

#16 Amanda Marks the Event

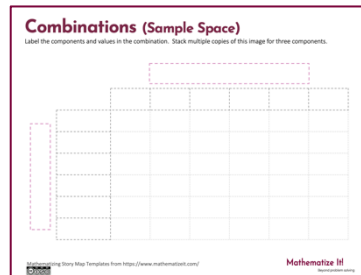
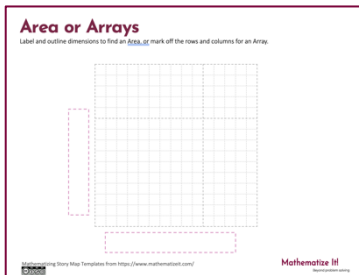
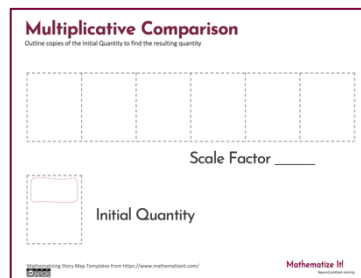
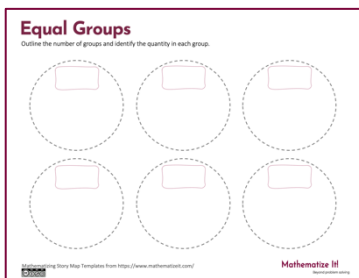
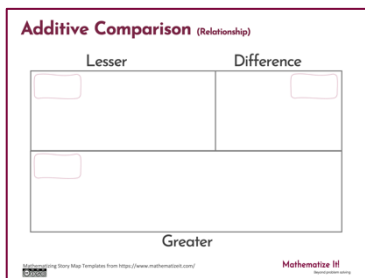
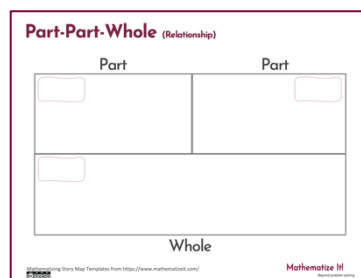
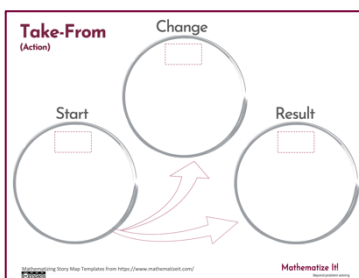
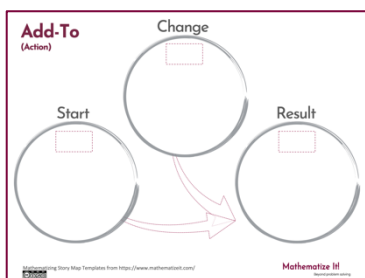
Area and Array

Product Unknown

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



Mathematizing Story Maps



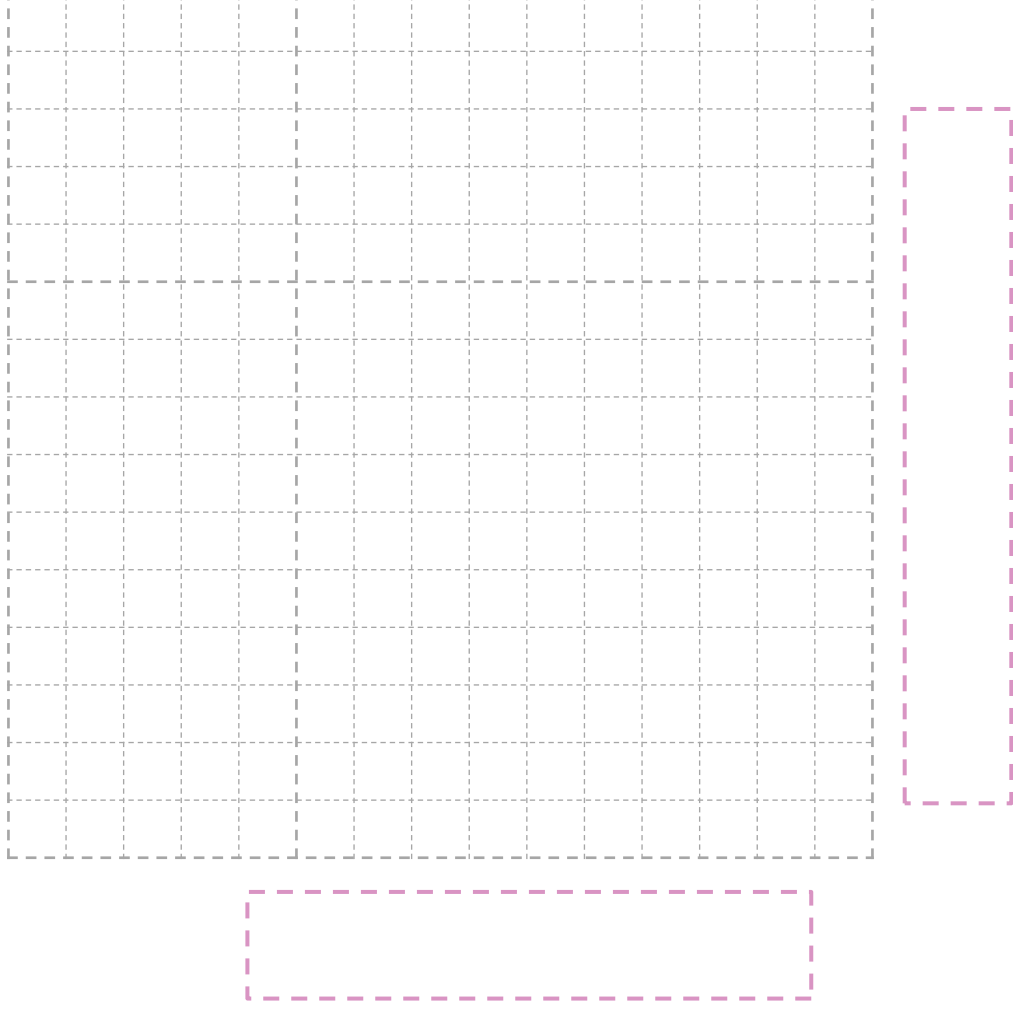
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Area or Arrays

