

MA.3.DP.1.1

Overarching Standard: *MA.3.DP.1 Collect, represent, and interpret numerical and categorical data.*

Benchmark of Focus

MA.3.DP.1.1: Collect and represent numerical and categorical data with whole-number values using tables, scaled pictographs, scaled bar graphs or line plots. Use appropriate titles, labels and units.

Benchmark Clarifications

Clarification 1: Within this benchmark, the expectation is to complete a representation or construct a representation from a data set.

Clarification 2: Instruction includes the connection between multiplication and the number of data points represented by a bar in scaled bar graph or a scaled column in a pictograph.

Clarification 3: Data displays are represented both horizontally and vertically.

Related Benchmark/Horizontal Alignment

- MA.3.NSO.2.2/2.4
- MA.3.GR.1.1

Vertical Alignment

Previous Benchmarks

MA.2.DP.1.1

Next Benchmarks

MA.4.DP.1.1

Terms from the K-12 Glossary

- Bar Graph
- Categorical Data
- Whole Number

Purpose and Instructional Strategies

The purpose of this benchmark is for students to represent numerical and categorical data using tables, scaled pictographs, scaled bar graphs, or line plots, using appropriate titles, tables, and units. Though there are many skills included in this benchmark, students bring background knowledge from Grades 1 and 2 when they collected, categorized, and represented data in tables, pictographs, and bar graphs. In Grade 2, students were expected to represent data with appropriate titles, labels and units.

- Before instruction begins, teachers should provide students with opportunities of reading and solving problems using scaled graphs before being asked to draw one. These skills will assist students with determining what they already know. This will save instructional time that can be focused on the Grade 3 extensions explained in the next paragraph (MTR.3.1).
- Instruction should include opportunities for students to collect and display their own numerical and categorical data (MTR.7.1).
- In Grade 3, two extensions of previous understandings about collecting and representing data occur. First, categorical data represented in pictographs and bar graphs are scaled. Students use their understanding of multiplication to read the data representations appropriately. Second,

students represent numerical data in line plots, which shows the frequency of data on a number line (MTR.2.1).

- During instruction, it is important to remind students that scales on graphs should begin with 0.
- Because the expectation is to represent data with whole-number values, number lines do not need to be partitioned into fractional parts. Students will represent fractional values beginning in Grade 4.
- During instruction, it is important that students have the opportunity to display data horizontally and vertically. Their work with GR.1.1 will be beneficial in making graphs that are accurate representations.

Common Misconceptions or Errors

- Students may confuse which types of data (categorical or numerical) can be displayed with a data representation. In Grades 1 and 2, students graphed frequency of categorical data in pictographs and bar graphs. Representing frequency in numerical data graphed via line plots is a new expectation in Grade 3. During instruction, expect students to justify the representations they choose based on the data collected.
- Students tend to count each square as one for intervals on bar graphs that are not single units.

Strategies to Support Tiered Instruction

- Instruction includes how to decide which way to display data (numerical vs. categorical). The teacher provides examples of when to use pictographs and bar graphs, and when to use line plots.
 - For example, students measure the lengths of pencils to the nearest 1 inch. Because the students are finding a numerical measurement, this data would be graphed on a line plot.
- Instruction includes how to decide which way to display their data (numerical vs. categorical). The teacher provides examples of when to use pictographs and bar graphs, and when to use a line plot. Also, the teacher provides instruction regarding how numerical data refers to data that is in the form of numbers and categorical data is a type of data that is divided into groups.
 - For example, categorical data could be favorite colors, types of pets at home, or hair color. Types of numerical data could be ages of students, numbers of siblings at home, or the results of the measurement of objects.
- Instruction includes opportunities to count the correct intervals on a scaled bar graph. The teacher provides instruction for identifying the scale and showing students how to read the bars according to the scale.

Questions to ask students:

- **If you wanted to represent data that was collected about lengths of different sized pencils, which type of representation would you choose and why? Pictograph, bar graph, or line plot?**
 - Sample answer that indicates understanding: *I would use a line plot because I am representing multiple pencils that might have the same lengths. Line plots are best to represent data that have to do with numbers and measurements, where pictographs and bar graphs are better for data that have different categories.*
- **Why is a key important when analyzing a pictograph?**

- Sample answer that indicates understanding: *A key lets the reader know the value of each picture on the graph. For example, if the key says each picture equals 3 then I would need to count by threes to find the total in that category.*
- **Reference a scaled bar graph, ask: Can you explain to me how this bar graph is scaled?**
 - Sample answer that indicates understanding: *On the left side of this bar graph, you can see that the numbers don't count up by 1. The scale on this bar graph is counting by 4, so every line up is 4 more. I can skip count by fours to find the total of each bar in the graph.*
- **What is the difference between a vertical and horizontal bar graph?**
 - Sample answer that indicates understanding: *They are very similar; the only difference is the way the bars are represented. The data and categories are switched on the graph, so in a vertical bar graph the categories are on the bottom and the bars go up. On a horizontal bar graph the categories are on the side and the bars go out to the right.*

Instructional Tasks

Instructional Task 1

The data below shows the ages of students in an art class and their favorite colors.

Name	Age	Favorite Color
Addison	10	Blue
Brett	9	Red
Carson	10	Yellow
Dewayne	9	Blue
Elliott	8	Blue
Frankie	9	Green
Glenn	11	Yellow
Horace	9	Blue
Isaiah	10	Red
Jorge	8	Red

Part A: Represent the ages of the students in the art class using a line plot.

