Erikson Institute
Early Math Collaborative

Nurturing Math in Infants, Toddlers & 2s
Precursor Concepts are all around

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Workshop at CA Early Math Symposium

remote

Erikson Institute

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How could we sort this collection?

We could sort by using a yes/no question …

How could we re-sort this collection?

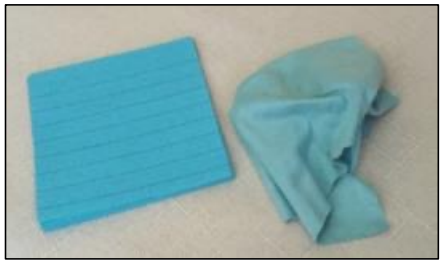
We could sort by considering the function of the objects …

How could we re-sort this collection?

We could sort by looking at the shape of the objects …

How could we re-sort this collection?

We could sort by looking at the color of the objects …



How is what we've been doing math?

Mathematics is a logical way of thinking that allows for increasing precision.

- We use mathematics to make sense of the world.
- We use mathematics to solve problems.

Have you ever said something like this to an infant, toddler or 2-year-old?

- *I just got your bottle **warm** - just right to be **yummy** for your tummy!*
- *Which ball do you prefer - the **bigger** and **bouncier** one or the **smaller** one that is **easier** for you to hold?*
- ***First** you washed your hands, **now** we have lunch, **then** we go outside to play. **After that**, it is nap time.*
- *It's such a beautiful day! Let's go **outside** instead of playing **inside** like we usually do.*

You are providing little ones with early math experience and nurturing their mathematical thinking using Precursor Math Concepts!

Precursor Mathematical Concept

Attributes *are properties or qualities that allow us to describe & classify the world around us.*

Key Ideas about attributes

- **We perceive attributes of the world around us through our senses.**
- **Attributes can be used to group.**
- **Language allows us to describe attributes with increasing precision**

What do we mean by “precursor concept”?

precursor – what comes before and prepares for or signals something

Let’s look at an example in child development … teething!

Precursor Mathematical Concept

Attribute

Key Idea 1

We perceive attributes of the world around us thru **our senses.**

Consider an apple.

- What does it look like?
- What does it taste like?
- What does it smell like?
- What does it feel like?
- What does it sound like?

- It might look red, yellow, green, multi-colored, speckled, round, shiny …
- It might taste sweet, tart, sour, spicy …
- It might smell fruity, piquant …
- It might feel smooth, crisp, hard, soft, wet …
- It might sound loud, crunchy …