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!

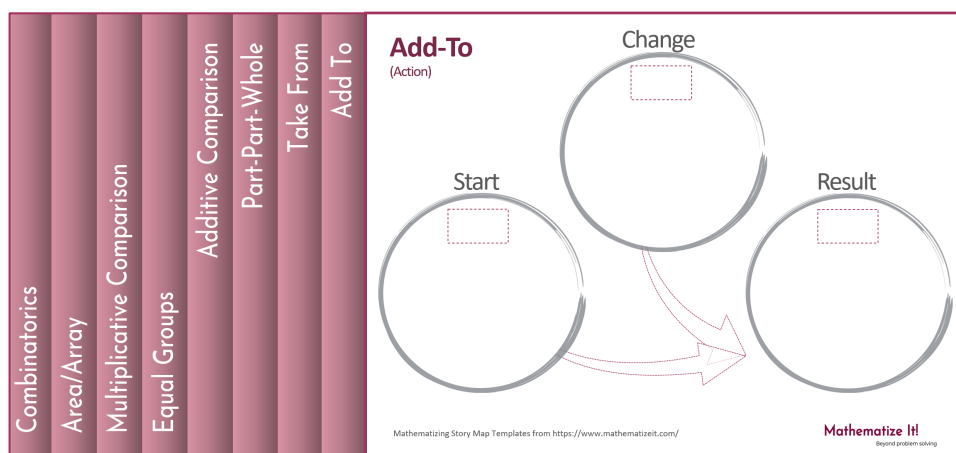
These strategies don't prepare students to formulate and solve **problems that matter** to them.

...
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)



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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.

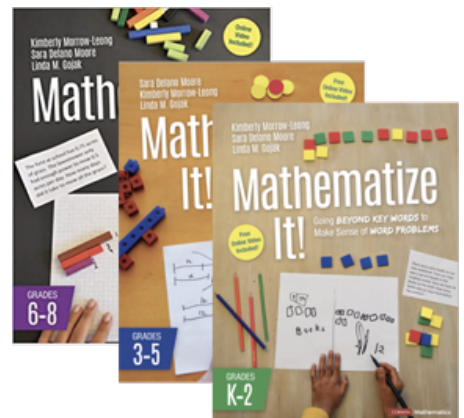
- Find the story behind every mathematical problem situation
- Use one of 8 Mathematizing Story Maps to act it out or show
- Represent the story and choose an operation (+ – × ÷) that matches the story.
- **Resist answer-getting.** We pay attention to the process of solving problems

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.



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Teacher Notes

Mathematizing Story Maps



Amanda Marks the Event

Problem Type

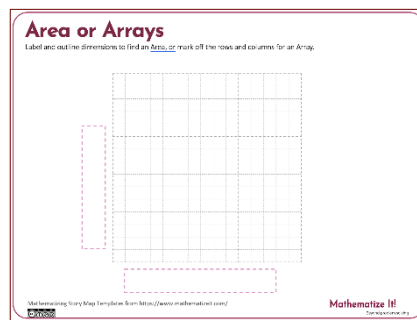
This story supports developing mathematical ideas around the Area/Array work of multiplication. Area/Array problem situations may be better thought of as moving from two measures of linear dimension (feet, yard, cm, m, km) that combine to make a new unit of measure. Instead of measuring a line, as a 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, the product is unknown. It represents the total quantity of the new square units. Students know two quantities measured in the same unit (the dimensions of a rectangle in square inches, for example) and are asked to find the total quantity of the new unit that is made from multiplication (area in square inches, for example).