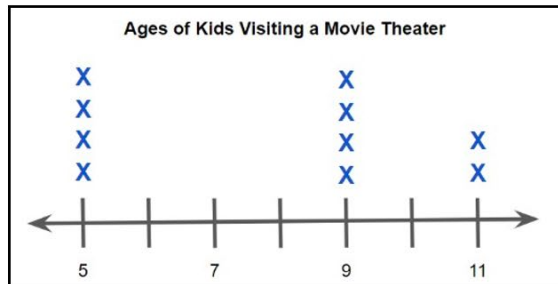
Part B: Represent the favorite colors of the students in an art class using a scaled pictograph.

Instructional Items

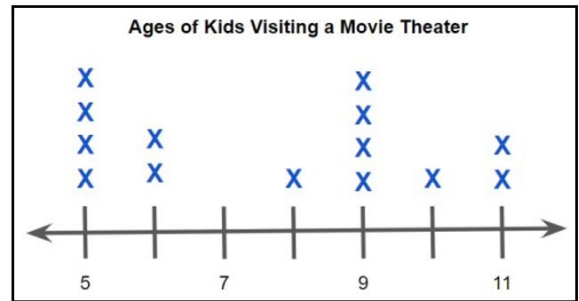
Instructional Item 1

Rebecca surveyed the ages of kids visiting a movie theater and displayed the data using a line plot. The customers' ages are below. Which line plot correctly displays the data that Rebecca collected?

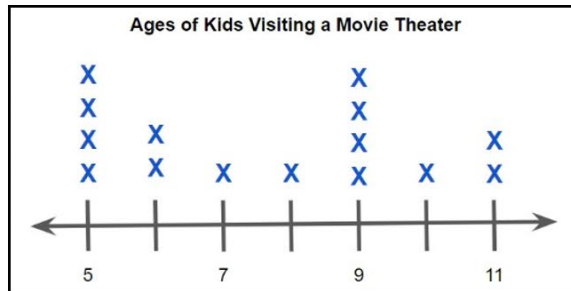
Ages of Kids Visiting a Movie Theater
5, 11, 9, 5, 6, 5, 9, 9, 8, 10, 6, 11, 9, 5



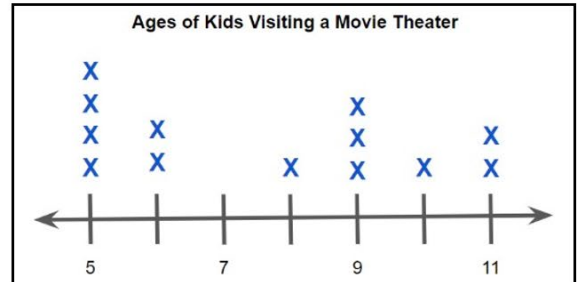
a.



b.



c.



d.

Achievement Level Descriptors

Benchmark		Context	Assessment Limits
MA.3.DP.1.2 Interpret data with whole-number values represented with tables, scaled pictographs, circle graphs, scaled bar graphs or line plots by solving one- and two-step problems. Clarification 1: Problems include the use of data in informal comparisons between two data sets in the same units. Clarification 2: Data displays can be represented horizontally or vertically. Clarification 3: Circle graphs are limited to showing the total values in each category. Also Assesses MA.3.DP.1.1 Collect and represent numerical and categorical data with whole number values using tables, scaled pictographs, scaled bar graphs or line plots. Use appropriate titles, labels, and units. Clarification 1: Within this benchmark, the expectation for representation is to complete a representation or construct a representation from a data set. Clarification 2: Instruction includes the connection between multiplication and the number of data points represented by a bar in scaled bar graph or a scaled column in a pictograph. Clarification 3: Data displays are represented both horizontally and vertically.		Real-world for MA.3.DP.1.2 Both for MA.3.DP.1.1	Data are limited to no more than six categories. Items assessing MA.3.DP.1.1 and including numerical data sets will not be presented as sets using braces.
ALD 2	ALD 3	ALD 4	ALD 5
given the data, creates a table, scaled pictograph.	represents numerical and categorical data with whole number	collects and represents numerical and categorical data with	collects and represents numerical and categorical data with whole number

or scaled bar graph with appropriate titles, labels, and units. solves one-step problems using a given scaled pictograph or scaled bar graph.	values using tables, scaled pictographs, or scaled bar graphs with appropriate titles, labels, and units. interprets data with whole number values presented in tables, scaled pictographs, circle graphs, or scaled bar graphs by solving one-step problems.	whole number values using tables, scaled pictographs, scaled bar graphs, or line plots; uses appropriate titles, labels, and units. interprets data with whole number values represented with tables, scaled pictographs, circle graphs, scaled bar graphs, or line plots by solving one- and two-step problems.	values using tables, scaled pictographs, scaled bar graphs, or line plots; uses appropriate titles, labels, and units; explains how different scale factors affect representation of data. interprets and compares multiple data sets with whole number and/or missing values represented with tables, scaled pictographs, circle graphs, scaled bar graphs, or line plots by solving one- and two-step problems.
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Additional Resources:

[CPALMS Resources](#)

Khan Academy Video: [Creating Picture and Bar Graphs](#)

Resources/Tasks to Support Your Child at Home:

Each morning check the weather with your child. Collect data in a table with the daily temperature at the time you choose to measure it. Once you've collected data for a couple weeks, have your child create a line plot to show the frequency of the temperatures in your area. Have your child explain the labels they can use to make sure the data is clear for others when analyzing their line plot.

Open a bag of different colored candy or cereal with your child and have them create a table and/or graph to represent how many of each color there are in the bag. Encourage your child to create a scaled graph or key, instead of counting by ones. Ask them to explain how and why they titled and labeled their graph.

Khan Academy Video: [Creating Picture and Bar Graphs](#)