

DMT COMPANION

Insight 9 · 2024 · for teachers, coaches, principals, and families



NUMBER LINES AND 100S CHARTS

How to Use This

This Companion is for anyone working with DMT Insight 9. Start with the three questions that follow. Answer them before you read the Insight or watch the video, then come back and answer them again. Coaches can open a team meeting with the same three questions, and use the worked examples to keep the conversation close to the classroom.

Key Idea • Answer the three questions first, then read. The gap between your two answers is the point of the Companion.

Three Guiding Questions

Answer these before you read the Insight or watch the video, then again afterward.

1. When your students use a 100s chart, are they reasoning about ten more, or following a movement on the chart?
2. When your students use a number line, can they say what the unit is and where zero is?
3. For the mathematics you are teaching this week, what relationship do students need to see, and which representation makes it visible?

Before and After: The Shift This Insight Asks For

The shift is from choosing a favorite tool to choosing a representation for the mathematics. In the before, the 100s chart supplies a movement: down one row to add 10. In the after, the student says what the movement means: 37 is ten more than 27, because there are ten ones from 28 to 37.

BEFORE · the chart supplies the rule

21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40

“Move down one row to add 10.”
The movement gives the answer.

AFTER · the student says why

21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40

“37 is ten more than 27.
There are ten ones from 28 to 37.”
The explanation names the quantity, not the movement.

Before: a movement on the chart. After: a relationship between two quantities.

A 100s chart and a number line organize numbers differently. A 100s chart makes counting and base-ten patterns visible. A number line makes magnitude, order, and distance visible. Either one can become a rule students follow when they stop reasoning about quantities.

Key Idea • A representation earns its place when it makes the relationship students need to reason about visible.

Worked Examples: The Model and the Words to Use**Example 1 · the 100s chart, why one row is ten more**

On a 100s chart, each row holds ten

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40

One space to the right
27 to 28: one more.

One row down
27 to 37: ten more,
because each row holds ten.

The pattern is visible. The reason for the pattern still has to be reasoned about.

One space to the right is one more. One row down is ten more, because each row holds ten.

The language to use:

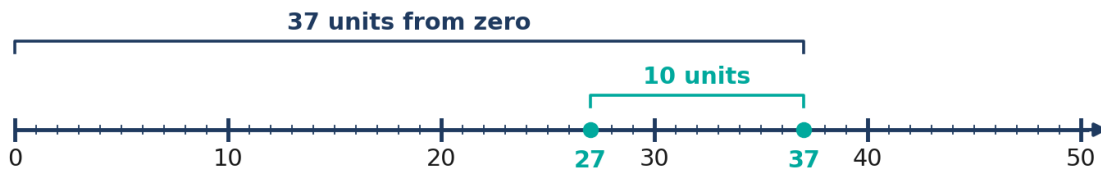
“What changes when you move one space to the right? Why?”

“What changes when you move down one row? How many numbers are in a row?”

“Why is 37 ten more than 27? Show me the ten.”

Example 2 · the number line, where 37 is located

On a number line, 37 is a position, and its distance from zero is its magnitude



37 is 7 units past 30 and 3 units before 40. Equal intervals represent equal units.

37 is located by its distance from zero and from benchmarks. It is 10 units from 27.

The language to use:

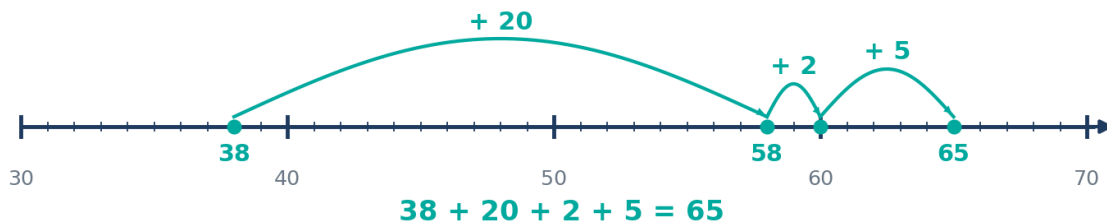
"What is the unit on this number line? Show me 1 unit."

