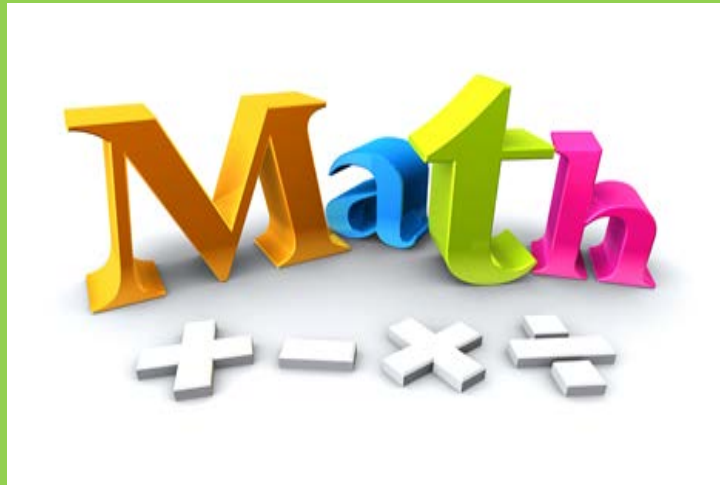# Teaching Math to Young Children

Welcome!

This training provides five recommendations to teach math to young children.

Recommendation 1

Teach number and operations using a developmental progression.

Recommendation 2

Teach geometry, patterns, measurement, and data analysis using a developmental progression.

Recommendation 3

Use progress monitoring to ensure that math instruction builds on what each child knows.

Recommendation 4

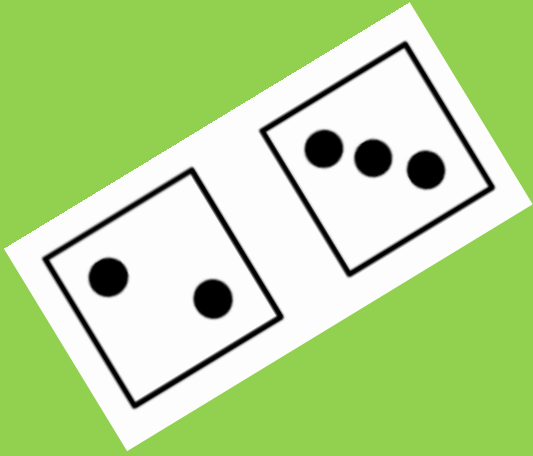*Teach children to view and describe their world mathematically*

Recommendation 5

Dedicate time each day to teaching math, and integrate math instruction throughout the school day.

Recommendation 1
*Teach number and operations using a developmental progression.*

Subitizing is the ability to instantly recognize "how many" in a small set. To identify the number of things by quickly looking at them—not by counting them one by one.

An example often used to explain this, is to think of dice – we immediately recognize the number of dots without having to count each one individually.
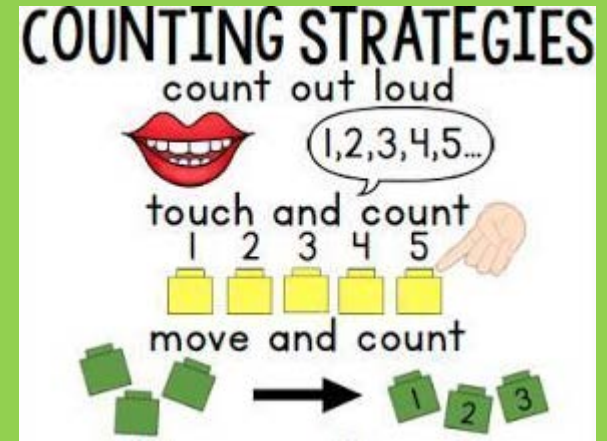
Meaningful Object Counting: Counting one-to-one and recognizing that the last word used while counting is the same as the total.

Cardinality- Understanding that the last number word is the total of the collection.

A child who recounts when asked how many candies are in the set that they just counted, has not understood the cardinality principle.

Counting-based comparisons of collections larger than three:

Once children can use small-number recognition to compare small collections, they can use meaningful object counting to determine the larger of two collections.

Number-after knowledge: Familiarity with the counting sequence enables a child to have number-after knowledge; to enter the sequence at any point and specify the next number instead of always counting from one.

