

5.MD: MEASUREMENT & DATA

Cluster Statement: B: Represent and interpret data.

Supporting Cluster (Students should spend the large majority of their time (65-85%) on the major work of the grade/course. Supporting work and, where appropriate, additional work should be connected to and engage students in the major work of the grade.)

<p>Standard Text</p> <p>5.MD.B.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.</p>	<p>Standard for Mathematical Practices</p> <p>SMP 1: Students can make sense of problems and persevere in solving them by interpreting and making sense of word problems involving information presented in line plots.</p> <p>SMP 2: Students can reason abstractly and quantitatively by attending to the meaning of the measured objects and plots on the number line by using operations involving fractions.</p> <p>SMP 5: Students can use tools by measuring objects to the nearest $\frac{1}{8}$, $\frac{1}{4}$, and $\frac{1}{2}$ inch using a ruler.</p>	<p>Students who Demonstrate Understanding Can:</p> <ul style="list-style-type: none"> • Identify benchmark fractions. • Make a line plot to display a data set of measurements in fractions of a unit. • Solve problems involving information presented in line plots which use fractions of a unit by adding, subtracting, multiplying, and dividing fractions. <p>Depth of Knowledge: 1-2</p> <p>Bloom's Taxonomy: Remember and Apply</p>
<p>Previous Learning Connections</p> <ul style="list-style-type: none"> • Connect to generating data by measuring lengths and making line plots using that data. (3.MD.4) • Connect to solving addition and subtraction problems using the data on line plots. (4.MD.4) 	<p>Current Learning Connections</p> <ul style="list-style-type: none"> • Connect to growing in their skill and understanding of fraction arithmetic. (5.NF) 	<p>Future Learning Connections</p> <ul style="list-style-type: none"> • Connect to displaying numerical data in plots on number lines, dot plots, histograms, and boxplots and choosing the most appropriate graph/plot for the data. (6.SP.4)
<p>Clarification Statement:</p> <p>5.MD.B.2: Grade 5 students grow in their skill and understanding of fraction arithmetic, including multiplying a fraction by a fraction, dividing a unit fraction by a whole number or a whole number by a unit fraction, and adding and subtracting fractions with unlike denominators. Students can use these skills to solve problems, including problems that arise from analyzing line plots. For example, given five graduated cylinders with different measures of liquid in each, students might find the amount of liquid each cylinder would contain if the total amount in all the cylinders were redistributed equally. (Students in Grade 6 will view the answer to this question as the mean value for the data set in questions.)</p>		
<p>Common Misconceptions</p> <ul style="list-style-type: none"> • Students may confuse various parts of the graph. Consider showing graphs that are incorrectly displayed and discuss why they are incorrect. 		

Multi-Layered System of Supports (MLSS)/Suggested Instructional Strategies

Pre-Teach

Pre-teach (targeted): *What pre-teaching will prepare students to productively struggle with the mathematics for this cluster within your HQIM?*

- For example, some learners may benefit from targeted pre-teaching that previews new contexts for tasks within the unit (e.g., cell phone plans) when studying representation and interpretation of data because this cluster focuses on solving problems using line plots created to display measurement data in fractions of a unit.

Pre-teach (intensive): *What critical understandings will prepare students to access the mathematics for this cluster?*

- 4.MD.B.4: This standard provides a foundation for work with representation and interpretation of data because students begin to make a line plot to display a data set of measurements in fractions of a unit ($\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$) and solve problems involving addition and subtraction of fractions by using information presented in line plots. If students have unfinished learning within this standard, based on assessment data, consider ways to provide intensive pre-teaching support prior to the start of the unit to ensure students are ready to access grade level instruction and assignments.