Precursor Mathematical Concept

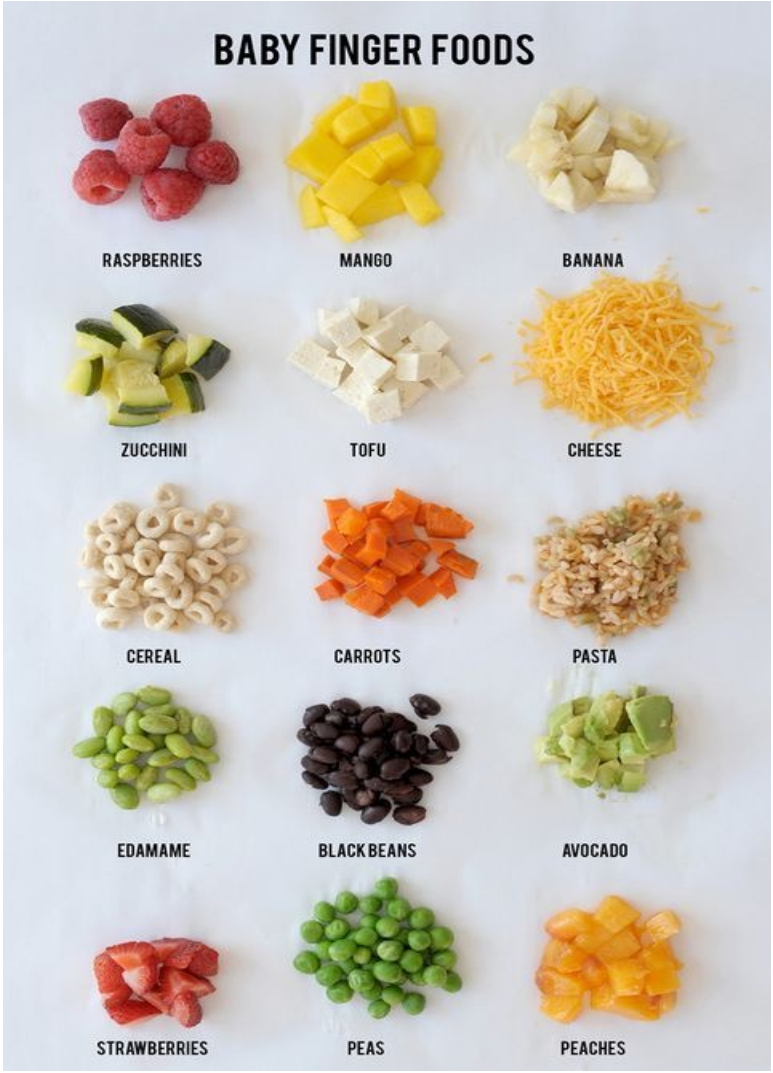
Attribute

Key Idea 2

Attributes can be used to group

How could we group these finger foods?

- by color
  - red – raspberries & strawberries
  - green – peas, avocado, edamame & zucchini
  - & so on …
- by texture
  - mushy – mango, banana, tofu & avocado
  - crunchy – cereal & carrots
  - & so on…

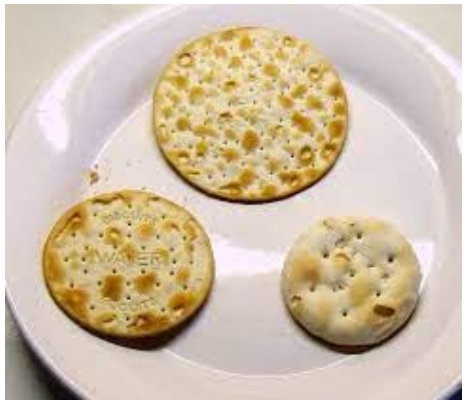


Precursor Mathematical Concept

Attribute

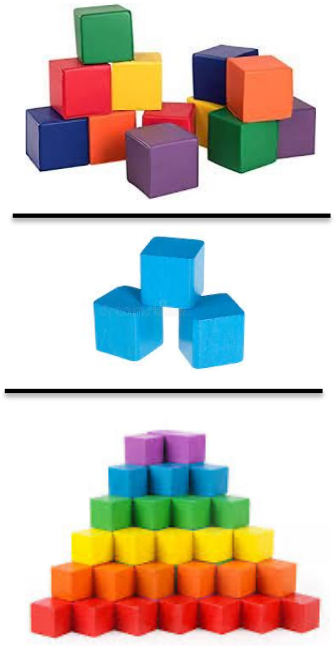
Key Idea 3

Language allows us to describe attributes with increasing precision



Crackers

- all round
- all with holes
- all white and beige
- 1 smallest, 1 largest, 1 in the middle
- 1 with words, 2 without
- 1 puffy, 2 flatter



Blocks

- all cubes
- all piles
- all painted
- 1 set with 1 color, 2 sets with many colors
- 1 multi-color set organized by color
- 1 set of 3, 2 sets with more

We have been thinking about ATTRIBUTE

Attribute is an important part of math from birth to kindergarten (& beyond)

Precursor Mathematical Concept

Attributes *are properties or qualities that allow us to describe & classify the world around us.*

→ **Big Ideas of Early Math**

- Attributes *can be used to sort collections into sets.*
- *Quantity is an attribute of a set of objects.*
- *Many different attributes can be measured, even when measuring a single object.*
- *Shapes can be defined and classified by their attributes.*

Big Idea of Early Math

Attributes *can be used to sort collections into sets.*

What can we call these different groups?

1. Things that are round
2. Things that are long and straight
3. Things with holes
4. Things that are light brown

Big Idea of Early Math

Quantity is an attribute of a set of objects.

3 elephants might seem obviously bigger when compared to 3 mice if you look at the attribute of **size or weight**
BUT, for the attribute of **quantity,** these two sets are identical. Both are sets of 3 creatures.

Big Idea of Early Math

Many different attributes can be measured, even when measuring a single object.

Which Jar Is Big?

