standards

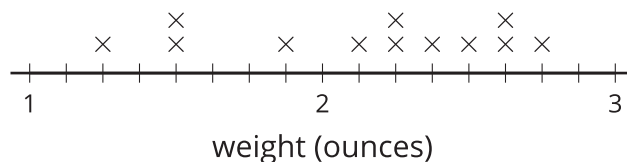
Addressing 5.MD.B.2

### Student Task Statement

Here are the weights of a different collection of chicken eggs.

What is the combined weight of all the eggs that weigh more than  $2\frac{1}{2}$  ounces? Explain or show your reasoning.

Chicken Eggs



## Student Response

8 ounces (or equivalent). Sample response: There are 2 eggs that weigh  $2\frac{5}{8}$  ounces and 1 egg that weighs  $2\frac{3}{4}$  ounces, or  $2\frac{6}{8}$  ounces. If I add them up, I get  $6\frac{16}{8}$  ounces which is the same as 8 ounces.

## Responding to Student Thinking

The work in this lesson builds from the line-plot concepts developed in a prior unit.

Prior-Unit Support  
Grade 4, Unit 3, Section B Addition and Subtraction of Fractions