Core Instruction

Access

Perception: *How will the learning for students provide multiple formats to reduce barriers to learning, such as providing the same information through different modalities (e.g., through vision, hearing, or touch) and providing information in a format that will allow for adjustability by the user?*

- For example, learners engaging with representation and interpretation of data benefit when learning experiences ensure information is accessible to learners with sensory and perceptual disabilities, but also easier to access and comprehend for many others such as offering alternatives for visual information such as descriptions (text or spoken) for all images, graphics, video, or animations; touch equivalents (tactile graphics or objects of reference) for key visuals that represent concepts; objects and spatial models to convey perspective or interaction; auditory cues for key concepts and transitions in visual information because experience with what a line plot is, how the data was gathered, and how to read and interpret the data.

Build

Effort and Persistence: *How will the learning for students provide options for sustaining effort and persistence?*

- For example, learners engaging with representation and interpretation of data benefit when learning experiences attend to students' attention and affect to support sustained effort and concentration such as generating relevant examples with students that connect to their cultural background and interests because this will allow data and line plots to have some relevance to students and allow them to make connections to the standard.

Language and Symbols: *How will the learning for students provide alternative representations to ensure accessibility, clarity and comprehensibility for all learners? (e.g., a graph illustrating the relationship between two variables may be informative to one learner and inaccessible or puzzling to another; picture or image may carry very different meanings for learners from differing cultural or familial backgrounds).*

- For example, learners engaging with representation and interpretation of data benefit when learning experiences attend to the linguistic and nonlinguistic representations of mathematics to ensure clarity can comprehensibility for all learners such as pre-teaching vocabulary and symbols, especially in ways that promote connection to the learners' experience and prior knowledge because students will use appropriate vocabulary when working with line plots and fractional measurements.

Expression and Communication: *How will the learning provide multiple modalities for students to easily express knowledge, ideas, and concepts in the learning environment?*

- For example, learners engaging with representation and interpretation of data benefit when learning experiences attend to the multiple ways students can express knowledge, ideas, and concepts such as providing multiple examples of novel solutions to authentic problems because this will allow students opportunities to solve problems using operations on fractions from information presented in line plot.

Internalize

Self-Regulation: *How will the design of the learning strategically support students to effectively cope and engage with the environment?*

- For example, learners engaging with representation and interpretation of data benefit when learning experiences set personal goals that increase ownership of learning goals and support healthy responses and interactions (e.g., learning from mistakes), such as using activities that include a means by which learners get feedback and have access to alternative scaffolds (e.g., charts, templates, feedback displays) that support understanding progress in a manner that is understandable and timely because it will help students to build their abilities to construct a line plot with information gathered and display, analyze, and interpret their data.

Re-teach

Re-teach (targeted): *What formative assessment data (e.g., tasks, exit tickets, observations) will help identify content needing to be revisiting during a unit?*

- For example, students may benefit from re-engaging with content during a unit on representation and interpretation of data by clarifying mathematical ideas and/or concepts through a short mini-lesson because students are building their experience in measuring objects to one-eighth of a unit, constructing a line plot with information gathered, and display, analyze, and interpret their own line plot.

Re-teach (intensive): *What assessment data will help identify content needing to be revisited for intensive interventions?*

- For example, some students may benefit from intensive extra time during and after a unit on representation and interpretation of data by helping students move from specific answers to generalizations for certain types of problems because some students may not know what measurement to use if the object measures between $\frac{1}{8}$ and $\frac{1}{4}$ inch. To address this, help students understand that approximations can be used to measure to the closest $\frac{1}{8}$ inch and $\frac{1}{4}$ inch.

Extension

What type of extension will offer additional challenges to 'broaden' your student's knowledge of the mathematics developed within your HQIM?

- For example, some learners may benefit from an extension such as open ended tasks linking multiple disciplines when studying representation and interpretation of data because data is more meaningful to students if it is their own project or idea; students create their own data, measure objects to the nearest $\frac{1}{8}$ inch, construct line plot, and display, analyze, and interpret their line plot to draw conclusions.

Culturally and Linguistically Responsive Instruction:

Validate/Affirm: How can you design your mathematics classroom to intentionally and purposefully legitimize the home culture and languages of students and reverse the negative stereotypes regarding the mathematical abilities of students of marginalized cultures and languages?

