Facilitator Guide: Equal Distances

Lesson Overview:

Big Idea: Fractions are numbers that can be represented as points on a number line. When the whole distance is defined (0 to 1), fractions with the same unit (thirds, fourths…) are located at equal distances from each other (equidistant points) based on the length of the unit fraction (1/3, 1/4). Prior to working with fraction notation, this lesson develops students spatial-temporal reasoning for equidistant points by giving them an interactive experience of plotting points. Students then apply their prior experiences with fractions to label points and plot fractions on a number line.

Lesson Flow: From the lesson's agenda page, direct students to play the Equal Distance puzzles. After 5 minutes, open the teacher's Equal Distance puzzle and discuss strategies for placing the pins at equal distances. Have students return to the Agenda and play Fractions as Points on a Number Line puzzles. After 5 minutes, open the teacher's Fractions as Points on a Number Line puzzle and discuss strategies for plotting the given fractions. Give students the Fractions on a Number Line Problem Sheet and have them solve the problems independently. When most students have finished, use the link in the agenda page to project two problems to discuss and solve as a class.

Warm Up: Equal Distance Points

Part 1: Students solve Equal Distance puzzles (5 min)

- Students practice setting pins on a line segment to create equidistant points
- Develop spatial accuracy for setting equidistant points

Part 2: Solve and discuss an Equal Distance puzzle (5 min)

- Focus discussion on comparing strategies: Place 3 pins between two points
  - Repeated halving: find the midpoint, then find the midpoint of each segment on either side.
  - Guess and check: move all pins onto the line and adjust them until it 'looks' right

Questions

- What is the puzzle asking you to do with the pins?
- How can you accurately place these pins so they are equidistant from each other?

Activity One: Fractions as Points on a Number Line

Part 1: Students solve Fractions on a Number Line puzzles (5 min)

- The line segment is labeled 0 and 1. Students use the pins to estimate equal distances then label some of the pins with fractions
  - Not all the fraction labels are included, students must reason about where to place fractions out of sequence

Part 2: Solve and discuss a Fractions as Points on a Number Line puzzle (5 min)

- Ask students to think on their own, discuss with a partner and then share as a class how to find 4/6, 2/6 and 5/6 on this number line.
  - Some students may use the pins to estimate the point and move them around until they 'look' like they are equally spaced, then use the fraction labels to plot the points.
  - Others may use the bar models to measure out sixths on the number line, then labeling the points with the corresponding fractions.

Activity Two: Plot Fractions with Bar Measurements

Part 1: Students solve Plot Fractions with Bar Measurements puzzles (5 min)

- Students choose which of the bar models will be useful to measure distances based on the unit fraction given.
- Students can add as many tick marks as they see fit
- If needed, facilitate a class discussion on how the bar model can be used to solve the given problem

  - More than one bar will work and a bar can be given a value greater than a unit fraction, e.g. a bar can be said to be 2/3.

Part 2: Solve and discuss a Plot Fractions puzzle (5 minutes)

- Have students think on their own, then share with a partner about how to solve this puzzle
  - Will more than one of the bars work? Why or why not?
    - The largest bar may not work if we say it's 1/6, but will it work if it's 2/6?

Activity Three: Fractions on a Number Line

Part 1: Students work on **Fractions on a Number Line** problem sheet (5 min)

- The number lines extend to include fractions between 0 and 2 so students need to think about fractions greater than 1. They have to visually estimate equal distances based on the unit fraction and then reason to plot the fractions given. The fractions to be plotted are not in sequence and not all fractions are given (e.g., 6/4 and 3/4).

Part 2: Class discussion on last two problems in the worksheet (5 minutes)

- Project the last two problems
- Ask students to think on their own, share with a partner and then discuss as a class, "What strategies can you use to find these fractions on the number line?"
- Project slide 6 from Lesson Slides
- The number line for plotting 9/6 and 4/6 is ticked in thirds. Students need to recognize this and figure out that to find sixths they need place tick marks at the midpoint between thirds to find sixths.
  - If students assume the tick marks are sixths, they may struggle with finding sixths. Ask these students to count the tick marks and check to see if 6-sixths lines up with 1 whole on the number line. When it does not, ask them what unit fraction will land on 1 whole.