"Where is 37 located? Which benchmarks did you use?"

"How far is 37 from 27? How far is it from 40?"

Example 3 · addition, a starting quantity and a change

38 + 27: a starting quantity, a change, and a result



38 + 27 as a starting quantity, a change decomposed into 20, 2, and 5, and a result. The intervals are drawn to scale.

The language to use:

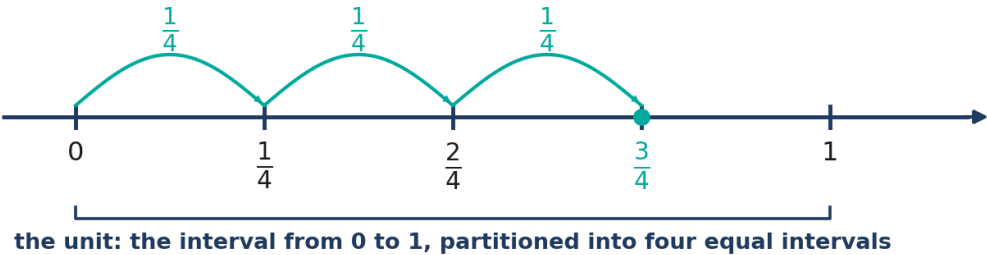
"Where is the starting quantity? What is the change?"

"You added 20, then 2, then 5. Why did you decompose 27 that way?"

"Write the equation that matches your number line."

Example 4 • fractions, partition the unit and iterate it

Partition the unit, then iterate it



The unit from 0 to 1 is partitioned into four equal intervals. Three iterations of one-fourth locate three-fourths.

The language to use:

- “Where is 0? Where is 1? That interval is the unit.”
- “Into how many equal intervals did you partition the unit? What is the size of 1 interval?”
- “How many of those intervals did you iterate from zero to locate three-fourths?”

Key Idea • One model per example, and the words to say alongside it. The questions ask about the unit and the relationship, not the movement.

The Language Shift

Keep this by the board. The left column names a movement or a rule. The right column asks for the relationship.

Instead of	Say
Move down one row to add 10.	Why does moving down one row change the number by ten?
Jump to the next number.	What is the unit? How far is it from this number to that one?
Start at 1.	Where is zero? How far is this number from zero?
Count the tick marks.	Count the intervals. What does each interval represent?
Three out of four.	The unit is partitioned into four equal intervals. How many did you iterate from zero?
Which tool is better?	What relationship do students need to see?

What to look for in a classroom:

- Students naming the unit before they locate a number.
- Number lines with 0 and one benchmark marked, not every position labeled.
- Students explaining why a pattern on the 100s chart occurs.
- The same quantity shown on both representations, with students saying what each one makes visible.

Key Idea • The issue is not the representation. The issue is whether students are reasoning about the relationship it is intended to reveal.

Across the Grades

The number line continues across number systems. The unit and how it is partitioned change, and the questions continue.

Grade band	Example	Model	The shift it asks for
Grades K-2	Locating 37 relative to 30 and 40, and explaining why 37 is ten more than 27	Number line, 100s chart	From following a movement to reasoning about one more and ten more
Grades 3-5	Partitioning the unit from 0 to 1 and iterating one-fourth to locate three-fourths	Number line	From counting marks to partitioning and iterating a unit
Grades 6-8	Locating -3 and 2.5 , and finding the distance between two numbers	Number line, double number line	From positions to distance and direction from zero

Key Idea • Students do not need a new representation every time the number system expands. They return to the same questions about the unit, zero, and distance.

Where to Go Next

Read DMT Insight 9 on number lines and 100s charts, and watch the short video. Find both at mathsuccess.io/dmtinsights, along with the rest of the DMT Insights series.

Try this every day for a week. Draw a number line with only 0 and one benchmark marked, and ask where another number belongs and why. Their answers will show you who is reasoning about the unit and who is counting marks.