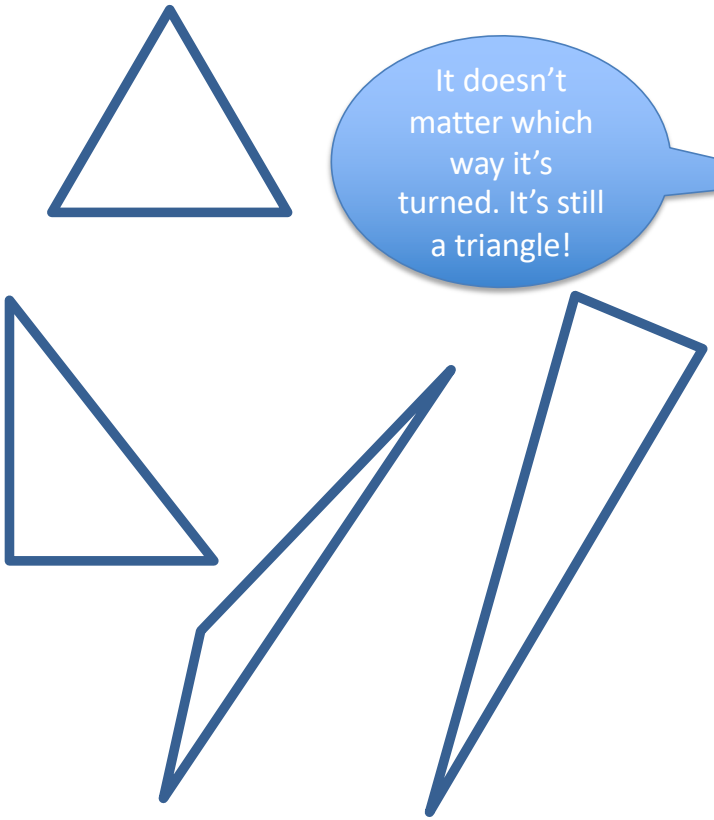
What kind of “big” is it?

What attribute are you comparing?

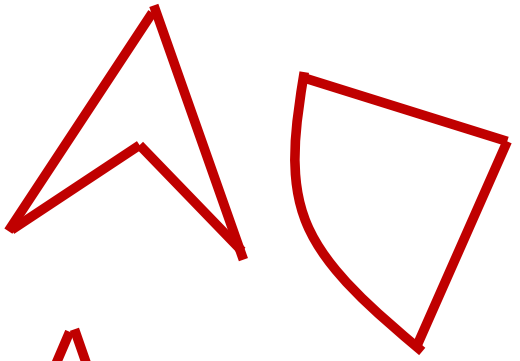
- Height
- Weight
- Capacity
- Circumference

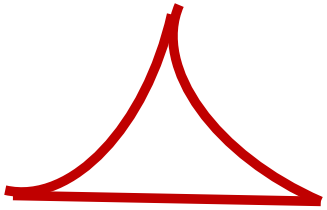
Big Idea of Early Math

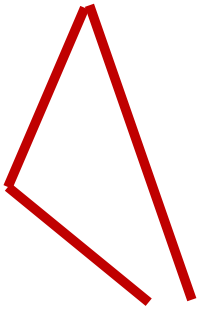
Shapes can be defined and classified by their attributes.



It doesn't matter which way it's turned. It's still a triangle!







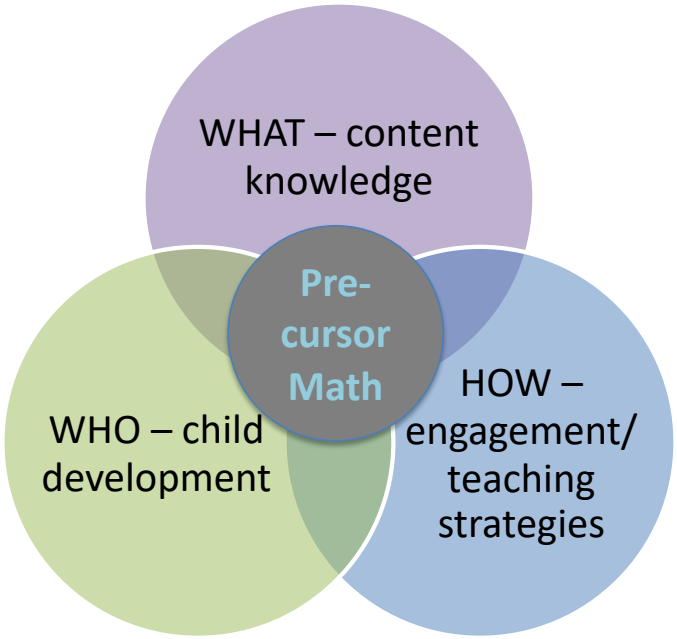
What do we mean by “precursor concept”?

In mathematics, a precursor math concept is an understanding or ability that

underlies or prepares the ground

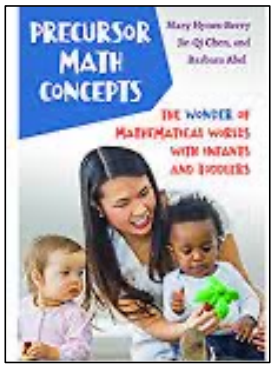
for the mathematical big ideas

that develop in the early school years (3-6).



