MA.4.DP.1.1

Overarching Standard: MA.4.DP.1 *Collect, represent and interpret data and find the mode, median and range of a data set.*

Benchmark of Focus

MA.4.DP.1.1: Collect and represent numerical data, including fractional values, using tables, stem-and-leaf plots or line plots.

> *Example:* A softball team is measuring their hat size. Each player measures the distance around their head to the nearest half inch. The data is collected and represented on a line plot.

Benchmark Clarifications

Clarification 1: Denominators are limited to 2, 3, 4, 5, 6, 8, 10, 12, 16 and 100.

Related Benchmark/Horizontal Alignment

- MA..4.NSO.1.5
- MA.4.FR.1.3/1.4
- MA.4.M.1.1

Vertical Alignment

Previous Benchmarks Next Benchmarks

MA.3.DP.1.1   MA.5.DP.1.1

Terms from the K-12 Glossary
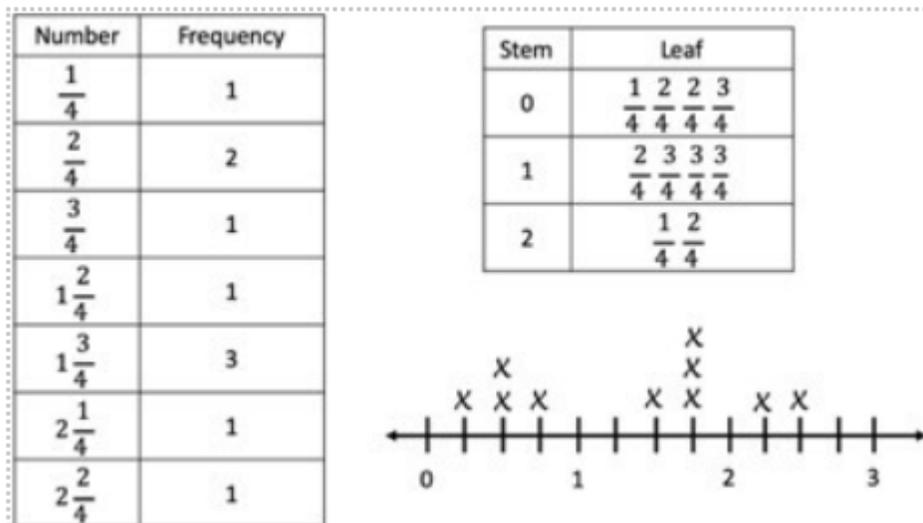
- Line Plot
- Stem-and-Leaf Plot

Purpose and Instructional Strategies

The purpose of this benchmark is to collect authentic data and display the data using the appropriate format. This concept builds on collecting and displaying whole number data using line plots, bar graphs, and tables in Grade 3 (MA.3.DP.1.1). Student data in Grade 4 will be displayed using stem-and-leaf plots, in addition to other methods. In Grade 5, fractional and decimal data will be included (MA.5.DP.1.1).

- A stem-and-leaf plot displays numerical data and use place value to display data frequencies. In a stem-and-leaf-plot, a number is decomposed so that leaves represent the smallest part of a number (e.g., ones, fraction less than 1) and the stem consists of all its other place values (e.g., hundreds, tens,

ones in fractions greater than 1). Stem-and- leaf plots help students build line plots. Stem-and-leaf plots can help students identify benchmarks for their number lines when creating a line plot.

- During instruction connections should be made between how data is represented on stem-and-leaf and line plots. Stem-and-leaf plots can help students identify benchmarks for their number lines when creating a line plot.
- A stem-and-leaf plot organizes data by size (e.g., least to greatest or greatest to least) and identifies the mode of a data set as the stem with the greatest number of leaves. It can be used to find the median and range of the data set.

- Measurement data can be gathered (including measuring with precision to the nearest 1/16 inch and displayed on tables, line plots, and stem and leaf plots. The data is the same for each of the displays below.

Number	Frequency
$\frac{1}{4}$	1
$\frac{2}{4}$	2
$\frac{3}{4}$	1
$1\frac{2}{4}$	1
$1\frac{3}{4}$	3
$2\frac{1}{4}$	1
$2\frac{2}{4}$	1

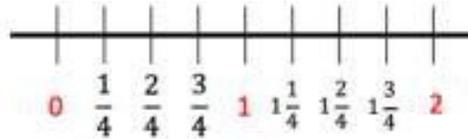| Stem	Leaf
0	$\frac{1}{4}\ \frac{2}{4}\ \frac{2}{4}\ \frac{3}{4}$
1	$\frac{2}{4}\ \frac{3}{4}\ \frac{3}{4}\ \frac{3}{4}$
2	$\frac{1}{4}\ \frac{2}{4}$

- Instruction of line plots should first focus on creating appropriate number lines that allow a data set to be displayed.

**Common Misconceptions or Errors**
- For line plots, students may misread a number line and have difficulty because they use whole-number names when counting fractional parts on a number line instead of the fraction name. Students also count the tick marks on the number line to determine the fraction, rather than looking at the "distance" or "space" between the marks.
- For stem-and-leaf plots, students may read they key incorrectly. Some students may try to represent numerical data in a stem-and-leaf plot without first arranging the leaves for each stem in order.

