

DMT COMPANION

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



TEACHING WITH LINEAR MODELS AND 100S CHARTS

Composing ten, adding and subtracting, locating, partitioning, and counting patterns

How to Use This

This Companion is for teachers, coaches, and school leaders working with DMT Insight 9. It shows how DMTI uses bar models as a primary way to represent number relationships and operations, how number lines represent position and distance, and where hundreds charts fit in. The central example, $14 + 10 = 24$, compares all three. Each example includes questions to ask.

Key Idea • Bar models represent quantities and relationships through length. Number lines represent position and distance. Hundreds charts organize the counting sequence.

Three Guiding Questions

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

1. When students add or subtract, does the representation show the quantities and their relationships, or only a movement from one number to another?
2. What is the unit, and what quantities does the bar model or number line represent?
3. For the mathematics you are teaching this week, which representation makes the relationship visible?

What Each Representation Shows

DMTI recommends bar models as a primary representation for number relationships and operations, number lines for position and distance, and hundreds charts for counting sequences and patterns.

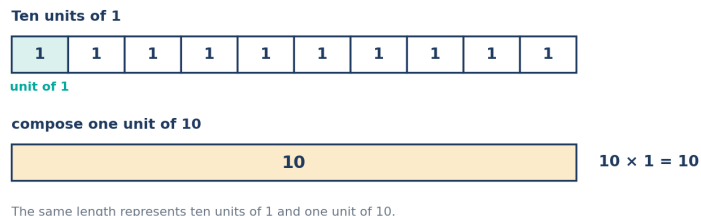
- Bar models: composing and decomposing, addition, subtraction, comparison, multiplication, division, fractions, ratio, and algebra.
- Number lines: position, magnitude, equal intervals, distance, partitioning, and iteration.
- Hundreds charts: counting forward and backward and examining base-ten patterns, not a procedure for addition and subtraction.

For addition and subtraction, DMTI prefers the linear structure of the bar model because it keeps attention on the quantities and their relationship, rather than on movements across rows and columns.

Key Idea • Teach students to represent and reason about quantities, not to navigate a grid to obtain answers.

Worked Examples: The Model and the Words to Use

Example 1 • composing ten, ten units of 1 and one unit of 10



The same length represents ten units of 1 and one unit of 10.

Ten units of 1 compose one unit of 10. The two bars have the same length.

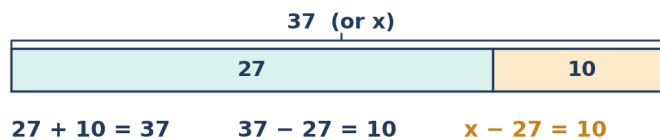
The language to use:

“What is the unit in the top bar? How many units of 1 are there?”

“How does the bottom bar show the same quantity?”

“If you decompose the ten, how many ones do you have?”

Example 2 • addition and subtraction, one bar model



Lengths are proportional: the part of 10 is 10/37 of the total length.

One bar model for $27 + 10 = 37$, $37 - 27 = 10$, and $x - 27 = 10$. The lengths are proportional.

The language to use:

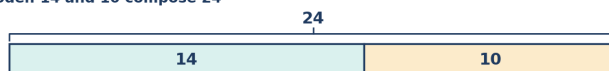
“What are the units and quantities? Which is the total?”

“Write an addition equation and a subtraction equation for this bar model.”

“If the total were unknown, how would you write the equation?”

Example 3 · $14 + 10 = 24$, three representations

Bar model: 14 and 10 compose 24



Number line: 14 and 24 are ten units apart



Hundreds chart (rows 1 to 3 of a 1-100 chart): 14 and 24 are one row apart

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

The bar model and the number line use the same scale. The parts 14 and 10 are proportional to the total of 24, and the interval from 14 to 24 is ten equal units. On the chart, the cells show a base-ten pattern but not these lengths.

The bar model shows 14 and 10 composing 24. The number line shows ten equal units from 14 to 24. The chart shows that 14 and 24 are one row apart, but not the lengths of 14 and 10.

The language to use:

“What are the two quantities? How do 14 and 10 compose 24?”

“How far is 14 from 24 on the number line? How do you know?”