We have identified 4

Precursor *Mathematical* Concepts



Attribute

Comparison

Change

Pattern

Preschool & Primary Math Content Areas

- ***Sets & Sorting***
- ***Patterns***
- ***Number Sense & Counting***
- ***Number Operations***
- ***Spatial Reasoning & Shapes***
- ***Measurement & Data Analysis***

WHAT – content knowledge

0 to 3: Development of Precursor Understanding

24-38 months - Transforming

What can I make with this?

12-26 months - Developing

What can I do with this?

0-14 months - Emerging

What is This ?

WHO – child development

It takes C.A.I.R. for math to grow

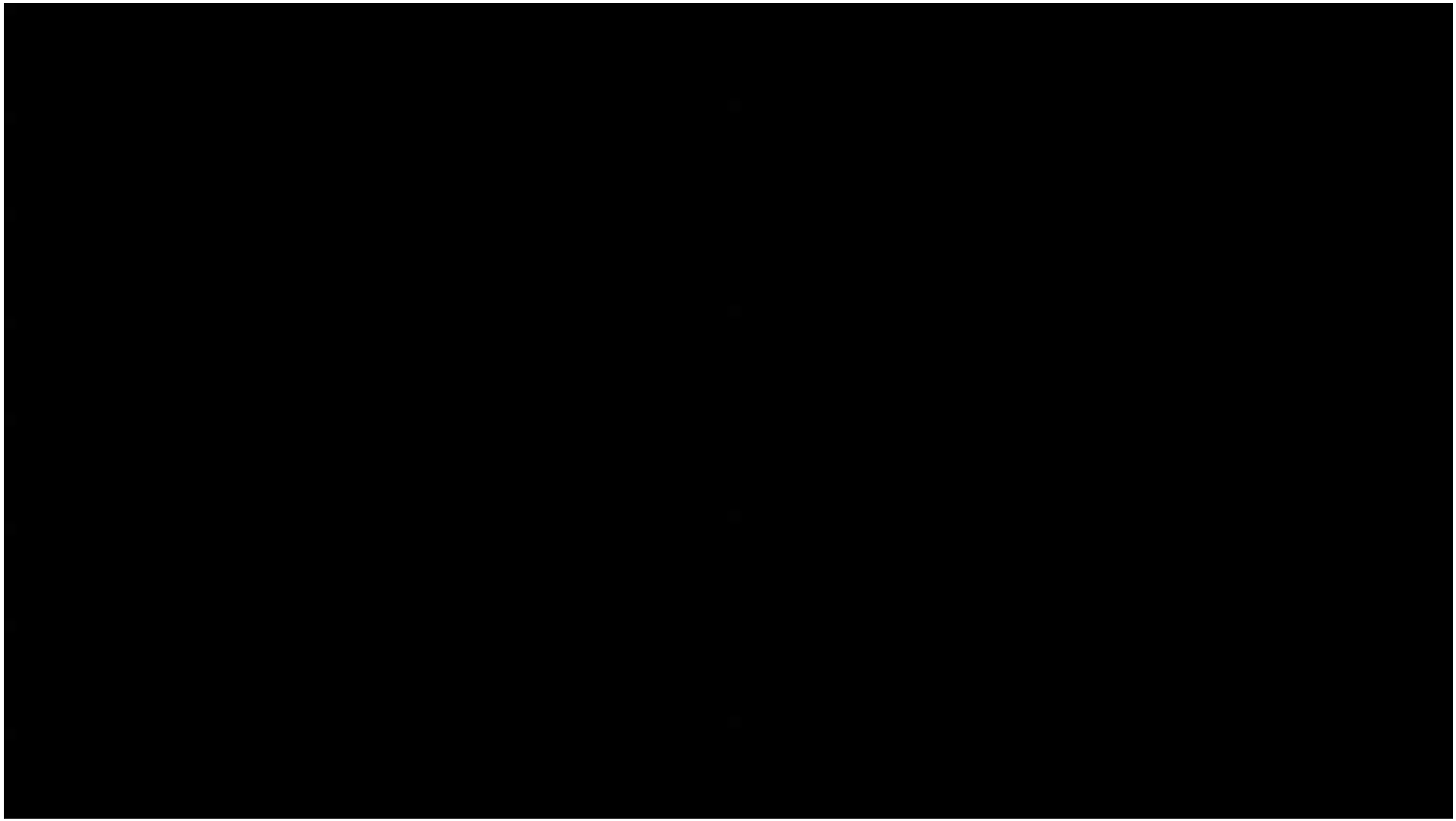
Babies, toddlers & 2s thrive & grow into playful, confident mathematical thinkers & problem-solvers when caregivers use the C.A.I.R. Principle:

