

DMT COMPANION

Insight 29 · 2026 · for teachers, coaches, and school leaders



UNDERSTANDING LINE PLOTS: CONNECTING DATA, QUANTITIES, AND FREQUENCY

Teaching students to interpret values, frequencies, and units on a line plot

How to Use This

This Companion is for teachers, coaches, and school leaders working with DMT Insight 29. It provides worked examples with count and measurement data, questions that reveal how students interpret a line plot, and ways to use student responses as evidence to plan instruction.

Key Idea • The position of an X shows a data value. The number of Xs above a value shows its frequency. Students need to interpret both.

Three Guiding Questions

Consider these questions as you plan a lesson and examine student work.

1. What is being counted or measured, and what does each X represent?
2. Can students distinguish a data value, its frequency, and the total number of observations?
3. What do students' explanations reveal about how they interpret the values and frequencies?

Quantities on a Line Plot

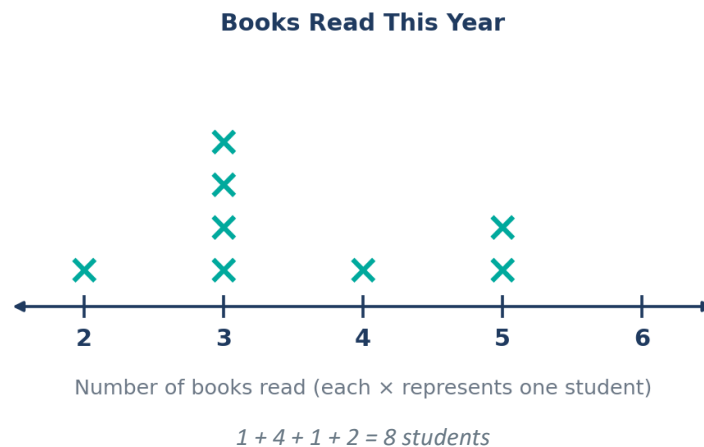
Each quantity describes a different aspect of the data in Example 1.

Quantity	What it describes	In Example 1
Data value	The numerical value of an individual observation	2, 3, 4, or 5 books
Frequency	How many students reported a value	4 students read 3 books
Total frequency	The total number of observations	8 students
Most frequent value	The value reported most often	3 books
Minimum and maximum	The least and greatest observed values	2 books and 5 books
Range	Maximum minus minimum	$5 - 2 = 3$ books
Empty position	A labeled value with no observations	No student read 6 books

Worked Examples

Example 1 • books read: values and frequencies.

Eight students reported how many books they read this year. Each X represents one student's response, and its position shows how many books that student read. The most frequent value is 3 books, the greatest observed value is 5 books, and the total is 8 students. Six appears on the axis, but no student read 6 books.



Questions to ask:

“What does each X represent? What do the numbers on the axis represent?”

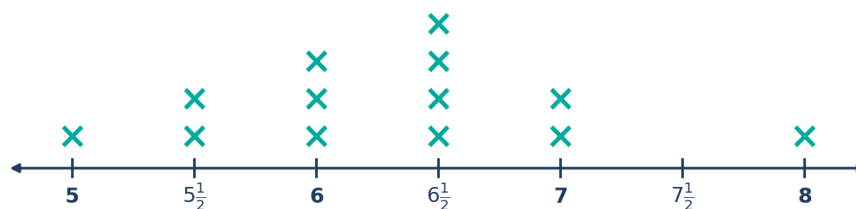
“Which value occurs most often? What is the greatest number of books reported?”

“How many students read 6 books? What does the empty position tell us?”

Example 2 • pencil lengths: units and equal intervals

Students measure their pencils to the nearest half inch. Each 1-inch unit is partitioned into two equal intervals, with each interval representing one-half inch. Thirteen pencils are represented. The most frequent length is $6\frac{1}{2}$ inches, the minimum is 5 inches, the maximum is 8 inches, and the range is 3 inches. No pencil measured $7\frac{1}{2}$ inches.

Pencil Lengths



Length to the nearest half inch (each X represents one pencil)

Each interval represents one-half inch. Each X represents one pencil.

Questions to ask:

“What is the unit? How was each inch partitioned?”

“How many pencils measured 6 1/2 inches? How do you know?”

“What is the range? Which values did you use?”

Example 3 • connecting the data, a frequency table, and the line plot

Students examine the original data (3, 5, 2, 3, 4, 3, 5, 3), a frequency table, and the corresponding line plot. Ask them to explain how each representation shows the same eight observations. The order of these representations can change with the lesson’s purpose.

Books read	2	3	4	5	6
Frequency	1	4	1	2	0

Questions to ask:

“Where is each of the 8 observations in the table? In the line plot?”

“Why does 6 have a frequency of 0?”

Key Idea • Data, frequency tables, and line plots organize the same observations. Ask students to explain how each one shows the values and frequencies.

What Student Responses Can Show

A response is evidence to examine. Ask the student to explain before deciding what instruction should follow.

Student response	What to investigate	Possible teacher response
Says there are 5 students	Whether the student counted axis values instead of Xs	Ask what each X represents and count the Xs together
Says 3 is the greatest number of books	Whether the student is using frequency for the value	Ask which value has the most Xs and which is the greatest value reported
Says 6 is the maximum	How the student interprets a labeled value with no Xs	Ask which values have Xs above them and which is the greatest observed value
Places a 6 1/2-inch pencil at the wrong tick mark	How the student interprets the equal intervals	Ask how each inch was partitioned and what one interval represents

Questions That Extend Mathematical Reasoning

Questions about answers are important. Also ask students to explain the units, quantities, and relationships behind their work.

Instead of only	Also ask
"How many read 3 books?"	"How do you know? What does each X represent?"
"What is the most?"	"Do you mean the most frequent value or the greatest value?"
"Make a line plot."	"What will each X represent? How will you label the axis?"
"What is the range?"	"Which observed values did you use, and why?"

Across the Grades

Across grade levels, the data and the scale change. The relationship between values and frequencies stays the same.

Grade band	Data	Scale	Mathematical focus
Grades 2–3	Whole-number counts and measurements to whole units or halves	Whole units and halves, as appropriate	What each X represents and how values are counted
Grades 4–5	Measurements involving fractional units	Halves, fourths, and eighths	How units are partitioned and how frequencies are represented
Grades 6–8	Numerical data sets and dot plots	Scale selected for the data	Distribution, center, spread, and variation

For Coaches

Coaches can work with teachers to select data sets, examine how students interpret values and frequencies, and identify instructional responses based on student work.

Questions for a coaching conversation:

- Which quantities did students distinguish, and which did they confuse?
- How did students explain what each X represents?
- Where did measurement data connect the line plot to units and equal intervals?
- What do the student responses suggest for the next lesson?

For School Leaders

School leaders can support this work by giving teachers time to examine student responses, coordinate measurement and data instruction across grades, and use assessments that require both accurate calculations and explanations of mathematical relationships.

Read DMT Insight 29 at mathsuccess.io/dmtinsights.