Build/Bridge: How can you create connections between the cultural and linguistic behaviors of your students' home culture and language the culture and language of school mathematics to support students in creating mathematical identities as capable mathematicians that can use mathematics within school and society?

Supporting Productive Struggle in Learning Mathematics: The standard for mathematical practice, makes sense of mathematics and persevere in solving them is the foundation for supporting productive struggle in the mathematics classroom. “Too frequently, historically marginalized students are overrepresented in classes that focus on memorizing and practicing procedures and rarely provide opportunities for students to think and figure things out for themselves. When students in these classes struggle, the teacher often tells them what to do without building their capacity for persistence.” Teachers need to provide tasks that challenge students and maintain that challenge while encouraging them to persist. This encouragement or “warm-demander” requires a strong relationship with students and an understanding of the culture of the students. For example, when studying representation and interpretation of data supporting productive struggle is critical because students will need to make sense of measured objects and plots on a number line to solve everyday problems. Students will use reasoning and connections to their background to display, interpret, and analyze their own line plots.

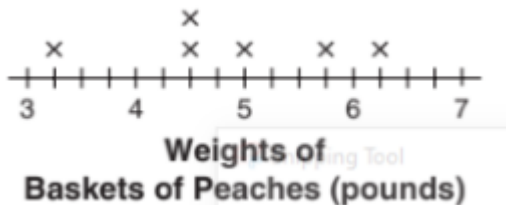
Standards Aligned Instructionally Embedded Formative Assessment Resources:

Source: Cognia

The owner of a produce stand recorded the weights, in pounds, of the baskets of peaches for sale.

$$3\frac{1}{4}, 5\frac{3}{4}, 6\frac{1}{8}, 4\frac{1}{2}, 5, 3\frac{1}{8}, 6\frac{1}{4}$$

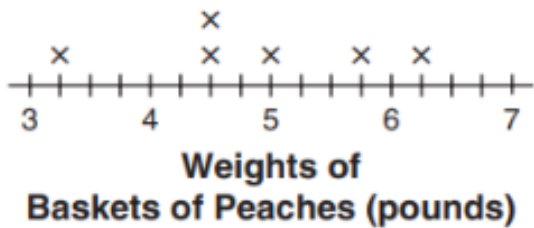
The owner made this line plot of data.



A. Why are the data on the line plot incorrect? Show your work or explain your answer.

The owner used the incorrect data from this line plot to find the total weight of the peaches sold.

$$3\frac{1}{4}, 5\frac{3}{4}, 6\frac{1}{8}, 4\frac{1}{2}, 5, 3\frac{1}{8}, 6\frac{1}{4}$$



B. By how many pounds would the total weight of the peaches change if he used the correct data from the list?

Answer Key

Constructed-Response Rubric	
Score	Description
2	for correct answers to part a., The owner did not include all the data ($3\frac{1}{8}$ and $6\frac{1}{8}$) and part b., $9\frac{1}{4}$ or equivalent
1	for correct answer to one part
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No Response.

Sample Response

- a. The line plot is the wrong scale. The number line needs to be divided in eighths. The owner left out the data that had eighths.
 b. $9\frac{1}{4}$

Relevance to families and communities:

During a unit focused on representation and interpretation of data, consider options for learning from your families and communities the cultural and linguistic ways this mathematics exists outside of school to create stronger home to school connections for students. For example, students can measure their families' hand to the nearest $\frac{1}{8}$ of an inch, construct a line plot with the information gathered and display, analyze, and interpret their family line plot.

Cross-Curricular Connections:

Science: In fifth grade the NGSS recommends students work with measurement related to conservation of mass. Consider providing a connection for students to determine the mass of various object in different states in that measure in fractional units. Then have students graph and analyze that data.

Social Studies: In fifth grade the New Mexico Social Studies Standards state students should "gather, organize and interpret information using a variety of media and technology". Consider having students gather, graph and analyze data that contains measurements in fractions of a unit.