



# Gingerbread Village

A Guide to Mathematizing at Home

Jess Kyle

SD36 Numeracy Helping Teacher

# What is Mathematizing?

Mathematizing means to make the math in an activity, environment, picture or object apparent. We can help children mathematize their activities by asking questions like:

- What math are you using?
- What math do you see/hear?
- What math tools do we need?  
Measuring cups, rulers, calculators, charts, grids, graphs, compasses, protractors, timers and many other things are called "math tools."
- More specific questions can also be asked about counting, measuring, making bigger/smaller, sorting and patterning can also be woven throughout the conversation



# Why Mathematize?

- When children are able to see the math in their daily activities and the world around them, they develop concrete connections to how math lives and behaves.
- School math often moves away from these connections to quickly, forcing children to memorize abstract representations (numerals, equations, formulas, "tips and tricks") without having a real understanding of the math itself.
- Experiencing math through mathematizing their world gives children the knowledge base to build meaning, even in the face instructional practices that may not be the best fit for them
- Mathematizing creates space for the child to make connections between what they already fully understand and what they are learning. It is sense-making.
- Unlike school math, which often focuses on only one concept at a time, living math doesn't fit into a box. Children are free to experiment with strategies and tools, make mistakes and overcome challenges. They do not feel pressured or judged or "dumb." These experience build capacity and confidence, which shield the child from the myth that only a few people in the world are "good at math." It helps children connect to what math truly is: Not the computation heavy, answer focused, speed obsessed math so frequently found in classrooms, but rather, the creative, persistent, exploration and problem-solving of a true mathematician.



# Selecting the Activity

- ANY activity can be mathematized. Math is everywhere.
- You can be thoughtful in the questions you ask to surface mathematical connections AND thoughtful in the materials you choose.
- For example:
  - Baking Cookies: I intentionally choose small batch recipes that need to be doubled or even tripled. I often choose recipes with lots of fractions or different sizes or units of measure, rather than ones with only whole measurements or all measurements in cups. This creates an environment where conversions and computation, as well as measurement vocabulary and unitizing are automatically part of the experience.
  - Eating dinner: I have always supported my children in using Mathematical language when speaking. Rather than asking for a piece of apple or quesadilla, they now know to ask for  $\frac{1}{4}$  or  $\frac{1}{2}$ . Having this language base and visual referent has increased their concrete understanding of fractions, which helps them also add, subtract and understand equivalency, even though those skills will not be taught until later grades in school.