C*losely* ***A****ttend &* ***I****ntentionally* ***R****espond*

in ways that are appropriate for the child's age & stage of development

HOW – engagement/teaching strategies

Let’s watch an adult & a toddler exploring & talking about the math all around



How do we show CAIR? *(Closely Attending & Intentionally Responding)*

Highly effective strategies that use CAIR include:

- **Observe** the child carefully. **Decide** whether an active response makes sense.
- **A positive conversational mode**
- Using the **child's name** and making **eye contact**
- **Self-talk and/or "say what you see" narration** (caregiver explains what they are doing or what they notice in the child's responses)
- **Naming attributes** using precise language
- **Making connections** to child's prior experience and preferences as well as to related items that belong to the same category.
- **Using gestures,** especially pointing and saying the word

Many of these strategies involve our using language.

Language reflecting concepts related to ATTRIBUTE

quantity

all cardinal numbers (*one, two, three …*), generic terms such as *only, a lot, many, pair, dozen, gazillion….*

magnitude & size

big, huge, gigantic, little, teeny-weeny, long, short, tall ...

sensory perception: touch/physical sensations

cold, hot, prickly, cozy, soft, smooth ...

sensory perception: visible appearance including texture & color

red, magenta, pink, green, emerald; *smooth, wrinkly, bumpy, twisted ...*

sensory perception: *sound*

soft, loud, quiet, exploding, clattering ...

sensory perception: *taste/smell*

yummy, yucky, smelly, fragrant, sweet, salty, spicy ...

descriptive terms indicating time

soon, right now, after a while, today, long ago ...

spatial & positional ideas expressed in ***preposition*s & adjectives** related to location

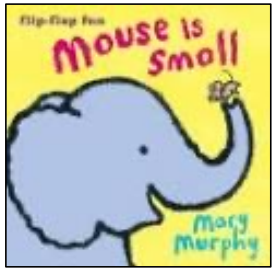
here, there, in, on, over under, above, below, next to, beside, behind, close, far, left, right...

Math All Around Me (MAAM) - what infants, toddlers & 2s experience

Adults using language to show CAIR can build their understanding

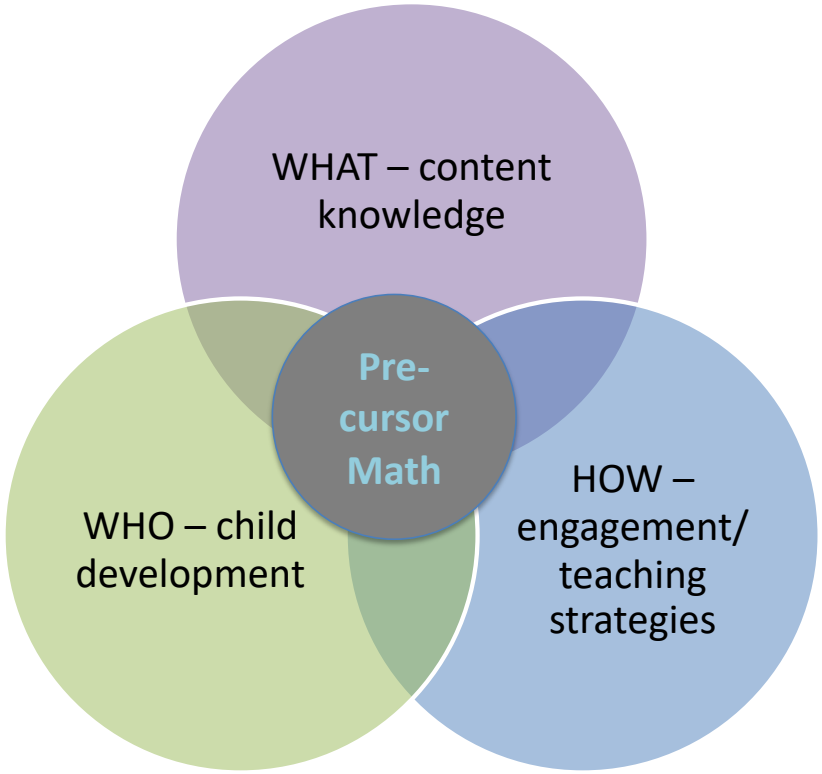
Layering language onto an experience helps children make sense of the world.

(Silent attention is also necessary.)



Books are one way to harness more precise language.

Thanks for joining us for this brief introduction to Precursor *Mathematical* Concepts!



We hope that it has helped you start thinking about how to **nurture math thinking in infants, toddlers & 2s**

Questions?

Comments?

Contact us.

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Check out our website!

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