

DMT COMPANION

Insight 35 · 2026 · for teachers, coaches, and school leaders



VARIED PRACTICE: CONNECTING MATHEMATICAL REPRESENTATIONS

Three-column tasks that connect contexts, models, language, and symbols

How to Use This

This Companion is for teachers, coaches, and school leaders working with DMT Insight 35 on Varied Practice. It shows three-column tasks across the grades, the questions that make the mathematics explicit, and what to look for in students' responses. Start with the three questions that follow.

Key Idea • Varied Practice asks students to represent one mathematical relationship in a context, a visual model, and an equation with mathematical language, and to explain how the representations correspond.

Three Guiding Questions

Consider these questions as you examine your current practice and student work.

1. When your students solve an equation correctly, can they explain the quantities it represents?
2. Which representation do your students most often have difficulty constructing: the story, the model, or the equation?
3. Do your practice tasks vary the mathematical structure, or only the format?

Three-Column Examples

Each row presents one mathematical relationship. The columns are Contextual (Story or Situation), Iconic (Visual Model), and Symbolic (Equation and Mathematical Language). In these rows, one representation is provided, and students construct the other two. For initial instruction, provide two representations and ask students to construct the third.

The three-column format is a DMTI instructional application informed by research on representations. Its value depends on the relationships the tasks address and on the questions teachers ask about students' responses.

Example from the Insight · comparison subtraction

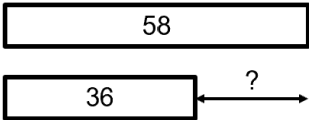
Questions to ask:

For the comparison problem: “What quantities are being compared?”

“What does each part of the bar model represent?”

“How does the model show the difference between 58 and 36?”

“How does the equation $58 - 36 = 22$ represent that same relationship?”

Contextual (Story or Situation)	Iconic (Visual Model)	Symbolic (Equation and Mathematical Language)
There are 58 green apples in one basket and 36 red apples in another basket. How many more green apples are there than red apples?	 A bar model with two horizontal bars. The top bar is labeled '58' and the bottom bar is labeled '36'. A double-headed arrow between the right ends of the bars is labeled with a question mark '?'.	$58 - 36 = 22$ “I compared 58 and 36. There are 22 more green apples than red apples.”

Grades 1–2 · composing and decomposing (addition and subtraction)

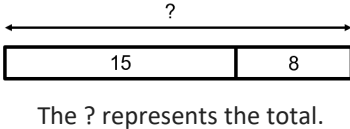
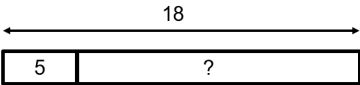
Questions to ask:

For the 15 and 8 bar model: “What does the question mark represent? Is it a part or the total?”

For $24 + 13$: “Where are 24 and 13 in your model? Where is the total?”

For the duck story: “Is 18 a part or the total? What equation shows the missing part?”

For the 18 and 5 bar model: “How is $18 - 5 = 13$ related to $5 + 13 = 18$?”

Contextual (Story or Situation)	Iconic (Visual Model)	Symbolic (Equation and Mathematical Language)
There are 14 red apples on a tree. 9 more apples grow. How many apples are there now?		
	 A bar model with a single bar divided into two sections labeled '15' and '8'. Above the bar is a double-headed arrow labeled with a question mark '?'. Below the bar is the text: 'The ? represents the total.'	
		$24 + 13 = ?$ $24 + 13 = 37$ “I composed 24 and 13 to make a total of 37.”
There are 18 ducks in the pond. 5 ducks are white, and the rest are brown. How many brown ducks are in the pond?		
	 A bar model with a single bar divided into two sections labeled '5' and '?'. Above the bar is a double-headed arrow labeled '18'.	

Contextual (Story or Situation)	Iconic (Visual Model)	Symbolic (Equation and Mathematical Language)
		$39 - 17 = ?$ $39 - 17 = 22$ "I decomposed 39 into 17 and the missing part, 22."

Grades 3–4 • multiplication and division

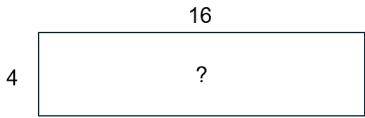
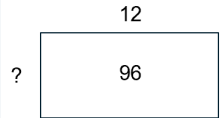
Questions to ask:

For the flower story: "What does one row represent? How is the unit of 6 iterated 15 times?"

For 7×16 : "What unit is iterated? How many times? How could your model show 7×10 and 7×6 ?"

