COMMON MISCONCEPTIONS

- A number line always starts at 0.
  A number line can begin and end at any two numbers. The start and end points are selected based upon the given problem. Students should practice creating line plots from given data sets or student-generated surveys where they need to decide on start and end points for the number line.

- You do not need to label the number line with numbers that are not in the data set.
  If a data set does not have a point for every possible value in the range, students may skip those values when labelling the line plot. Line plots are essentially number lines, so we cannot eliminate a section on the number line. It is important to show all of the equally-spaced intervals, since the gaps tell a story about the data.

- Students do not realize that every X or dot on a line plot records one vote or observation of that specific value.
  Students may have trouble connecting a tally sheet or table of data with the line plot that represents the data. Students can see the connection when they have first-hand experience creating line plots from a given data set. They see the process as transferring a set of tally marks or a number of incidences to one X or dot per tally or incidence on the line plot. Show students a tally table and its corresponding line plot, or have them create a tally table from a line plot to reinforce the connection.

LINE PLOTS: CONSTRUCTING

Students have used a number line to add and subtract numbers. In this lesson, they use a number line to show data. Model how to construct a line plot using either student-generated data (i.e. use the tally sheet from the Engage and Explore activity) or another data set. To construct a line plot, draw a number line with two arrows. The number line needs to include the least and greatest numbers in the data set. For instance, using the sample hand span data from Engage and Explore, we start our number line at a number at most 14 cm and end it at a number at least 23 cm.

Explain that although there are no measurements for 21 and 22 cm, we still include these values on the number line. Students need to understand that a number line is like a ruler in that consecutive whole numbers are one unit apart. They need to consider the distances between positions and segments when identifying missing numbers. You may want to use grid paper and/or rulers to help students make the connection between positions on a ruler, number line, and line plot. In the example below, we label the grid lines to make it easier to count the dots, but this is not needed for all line plots.
Encourage students to think of the data as a collection of points that form a shape or picture. Have them use their own words to describe the shape and any interesting features of the data set. Explain that line plots help us see trends in the data.

Encourage discussions and reflections that allow students to see interesting features of the data set: the most common hand span measurement, the smallest measurement, the largest measurement, the difference between the largest and smallest measurements. Ask higher-level comparison questions: how many hand spans are 17 cm or greater? How many are 16 cm or less? How many are 18 and 19 cm combined? If we collected data from the entire school, do you think the most common hand span would change? Why or why not? If we collected hand span data from your parents, would the most common hand span change? Why or why not? Highlight gaps in the data and ask what it means that there are no dots over a specific number.

As with any new type of graph, students should practice constructing line plots and choosing endpoints and scales based on the data set. Some data can be student-generated. Students like to learn about themselves and the easiest questions to begin with are those that can be answered by each class member contributing one piece of data. Allow students to select a question to ask students in order to collect discrete data (such as number of pets, or number of siblings).

Together, create a tally sheet and line plot from the data. Here is an example.

<table>
<thead>
<tr>
<th>Pets</th>
<th>Tally</th>
<th>Number of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>#</td>
<td>9</td>
</tr>
</tbody>
</table>

As with any new graph type, give students plenty of opportunities to design a question, survey classmates, record responses, construct a line plot, and interpret the results of the displayed data.

Have students use grid paper and rulers to construct line plots. This helps them to see the connection between these measurement tools and reduces the motor skills required to make neat columns of dots. You want students to see that a number line is a measurement model and to have them develop strategies related to determining distances, relative positioning of numbers, and reference points for missing values.

Plan experiences and reflections that allow students to practice reasoning about data.