“On the hundreds chart, 14 and 24 are one row apart. What does the bar model show that the chart does not?”

Example 4 · 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.

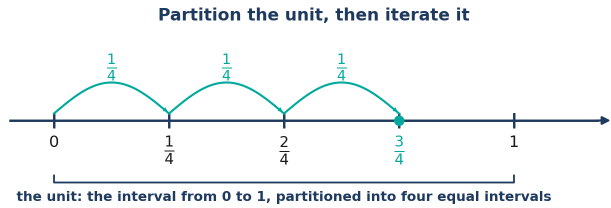
The language to use:

“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 5 • fractions, partition the unit and iterate it

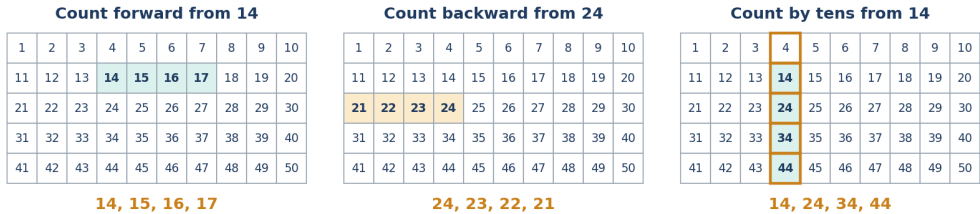


Partition the unit from 0 to 1 into four equal intervals. Three iterations of one-fourth locate three-fourths.

The language to use:

- “Where are 0 and 1? What interval represents the unit of 1?”
- “Into how many equal intervals did you partition the unit of 1? What fractional unit does each equal interval represent?”
- “How many of those intervals did you iterate from zero to locate three-fourths?”

Example 6 • the hundreds chart, counting patterns



Rows 1 to 5 of a 1–100 chart. In the third chart, every number in the outlined column has 4 ones: each row holds ten numbers.

Count forward from 14 and backward from 24. Count by tens from 14. Ask why each pattern occurs.

The language to use:

- “What stays the same as you count down a column? Why?”
- “Count by tens from 14. Why does every number in that column end in 4?”
- “Why does each row hold ten numbers?”

Key Idea • Use bar models and number lines for operations and magnitude. Use the hundreds chart for counting sequences and patterns, not as a procedure for adding or subtracting.

Questions That Focus on Quantities and Relationships

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.	Represent 14 and 10 using a bar model. How do the quantities compose 24?
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 does each representation show about the quantities?

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.
- **Students drawing a bar model before they calculate, and saying what each part represents.**

Key Idea • Ask whether students understand the units and quantities, not only whether they can use the representation.

Across the Grades

The bar model stays familiar while the mathematical relationships become more complex. The number line continues for position and distance.

Grade band	Example	Model	Relationship
Grades K–2	$7 + 3 = 10$; $37 - 27 = 10$	Bar model, number line	Compose parts into a total; compare quantities and find the difference
Grades 3–5	$3 \times 4 = 12$; $3/4 = 1/4 + 1/4 + 1/4$	Bar model, number line	Three iterations of the unit of 4; partition the unit of 1 and iterate one-fourth
Grades 6–8	$3x + 4 = 19$	Bar model	Represent an unknown unit and solve for its value

Key Idea • Students can use the same bar-model structure as the mathematics becomes more complex. They return to the same questions about the unit, the quantities, and their relationship.

For Coaches

Coaches can work with teachers to examine whether students understand the units and quantities in a bar model or number line, and to use student responses as evidence for planning rather than diagnosis.

Questions for a coaching conversation:

- Did students identify the unit and the quantities before calculating?
- Where did students use a bar model to add or subtract, and where did they rely on chart movements?
- How did students explain the relationship between the parts and the total?
- What do the student responses suggest for the next lesson?

For School Leaders

School leaders can support this work by choosing curricular resources that use bar models consistently across grades, giving teachers time to examine student work together, and using assessments that ask students to represent and explain quantities, not just calculate.

Where to Go Next

Read DMT Insight 9 at mathsuccess.io/dmtinsights.

Select an addition or subtraction task from an upcoming lesson. Have students represent the quantities using a bar model before calculating. Ask them to identify the unit, the quantities, and the relationship represented.