

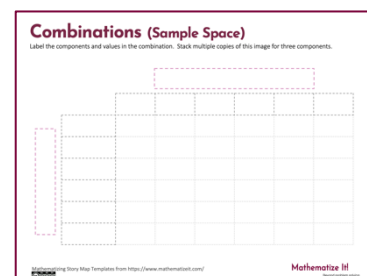
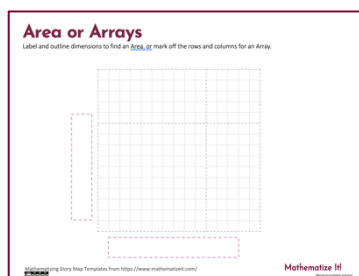
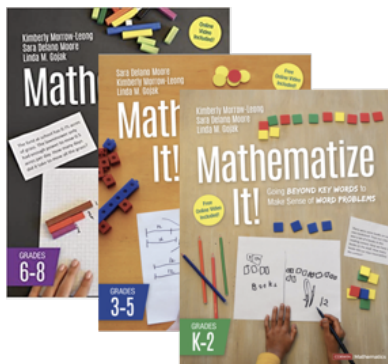
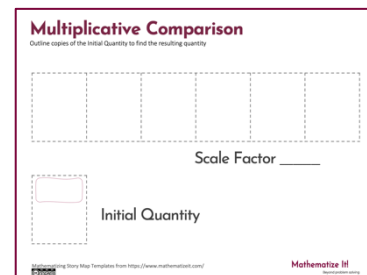
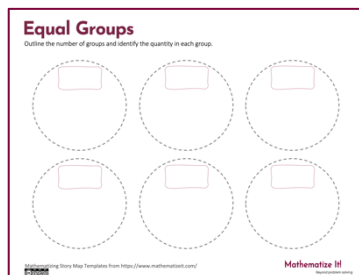
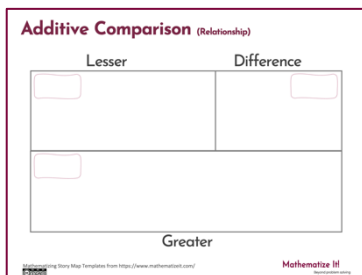
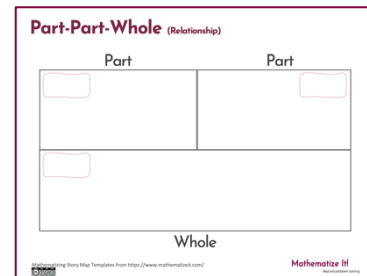
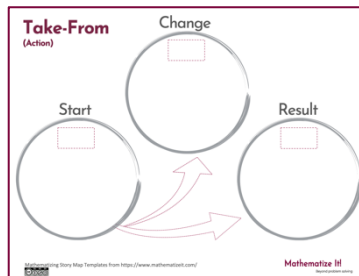
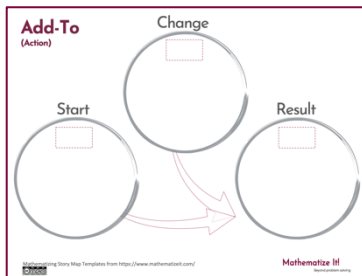
# #15 Metal Man