Mental comparisons of close or neighboring numbers:

Once children recognize that counting can be used to compare collections and have number-after knowledge, they can efficiently and mentally determine the larger of two adjacent or close numbers.

Number-after equals one more:

Once they can mentally compare numbers and see that "two" is one more than "one" and that "three" is one more than "two" they can conclude that any number in the counting sequence is exactly one more than the previous number.

What could our mathematical manipulatives be in the early years?

- **Loose parts:** Natural objects (stones, plant seeds, sticks, etc.) manmade objects (bottle tops, keys, washers, buttons, etc.)

- **Manufactured mathematical resources:** Counters, blocks, interlocking cubes, five and ten frames, mechanical clocks, pattern blocks

Subitizing (small-number recognition)	Subitizing refers to a child's ability to immediately recognize the total number of items in a collection and label it with an appropriate number word. When children are presented with many different examples of a quantity (e.g., two eyes, two hands, two socks, two shoes, two cars) labeled with the same number word, as well as non-examples labeled with other number words (e.g., three cars), children construct precise concepts of one, two, and three.
	A child is ready for the next step when, for example, he or she is able to see one, two, or three stickers and immediately—without counting—state the correct number of stickers.
Meaningful object counting	Meaningful object counting is counting in a one-to-one fashion and recognizing that the last word used while counting is the same as the total (this is called the cardinality principle).
	A child is ready for the next step when, for example, if given five blocks and asked, "How many?" he or she counts by pointing and assigning one number to each block: "One, two, three, four, five," and recognizes that the total is "five."
Counting-based comparisons of collections larger than three	Once children can use small-number recognition to compare small collections, they can use meaningful object counting to determine the larger of two collections (e.g., "seven" items is more than "six" items because you have to count further).
	A child is ready for the next step when he or she is shown two different collections (e.g., nine bears and six bears) and can count to determine which is the larger one (e.g., "nine" bears is more).
Number-after knowledge	Familiarity with the counting sequence enables a child to have number-after knowledge—i.e., to enter the sequence at any point and specify the next number instead of always counting from one.
	A child is ready for the next step when he or she can answer questions such as, "What comes after five?" by stating "five, six" or simply "six" instead of, say, counting "one, two, … six."
Mental comparisons of close or neighboring numbers	Once children recognize that counting can be used to compare collections and have number-after knowledge, they can efficiently and mentally determine the larger of two adjacent or close numbers (e.g., that "nine" is larger than "eight").
	A child has this knowledge when he or she can answer questions such as, "Which is more, seven or eight?" and can make comparisons of other close numbers.
Number-after equals one more	Once children can mentally compare numbers and see that "two" is one more than "one" and that "three" is one more than "two," they can conclude that any number in the counting sequence is exactly one more than the previous number.
	A child is ready for the next step when he or she recognizes, for example, that "eight" is one more than "seven."

Recommendation 2
Teach geometry, patterns, measurement, and data analysis using a developmental progression.

Help children recognize, name and compare shapes, then teach them to combine and separate shapes.

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- Take children on shape walks and ask them to point out the shapes they see.
- Ask children to bring in things from home that illustrates a particular shape or locate shapes in the classroom.

Identify patterns as well as, extend correct and create patterns.

- Introduce children to basic repeating patterns.
- Help children lean to extend patterns

Promote children's understanding of measurement by teaching them to make direct comparisons and to use both informal and formal units and tools.
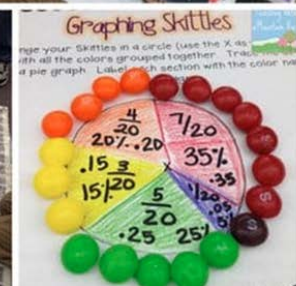

NONSTANDARD UNITS OF MEASURE

- Children can compare objects as they sort, arrange and classify them.