For the van story: "How many students are in each group? How many groups are there? Which number in $48 \div 6 = 8$ tells each?"

For the 96 and 12 area model: "Is 12 the quantity in each group or the number of groups? What does the missing side represent?"

Contextual (Story or Situation)	Iconic (Visual Model)	Symbolic (Equation and Mathematical Language)
A gardener plants 15 rows of 6 flowers. How many flowers in all?		
		
		$7 \times 16 = ?$ $7 \times 16 = 112$ "I iterated the unit of 16 seven times to get 112."
There are 48 students. Each van holds 6 students. How many vans are needed?		
		
		$42 \div 6 = ?$ $42 \div 6 = 7$ "Each group has 6. I found that 42 contains 7 groups of 6."

Grade 5 · fraction multiplication

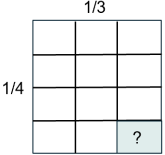
Questions to ask:

For the buns story: “What is the unit of 1? How many buns are in one-fourth of it? In three-fourths?”

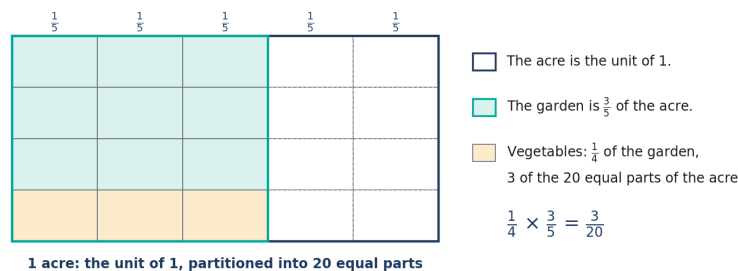
For the number line: “What quantity is the unit of 1? Where is one-fourth of 16?”

For the garden story: “What represents the unit of 1? How is three-fifths of that unit represented? How can we partition three-fifths into four equal parts?”

For the area model: “What represents the unit of 1? What part of the unit of 1 is the cell marked with a question mark?”

Contextual (Story or Situation)	Iconic (Visual Model)	Symbolic (Equation and Mathematical Language)
A baker made 24 buns and sold 3/4 of them. How many buns were sold?		
	 The unit of 1 is 16.	
		$\frac{2}{3} \times 18 = ?$ $\frac{2}{3} \times 18 = 12$ “The unit of 1 is 18. I partitioned 18 into three equal parts. Each part is 6, and two of those parts are 12.”
A garden is 3/5 of an acre, and 1/4 of it is planted with vegetables. What fraction of the acre is vegetables?		
	 The square is the unit of 1.	
		$\frac{1}{2} \times \frac{2}{3} = ?$ $\frac{1}{2} \times \frac{2}{3} = \frac{1}{3}$ “I partitioned two-thirds of the unit of 1 into two equal parts. One of those parts is one-third of the unit of 1.”

In the garden problem, the acre is the unit of 1. The garden is three-fifths of that unit, and the vegetable area is one-fourth of the garden. The quantity being partitioned, three-fifths of an acre, is not the unit of 1. Partitioning each fifth into four equal parts partitions the acre into 20 equal parts, and the vegetable area is 3 of them: $\frac{1}{4} \times \frac{3}{5} = \frac{3}{20}$.



The acre is the unit of 1. One-fourth of three-fifths of the acre is three-twentieths of the acre.

The Language Shift

Instead of only	Also ask
"What is the answer?"	"What does each number represent?"
"Draw a picture."	"Draw a model that shows how the quantities are related."
"Write a story."	"Write a situation this equation represents. Which relationship does your story show?"
"Does your model match?"	"Where is 36 in your model? Where is the difference?"

For Coaches

Coaches can plan a set of three-column tasks with teachers and then examine student responses together. Sort the responses by the relationship students represented, not only by whether the answer is correct.

Questions for a coaching conversation:

- Which column did students have the most difficulty constructing? Why might that be?
- Did the tasks vary the mathematical structure, or only which column was given?
- What did students' explanations show about the units and quantities?
- Which responses would be useful to compare in the next lesson?
- What mathematical relationship needs further development, and what task or representation would help students examine it?

For School Leaders

Varied Practice complements explicit instruction and procedural practice; it does not replace them. Leaders can support it by protecting time for teachers to plan tasks together and examine student work, and by looking for explanation, not just accuracy, during classroom visits.

Key Idea • The goal is not the number of representations students produce. It is whether they understand and can use the relationships those representations show.

Read DMT Insight 35 on Varied Practice at mathsuccess.io/dmtinsights.