

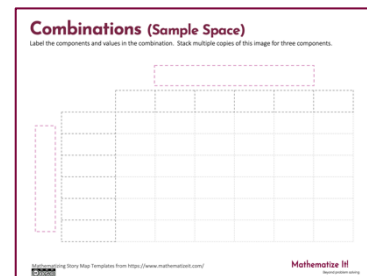
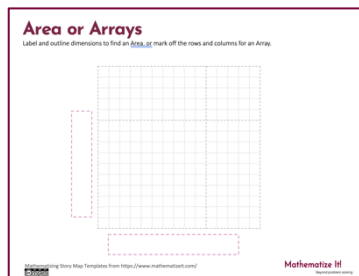
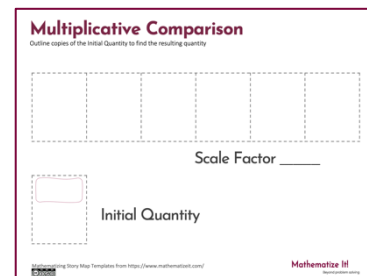
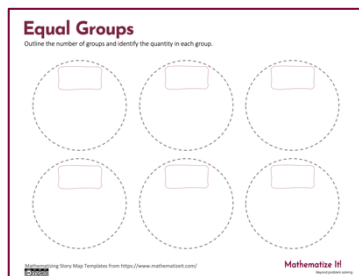
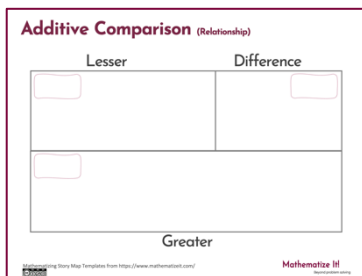
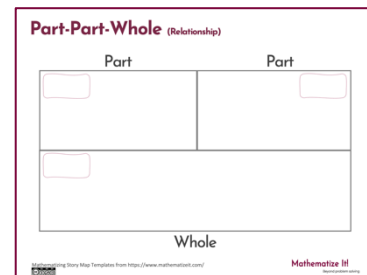
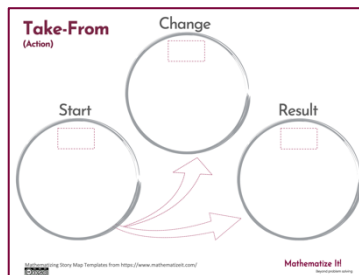
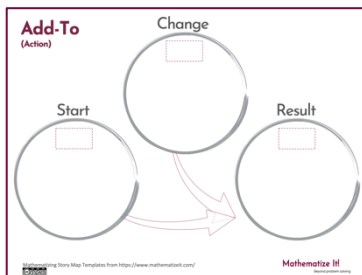
# #18 Carlos Takes the Lead



Area and Array  
Both Dimensions  
Unknown

Making sense of word problems with mathematical comprehension & operation sense.