Equal Groups  
Measure Unknown

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

## Mathematizing Story Maps



## Mathematize It!

Beyond problem solvin

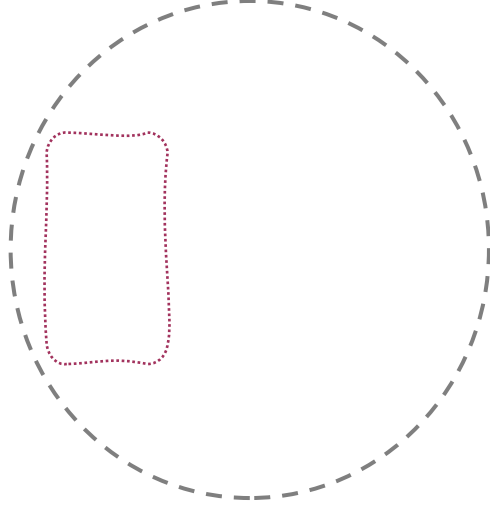
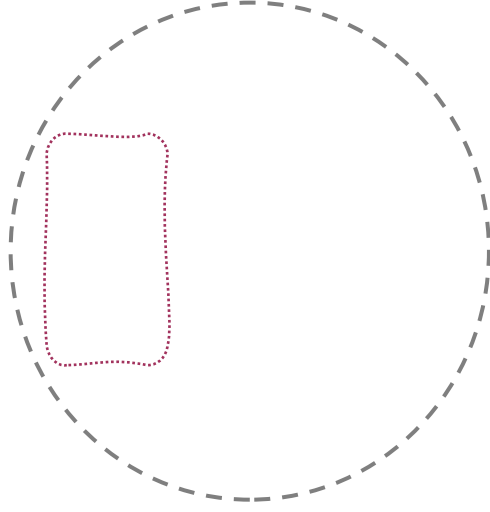
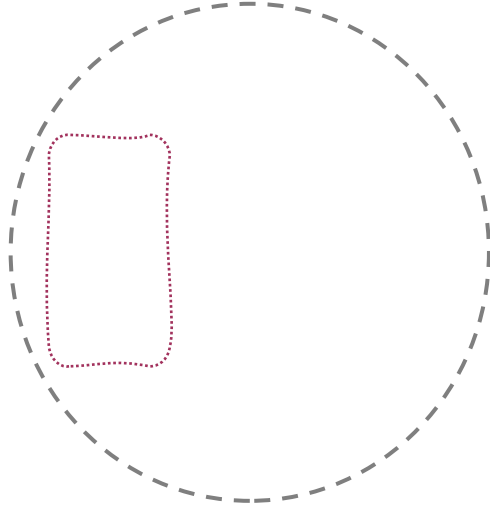
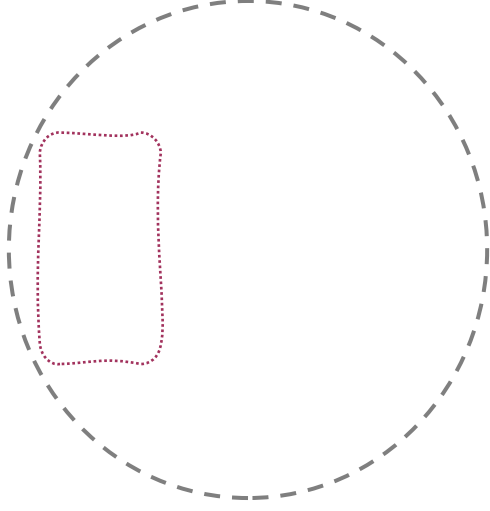
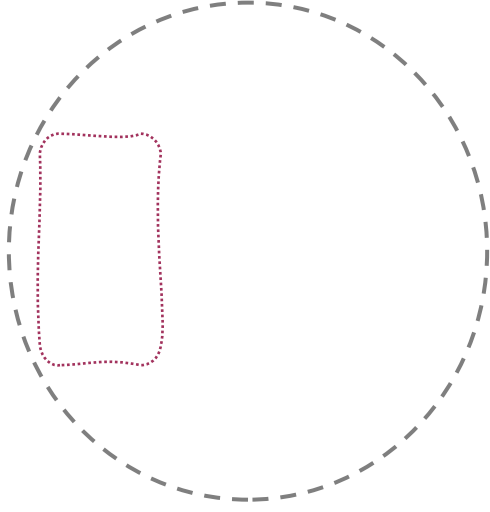
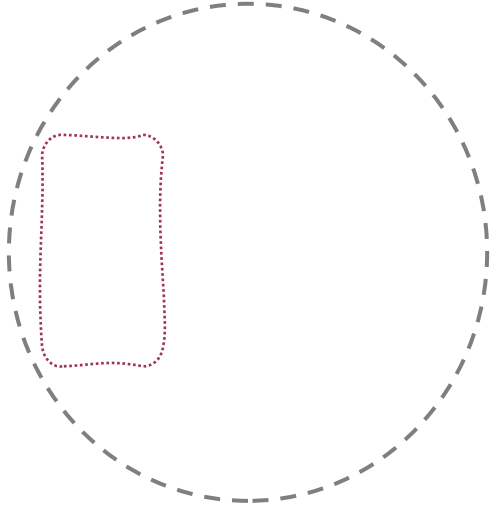


Sara Delano Moore and Kimberly Morrow-Leong

Mathematizing Story Map Templates from <https://www.mathematizeit.com/>

# Equal Groups

Outline the number of groups and identify the quantity in each group.