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

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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?*

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.

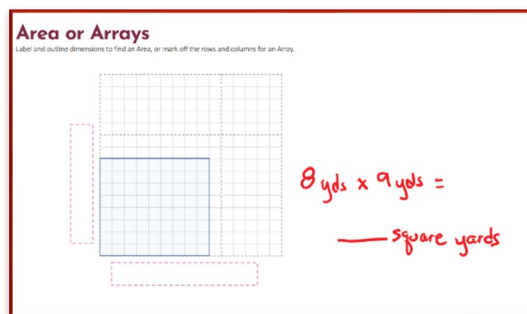
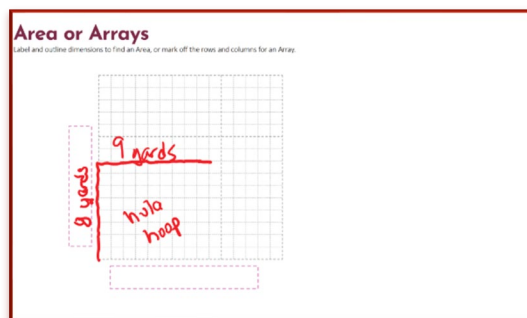
Encourage students to use manipulatives and visuals to show their thinking about the math in the story. Students should translate their work from manipulatives and sketches to the mathematical story map.

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.

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

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



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.



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Beyond problem solving

Amanda Marks the Event 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.

Carlos looked at the parking lot and wondered about the size of each parking space. His mom uses a wheelchair so she needs an even bigger space for their van. He grabbed a tape measure and measured the handicapped parking space. It was 8 feet wide, with another 5 feet for the extra access aisle beside a handicap spot. The space was 18 feet long. How many square feet does the parking space and access aisle occupy? Is it big enough for the family van?

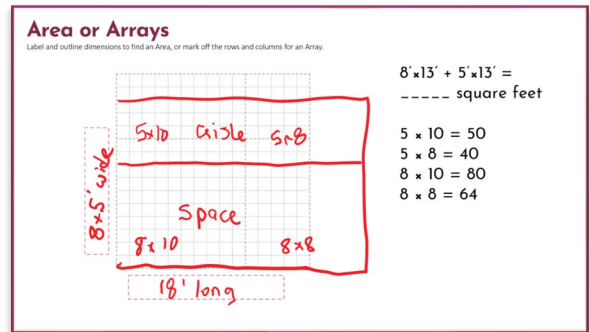
Tyler was figuring out the spreadsheet to keep track of the winner of each of the events. There were 5 events and he had to decide whether those were rows or columns in the spreadsheet. Each event had 7 heats, represented by either rows or columns. How many cells were required to log the winner of each heat in each event?

After marking the hula hoop space, Amanda went on to mark the space for the paper airplane contest. They were going for the greatest distance so they needed a long & skinny space. The space was 3 meters wide, so each person had 1 meter width to stand in and throw. Amanda marked a space 40m long, breaking it up every 10m so it would be easier to estimate distance. How much space did the airplane throw use? Amanda hoped it was long enough.

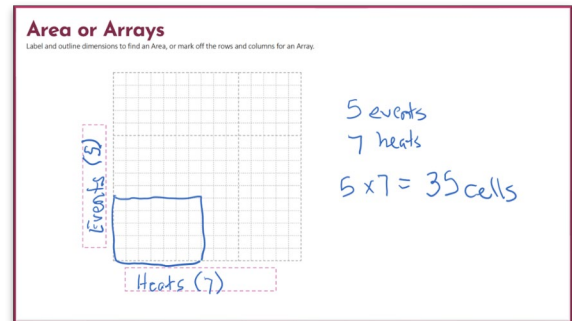
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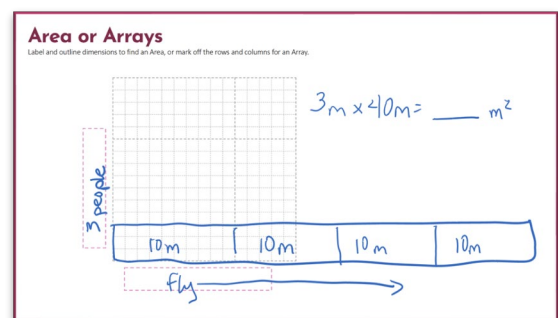
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Area and Array Situations, Product Unknown

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