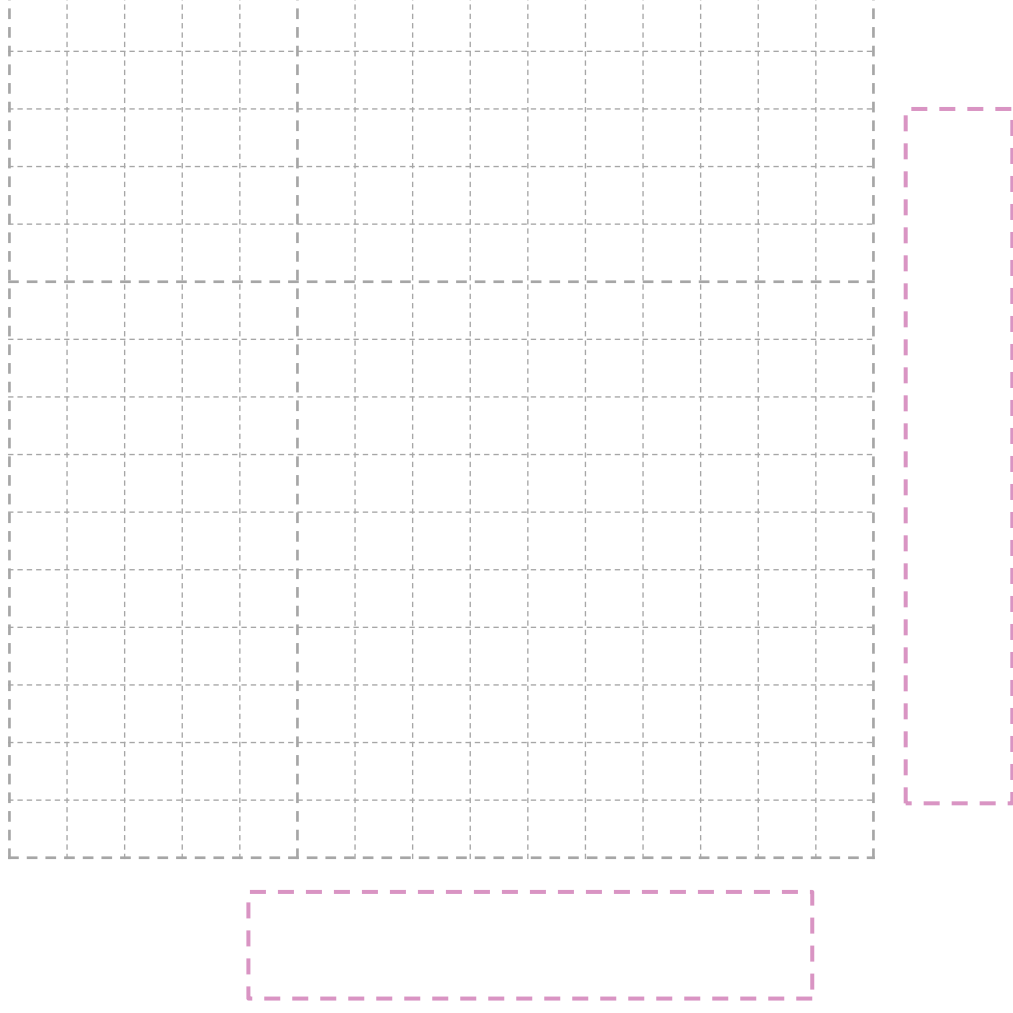
## Mathematizing Story Maps



# Mathematize It!

# Area or Arrays

Label and outline dimensions to find an Area, or mark off the rows and columns for an Array.



# ... Mathematizing Story Maps ...

How do your students approach word problems?

**Key words** don't always help. What are we supposed to underline in **CUBES** anyway?

Sometimes it feels like students just pick an operation and they don't know why!

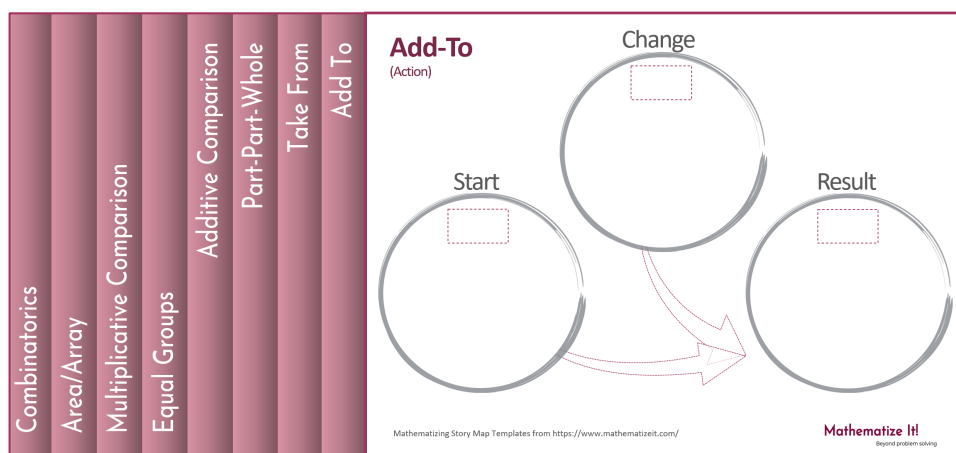
These strategies don't prepare students to formulate and solve **problems that matter** to them.

...  
Prepare students to DO math!  
...

## Teacher Background

Mathematizing Story Maps encourage students to **model** with mathematics and find the math in their everyday lives. Opening stories are written to engage students first in thinking about the **story** and then about the mathematics.

Mathematizing Story Maps help students understand what the four familiar operations (+ - × ÷) can do. The more students know about how we use subtraction or when we use division, the more skills they will have to match a strategy to a problem.



Mathematizing Story Maps by Sara Delano Moore & Kimberly Morrow-Leong

Find more at [mathematizeit.com](https://www.mathematizeit.com)



**Mathematize It!**

Beyond problem solving

## How to teach the Mathematizing Story Maps

1. **Read the story**
  - a. Think about how your students might respond. What's familiar? What's not?
  - b. What mathematics is seen in the story? How might students **represent their thinking**?
2. **Choose tools you have and that students know.**
  - a. What **manipulatives** might your students use to represent the mathematics in the story? Consider counters, base ten materials, fraction tools, or more!
  - b. What **visual representations** might your students know (ten frames, number tracks, number lines, grid paper, etc.)
3. **Choose a Mathematizing Story Map**

We share a mathematizing story map for each of 8 categories of problem situations.



Mathematizing Story Maps help students act out or represent what is happening in a problem and make sense of it.



## What will students do?

Most word problems (story problems) students encounter support their calculation skills. We need to build their understanding of **how to use math** to solve real problems.