# ... 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!

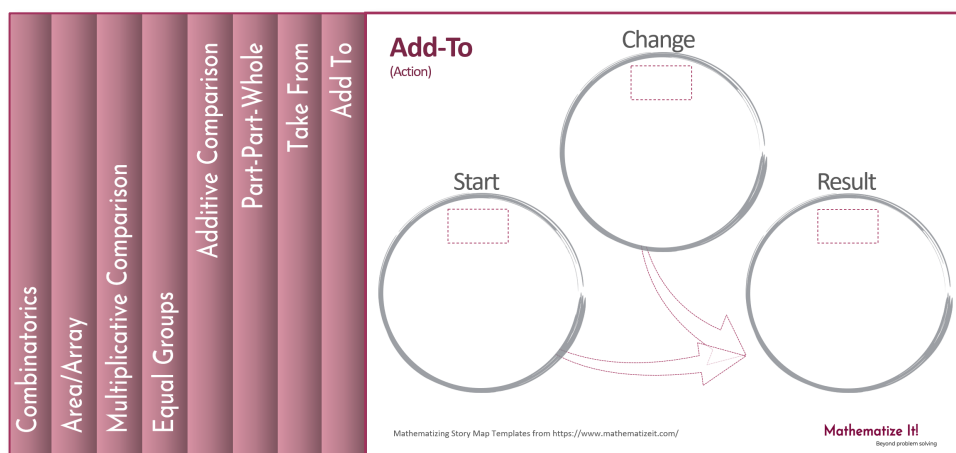
These strategies don't prepare students to formulate and solve **problems that matter** to them.

...  
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.

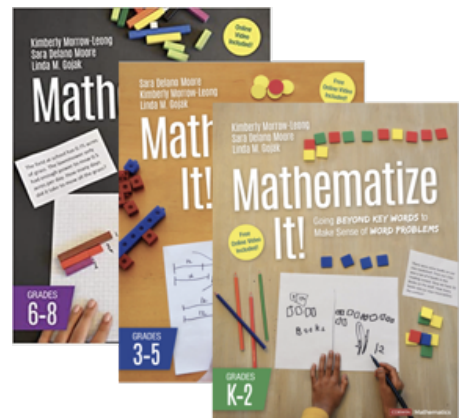
- Find the story behind every mathematical problem situation
- Use one of 8 Mathematizing Story Maps to act it out or show
- Represent the story and choose an operation (+ – × ÷) that matches the story.
- **Resist answer-getting.** We pay attention to the process of solving problems

## 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.



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# Teacher Notes

## Mathematizing Story Maps



### Metal Man

#### Problem Type

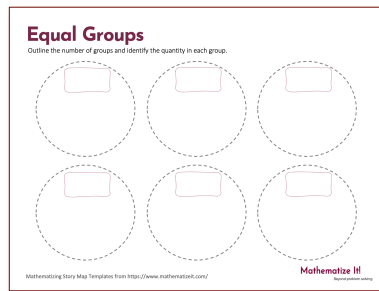
This story supports developing mathematical ideas around the Equal Groups job of multiplication. Equal Groups situations describe the combining of multiple copies of a set or multiple groups of the same quantity. In this situation, the two factors do different jobs; one represents the number of groups (the multiplier) and one represents the size of each group (the measure).

#### Missing Element

In this story, the measure (size of each group) is unknown. Students know the number of groups and the total quantity; they must find the size of each group created within these parameters.

#### The Mathematizing Story Map

The Mathematical Story Map provided supports Equal Groups job of multiplication by representing both the number of groups (the circles) and the size of each group (identified inside the circle).