# Why This Kit?

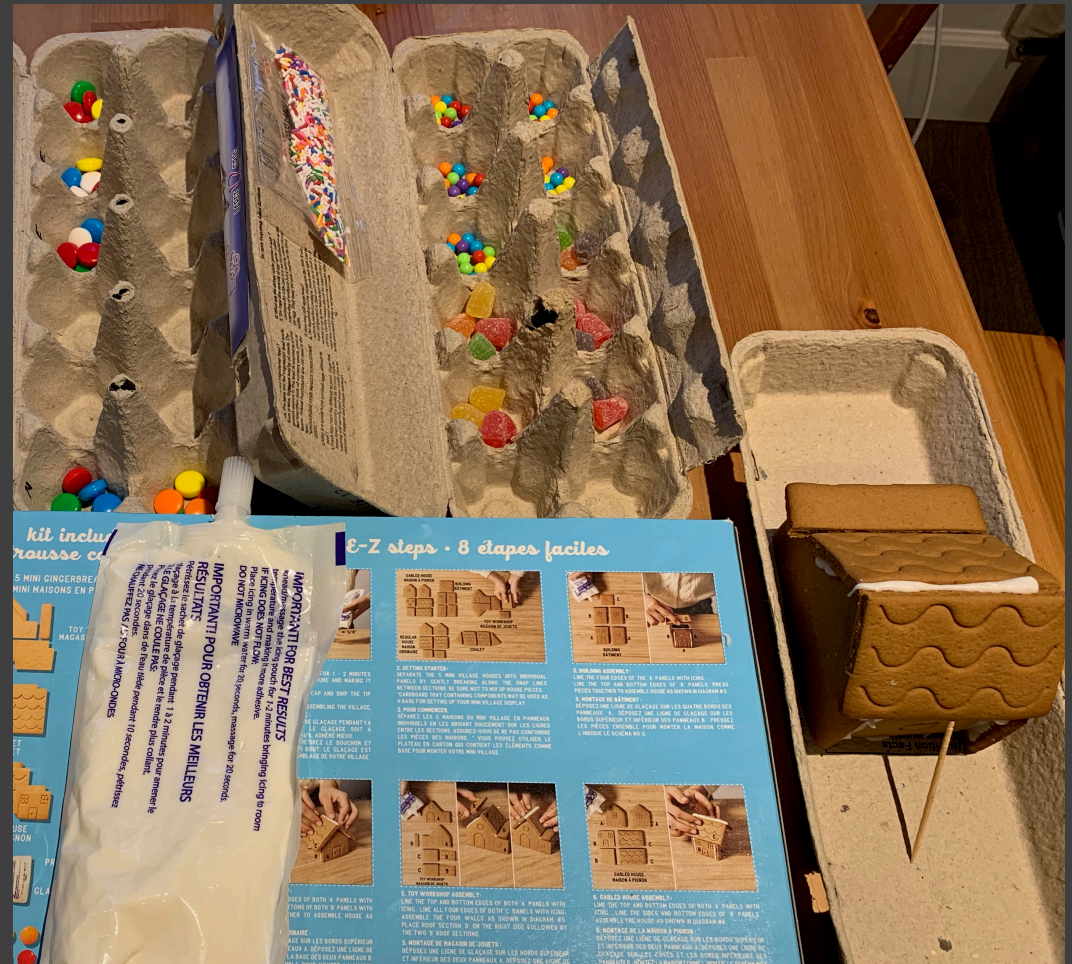
- Smaller houses: easier to put together = less frustration
- Multiple houses = more practice
- Different designs = richer conversations about shapes (2D/3D)
- Candy packages must be divided between the houses = computation practice (division/multiplication/fractions)
- This activity, like most authentic activities that children engage in, allows for many strands of mathematical exploration to be employed. The builder is free to choose from a variety of mathematical strategies and tools to do the building and decorating. They will face some challenges, but not enough to cause frustration.





# The Tools

- **Math Tool:** Egg carton bottoms/cups (for making groups: counting, dividing, identifying fractions)
- **Building Tools** (allow children to help make these decisions, as making decisions and testing the results is part of the problem-solving process):
  - Scissors: snipping the icing bag
  - Egg carton lids: to more easily move the houses without them falling apart
  - Toothpicks: to keep the roof from sliding off while the icing dried





## Questions I Asked

- How will we divide the houses?
- A: "We get 2 each and then you can build one."
- Why?
- A: "2 and 2 is four and there are 5, so you can have one."
- L: "We get 2 each. That's 4. You can build the last one."
- What equations did you use to decide?
- A: (Grade 2) It's 2 and 2 and 1 ( $2+2+1$ )
- L: (Grade 4) Well, it's 2 GROUPS of 2 and 1 left over ( $2 \times 2 + 1$ )
- So, you can use multiplication or addition?
- A: Yes. I can do multiplication!





## Questions I Asked

- How will we separate the candy?
- L: Do you have egg cartons?
- (I always have egg cartons)
- A: We can make 5 groups of each of the candies.
- Why?
- A: There are 5 houses and it should be fair so we get to eat the same amount of candy. (Children will have all kinds of ways to separate things. Listen for their REASONING.)
- After working for a minute or two:
- A: Oh! This one only gets 3 and the others have 4. You get that one mommy because you have the small house and you don't care about candy.
- L: I made 3 groups of 6 and 2 groups of 5. We can each have one of 5 and one of 6. That's fair. You can have the last 6.





## Questions I Asked

- What equations represent your groups?
- A: 4, 4, 4, 4...no...  $4 \times 4$
- Me: plus 3?
- A: yep
- L:  $3 \times 6$  and  $2 \times 5$
- Me: So,  $3 \times 6 + 2 \times 5$ ?
- L: right