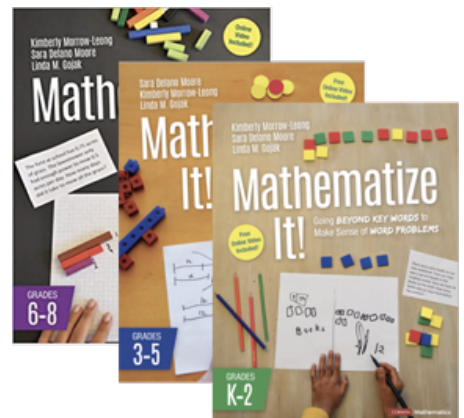
- Find the story behind every mathematical problem situation
- Use one of 8 Mathematizing Story Maps to act it out or show
- Represent the story and choose an operation (+ – × ÷) that matches the story.
- **Resist answer-getting.** We pay attention to the process of solving problems

## What's included?

Each mathematizing story map lesson includes:

- Teaching notes on 8 categories of problem situations.
- Teaching notes for the Mathematizing Story Maps
- A set of questions to pose that focus students on the mathematizing story.

To read more about problem situations and the four operations, check out the [Mathematize It!](#) book series.



Mathematizing Story Maps by Sara Delano Moore & Kimberly Morrow-Leong

Find more at [mathematizeit.com](http://mathematizeit.com)



**Mathematize It!**

Beyond problem solving

# Teacher Notes

## Mathematizing Story Maps

### Carlos Takes the Lead



#### Problem Type

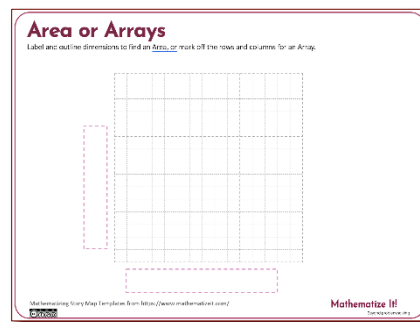
This story supports developing mathematical ideas around the Area/Array work of multiplication. Area/Array problem situations may be better thought of as moving from two measures of linear dimension (feet, yard, cm, m, km) that combine to make a new unit of measure. Instead of measuring a line, as a single dimension does, area is measured with a square. An array is similar because a new unit is named where a row and column meet, yet it isn't called either of those names: it's a cell, a square, etc.. Area/Array problem situations describe the creation of something new.

#### Missing Element

In this story, both factors are unknown. Students know the total product, including its unit of measure. They must identify one or more possible combinations of factors, including units, which combine to make the given quantity and form the new unit of measure.

#### The Mathematizing Story Map

The Mathematizing Story Map provided supports students' understanding of Area & Array multiplication. The map shows the dimensions on each side of the array, and the number of individual squares represents the total quantity of the new (square) unit of measure. This is the product.



Asymmetric Situations	Equal Groups (Ratio/Rate)	Product Unknown	Number of Groups (Multiplier) Unknown	Group Size (Measure) Unknown
	Multiplicative Comparison	Resulting Value Unknown	Scale Factor Unknown	Original Value Unknown
Symmetric Situations	Area/Array	Product Unknown	One-Dimension Unknown	Both Dimensions Unknown
	Combinatorics	Sample Space (Total Outcomes) Unknown	One Factor Unknown	Both Factors Unknown

Mathematizing Story Maps by Sara Delano Moore & Kimberly Morrow-Leong

Find more at [mathematizeit.com](http://mathematizeit.com)



**Mathematize It!**

Beyond problem solving

## Day 1

Read the story at least once with your class. Talk about the story and support your students as they make sense of the events in the story as you would for any narrative.

Then encourage students to find the mathematics in the story with questions like these:

- *What are the units of measure shown in this situation?*
- *For each factor, what is the unit? What will be the unit of the product?*

You may wish to use the [Three Reads Strategy](#) (p.15) to support student understanding of the text itself.

If students start calculating numbers right away, particularly if they are “number-plucking” or randomly doing calculations, refocus their attention on the relationship in the story.

Encourage students to use manipulatives as they work on the Mathematizing Story Map to show the relationship that is in the story. Label the quantities and their units. Before ending for the day, give students the opportunity to record their thinking on paper.

To focus on the story, create a [numberless word problem](#). Remove the numbers from the story as the class discusses it.

Encourage students to use manipulatives and visuals to show their thinking about the math in the story. Students should translate their work from manipulatives and sketches to the mathematical story map.

## Day 2

Reread the story and use the Mathematizing Story Map to retell it and act it out. Ask your students to translate their actions on the Mathematizing Story Map into an equation. Each student should be able to connect the elements of the story map to the narrative. Discuss the **quantities** in the story and what strategies students might use to find an answer to the question they have asked. Ask students to consider other mathematical stories (or variations on the current story) they can see in this narrative.