Multiplication & Division Problem Situations				
<b>Asymmetric Situations</b>	<b>Equal Groups (Ratio/Rate)</b>	Product Unknown	Number of Groups (Multiplier) Unknown	Group Size (Measure) Unknown
	<b>Multiplicative Comparison</b>	Resulting Value Unknown	Scale Factor Unknown	Original Value Unknown
<b>Symmetric Situations</b>	<b>Area/Array</b>	Product Unknown	One-Dimension Unknown	Both Dimensions 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 groups in the story?*
- *What is the size of each group?*
- *How many groups are there?*
- *What is the total quantity represented in the situation?*

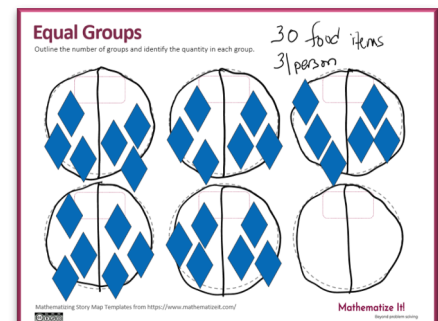
If students start calculating numbers right away, particularly if they are “number plucking” or randomly doing calculations, refocus their attention on the role of each factor in the story.

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.

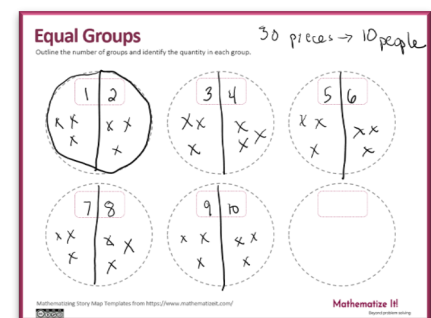
Encourage students to use manipulatives as they work on the Mathematizing Story Map to show the relationship that is in the story. Label the quantities and their units, both the number of groups and the size of each group. Before ending for the day, give students the opportunity to record their thinking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



## 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 groups in the story?*
- *What is the size of each group?*
- *How many groups are there?*
- *What is the total quantity represented in the situation?*

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 multiplication is doing in these situations:
  - *Where do you see groups in the story? How big are the groups?*
  - *How does the story map represent each group?*
  - *Where do you see the total on the story map?*
  - *What do you know and what are you trying to figure out?*
- 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!](https://www.mathematizeit.com) book series.

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**Mathematize It!**

Beyond problem solving

## Metal Man 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.

The market sells big bags of rice. Limar helped Ninang Janet carry 4 of them into the house. “That’s 20 pounds of rice! I needed your help.” Limar wonders how much each bag of rice weighs.

Limar’s older sister is sorting school supplies to get ready for the new year. She finds a box of 36 pencils to share with Limar since their little sister Alisa isn’t in school yet. How many pencils will each child have for school?

Limar helps his Ninong Troy feed the neighborhood cats. They put out 3 cans of food each evening. If one case of food has 24 cans, how many nights will one case last? Is it at least a week?



## Metal Man 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.

The market sells big bags of rice. Limar helped Ninang Janet carry 4 of them into the house. "That's 20 pounds of rice! I needed your help." Limar wonders how much each bag of rice weighs.

**Equal Groups**  
Outline the number of groups and identify the quantity in each group.

4 bags  
20 pounds rice

Mathematizing Story Map Templates from <https://www.mathmatizeit.com/>

Mathematize It!

Limar's older sister is sorting school supplies to get ready for the new year. She finds a box of 36 pencils to share with Limar since their little sister Alisa isn't in school yet. How many pencils will each child have for school?

**Equal Groups**  
Outline the number of groups and identify the quantity in each group.

36 pencils  
 $36 \div 2 = 18$

Mathematizing Story Map Templates from <https://www.mathmatizeit.com/>

Mathematize It!

Limar helps his Ninong Troy feed the neighborhood cats. They put out 3 cans of food each evening. If one case of food has 24 cans, how many nights will one case last? Is it at least a week?

**Equal Groups**  
Outline the number of groups and identify the quantity in each group.

24 cans of food  
3 cans = 1 night

Mathematizing Story Map Templates from <https://www.mathmatizeit.com/>

Mathematize It!

Equal Groups Situations, Measure Unknown

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Beyond problem solving