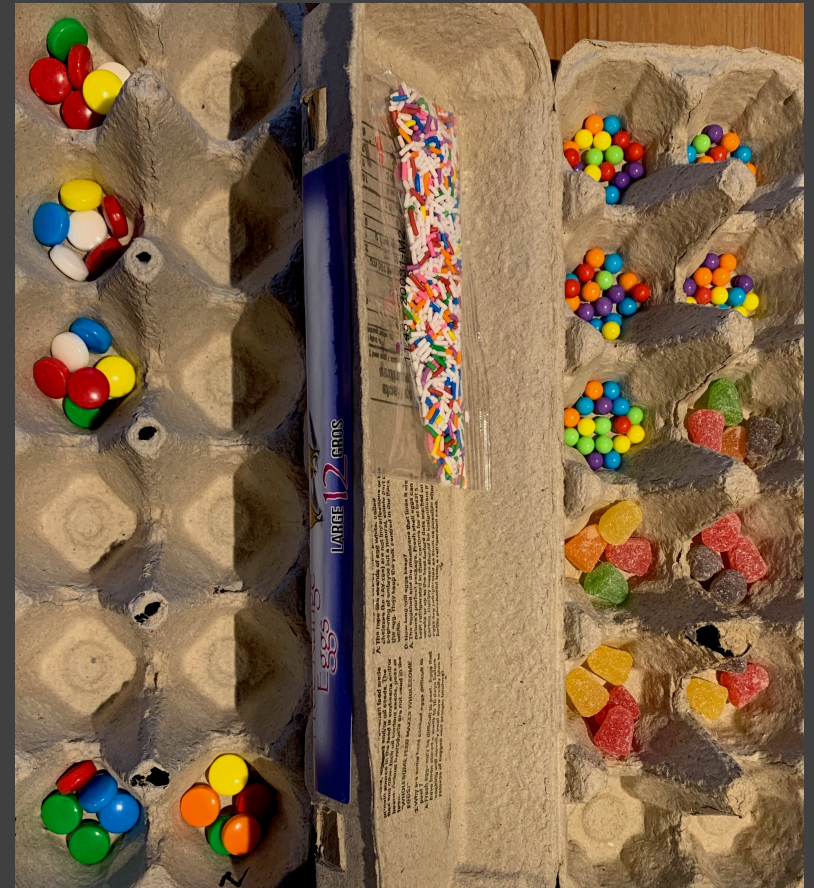


## How many? How do you see them?

These two simple questions can be asked any time there is the potential for counting or computation. They encourage important number sense skills like subitizing, counting and connecting concrete amounts to symbolic representations (equations).

In this activity we discussed how many houses and how many candies. We connected how the kids separated the houses and candies into groups and how those groups connected to equations. However, if asked the question How Many? Based on this image, children might choose to count the egg cups instead of the candies or all the candies together or something else. These are all valid ways of answering the question.

**IMPORTANT:** The richness of this routine comes from children learning that there are **MANY** ways of seeing and recording how many. It is important to allow this lens to develop without always focusing on the "best" or "right" way. Those conversations are also valuable, but children must first build on what they already know. **LISTEN** for logical **REASONING** in the child's response.





# Counting Collections At Home

- The majority of the mathematizing in this activity centered around counting. In Education, we call the Mathematical Routine a Counting Collection.
- Teachers use Counting Collections to deepen student understandings of many foundational concepts in Number Sense. Number Sense is the basis for success in Math.
- Counting Collections can easily be done at home using anything from a collection of toy cars to pebbles children gather on a walk to candies found in a holiday kit. For more information on Counting Collections at home go to this page and scroll to the Videos section:



<https://mathingaround.com/resources/educator-resources/routines/counting-collections>



# More Questions to Ask

Is it a pattern? How do you know? What comes next? How do you see the pattern growing?

- All patterns repeat, even increasing and decreasing patterns.
- It is important that children are exposed to a variety of patterns or they quickly begin to believe that a pattern can only be linear with an obvious repeating core.
- ie: red blue red blue is a linear pattern with a core of "red blue." An understanding that patterns can be used to generalize and make predictions is a key idea in Math and the basis for Algebraic Thinking.



## More Questions to Ask

## What shapes do you see?

## How are they the same?

## How are they different?

- Properties of shapes and the relationships between them are foundational to student's understanding of Geometry.
- It is very important that children see shapes in a variety of contexts and orientations, as well as notice how 2D shapes create other 2D and 3D shapes.
- Without the chance to explore and make sense of shapes, many students are left with the misconception that all triangles, for example, look the same or that a triangle is only a triangle if it is sitting on it's base.