**Area or Arrays**  
Label and outline dimensions to find an Area, or mark off the rows and columns for an Array.

$4 \times 8 = 32$   
 $2 \times 16 = 32$

**Area or Arrays**  
Label and outline dimensions to find an Area, or mark off the rows and columns for an Array.

And  $8 \times 4$   
 $16 \times 2$   
 $32 \times 1$

## Day 3

Use the mathematizing story map to support solving the word problems provided. Take time for reading comprehension (does the story make sense?) before mathematical comprehension (what is happening in the story?) These questions can help students develop mathematical comprehension.

- *What are the units of measure shown in this situation?*
- *For each factor, what is the unit? What will be the unit of the product?*

Encourage your students to use manipulatives and visuals to show their thinking about the math happening in each problem. Students should translate their work from manipulatives and sketches to the mathematical story map.

## Days 4-5

Choose one or more of these options to continue developing student thinking.

- Continue working on the problems provided, focusing on the story map as a tool to develop mathematical comprehension and operation sense.
- Lead a discussion among students focusing on how the story map fits the narrative and problems provided. Use these questions to focus thinking on the job Area & Array is doing in these situations:
  - *How are the linear units of measure related to the square units of measure?*
  - *What number sentence(s) can you write to show these relationships?*
- Ask students to develop new narratives or problems, either from scratch or as extensions of the current storyline, which can also be told using the same mathematical story map. Encourage students to explain the underlying connections which make the mathematics similar even if the story contexts are not the same.

To read more about problem situations and the four operations, check out the *Mathematize It!* book series.



---

Mathematizing Story Maps by Sara Delano Moore & Kimberly Morrow-Leong

Find more at [mathematizeit.com](http://mathematizeit.com)



**Mathematize It!**

Beyond problem solving

## Carlos Takes the Lead Practice Problems

Use objects, pictures, numbers, and words to describe what is happening in each problem. Use a mathematizing story map to record your thinking.

Amanda thought about the fruit she arranged for the snack table. She made rows of 8 pieces out of the 48 pieces of fruit because that's how Mr. Franklin got them started. She wondered how many other ways there were to arrange the 48 pieces of fruit. How many could she find?

Tyler's school was getting a new parking lot for the teachers and staff. They were going to have 60 spaces so there would be some extra for visitors. Parking spaces are always arranged in a grid. Tyler wondered how many possible ways there were to arrange the 60 spaces and which way made the most sense for his school. For now, he decided not to worry about the driving lanes.

Carlos was excited. The percussion section of the high school marching band was going to perform at the start of the fundraiser. Carlos wanted to play the big drum in the band when he got to high school. There would be 24 percussionists walking. How many ways could they arrange themselves walking down the track?



## Carlos Takes the Lead Practice Problems

Use objects, pictures, numbers, and words to describe what is happening in each problem. Use a mathematizing story map to record your thinking.

Amanda thought about the fruit she arranged for the snack table. She made rows of 8 pieces out of the 48 pieces of fruit because that's how Mr. Franklin got them started. She wondered how many other ways there were to arrange the 48 pieces of fruit. How many could she find?

**Area or Arrays**  
Label and outline dimensions to find an Area, or mark off the rows and columns for an Array.

fruit	
rows	columns
6	8
3	16
12	4

what else?

Tyler's school was getting a new parking lot for the teachers and staff. They were going to have 60 spaces so there would be some extra for visitors. Parking spaces are always arranged in a grid. Tyler wondered how many possible ways there were to arrange the 60 spaces and which way made the most sense for his school. For now, he decided not to worry about the driving lanes.

**Area or Arrays**  
Label and outline dimensions to find an Area, or mark off the rows and columns for an Array.

60 Parking Spaces

$1 \times 60 = 60$   
 $2 \times 30 = 60$   
 $3 \times 20 = 60$  *is that all?*  
 $4 \times 15 = 60$   
 $5 \times 12 = 60$   
 $6 \times 10 = 60$

Carlos was excited. The percussion section of the high school marching band was going to perform at the start of the fundraiser. Carlos wanted to play the big drum in the band when he got to high school. There would be 24 percussionists walking. How many ways could they arrange themselves walking down the track?

**Area or Arrays**  
Label and outline dimensions to find an Area, or mark off the rows and columns for an Array.

Drums!

$4 \times 6$   $6 \times 4$   
 $3 \times 8$   $8 \times 3$   
 $2 \times 12$   $12 \times 2$   
 $1 \times 24$   
 $24 \times 1$

Area and Array Situations, Both Dimensions Unknown

Mathematizing Story Maps by Sara Delano Moore & Kimberly Morrow-Leong

Find more at [mathematizeit.com](http://mathematizeit.com)



**Mathematize It!**

Beyond problem solving