Strategies to Support Tiered Instruction

- Instruction includes opportunities to read number lines with fraction values and opportunities for students to use concrete models and drawing of number lines to connect their learning with fraction understanding.
  - For example, students plot fourths on the number line, paying particular attention to what each tick mark and the "distance" between each tick mark represents.

  - For example, utilizing fraction strips or tiles, students connect fractional parts to the measurement on a number line.
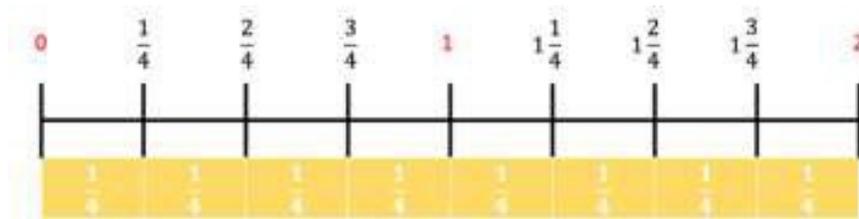
- Instruction includes representing numerical data in a stem and leaf plot and ordering the data from least to greatest. The stem will be the greatest place value of the largest number in the set. With a set of mixed numbers, the stems will be the whole numbers.
 - For example, create a steam and leaf plot using the data set shown.

Data set: 6, 8, 11, 20, 24

STEM	LEAF
0	6, 8
1	1
2	0, 4

- Instruction includes representing numerical data in a stem-and-leaf plot and writing the data set on index cards or sticky notes.
 - Example:

After organizing the data set in order from least to greatest, the students rip each number, separating the place values and place them on the graphic organizer. The greater place value will be the stem, the tens place for this example. The lesser place value will be the leaf, the ones place in this example. Since the stems will only be labeled once, the numbers with the same place value will be stacked on top of each other. Each of the leaves will be represented, even if repeated. Numbers with 0 in the tens place will be represented by a 0 for the stem.
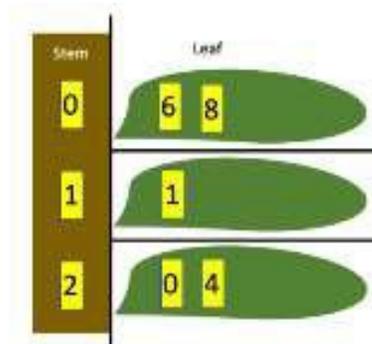
Questions to ask students:

- *Pointing to the X circled on the line plot, ask what does this represent? How do you know?*

Ribbon Lengths (inches)
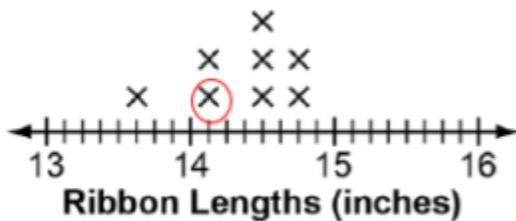
- Sample answer that indicates understanding: The X represents the length of one of ribbons that was 14 and 1/8. There were two ribbons with a length of 14 and 1/8 inches. I know the X is at 14 and 1/8 because it is between 14 and 15 inches and each tick mark represents one-eighth of an inch. There are 8 equal spaces between 14 and 15 inches.
- Sample answer that indicates an incomplete understanding or a misconception: The X is at 14 ¼ because it's a little more than 14.

Instructional Tasks

Instructional Task 1

Measure the length of 10 used pencils in the class to the nearest ¹/8 inch. Create a stem-and-leaf plot and a line plot to represent the lengths of all ten pencils.

Instructional Items

Instructional Item 1

Laura was given the data in the chart below.

High Jump Measurements (in feet)	
$3\frac{3}{8}$	$3\frac{3}{8}$
$4\frac{3}{8}$	$4\frac{5}{8}$
$3\frac{1}{4}$	$4\frac{3}{8}$
$4\frac{3}{8}$	$5\frac{3}{8}$
$4\frac{3}{4}$	$3\frac{1}{4}$
$4\frac{1}{8}$	$5\frac{3}{8}$

She was asked to create a line plot to represent her data. How many **X's** will she place above $4\frac{3}{8}$?

    a. 3
    b. 4
    c. 8
    d. 12

Achievement Level Descriptors

Benchmark	Context	Assessment Limits
MA.4.DP.1.1 Collect and represent numerical data, including fractional values, using tables, stem-and-leaf plots, or line plots. Example: A softball team is measuring their hat size. Each player measures the distance around their head to the nearest half inch. The data is collected and represented on a line plot. Clarification 1: Denominators are limited to 2, 3, 4, 5, 6, 8, 10, 12, 16 and 100.	Both	Items that contain fractions greater than one may be represented as mixed numbers. Items with numerical data represented on tables or line plots must include at least one fraction. Numerical data sets will not be presented using braces.

ALD 2	ALD 3	ALD 4	ALD 5
collects and represents numerical data using tables or line plots including fractions less than one with the denominator of 2, 4, 5, 10, and 100.	collects and represents numerical data, including fractional values, using tables, stem-and-leaf plots, or line plots including fractions less than one.	collects and represents numerical data, including fractional values, using tables, stem-and-leaf plots, or line plots.	collects and represents numerical data, including fractional values, using tables, stem-and-leaf plots, or line plots and justifies choice of data representation.

Additional Resources:

CPALMS Resources

Resources/Tasks to Support Your Child at Home:

Khan Academy: Making Line Plots with Fractional Data

Khan Academy: Stem and Leaf Plots