- Measurement using non-standard and standard tools.
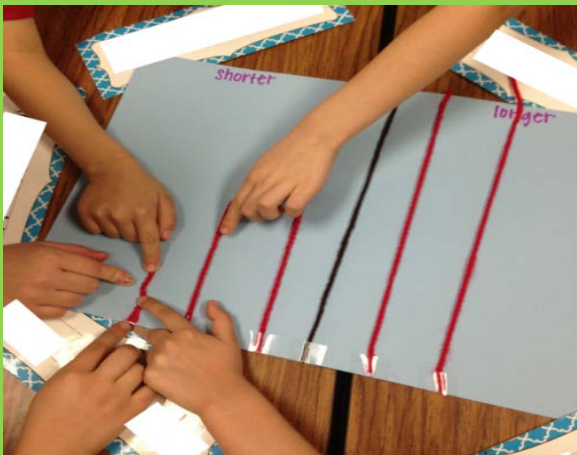
Help children collect and organize information, and then teach them to represent that information graphically.

Strategies

- Math Room Quest

- Describe, Describe, Draw

- Interactive Word Walls (Subject)

Visual supports help make language and
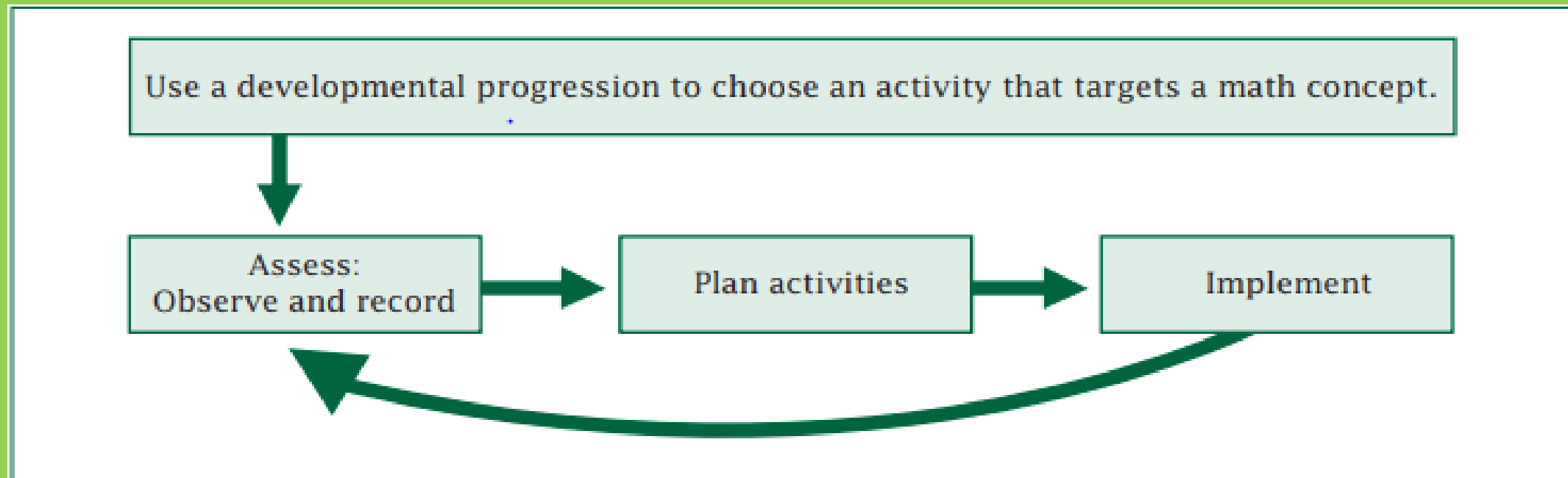
mathematics more comprehensible.

Recommendation 3
Use progress monitoring to ensure that math instruction builds on what each child knows.

Use introductory activities, observations, and assessments to determine each child's existing math knowledge, or the level of understanding or skill he or she has reached on a developmental progression.

- Use introductory activities to present a new concept to determine how much of the activity children are able to do independently.
- Observe using a math activity that addresses a specific skill and observing how children try to complete or solve the task.
- Use formal assessments to help teachers direct their instruction to particular goals.

The flow of progress monitoring.

Use a developmental progression to choose an activity that targets a math concept.

Assess: Observe and record → Plan activities → Implement

Tailor instruction to each child's needs, and relate new ideas to his or her existing knowledge.

Recommendation 4
*Teach children to view and **describe** their world mathematically.*

Tiered Vocabulary

Tier 3
Domain-specific academic vocabulary

Tier 2
high-utility academic vocabulary found in many content texts, cross-curricular terms

Tier 1
everyday words familiar to most students primarily learned through conversation
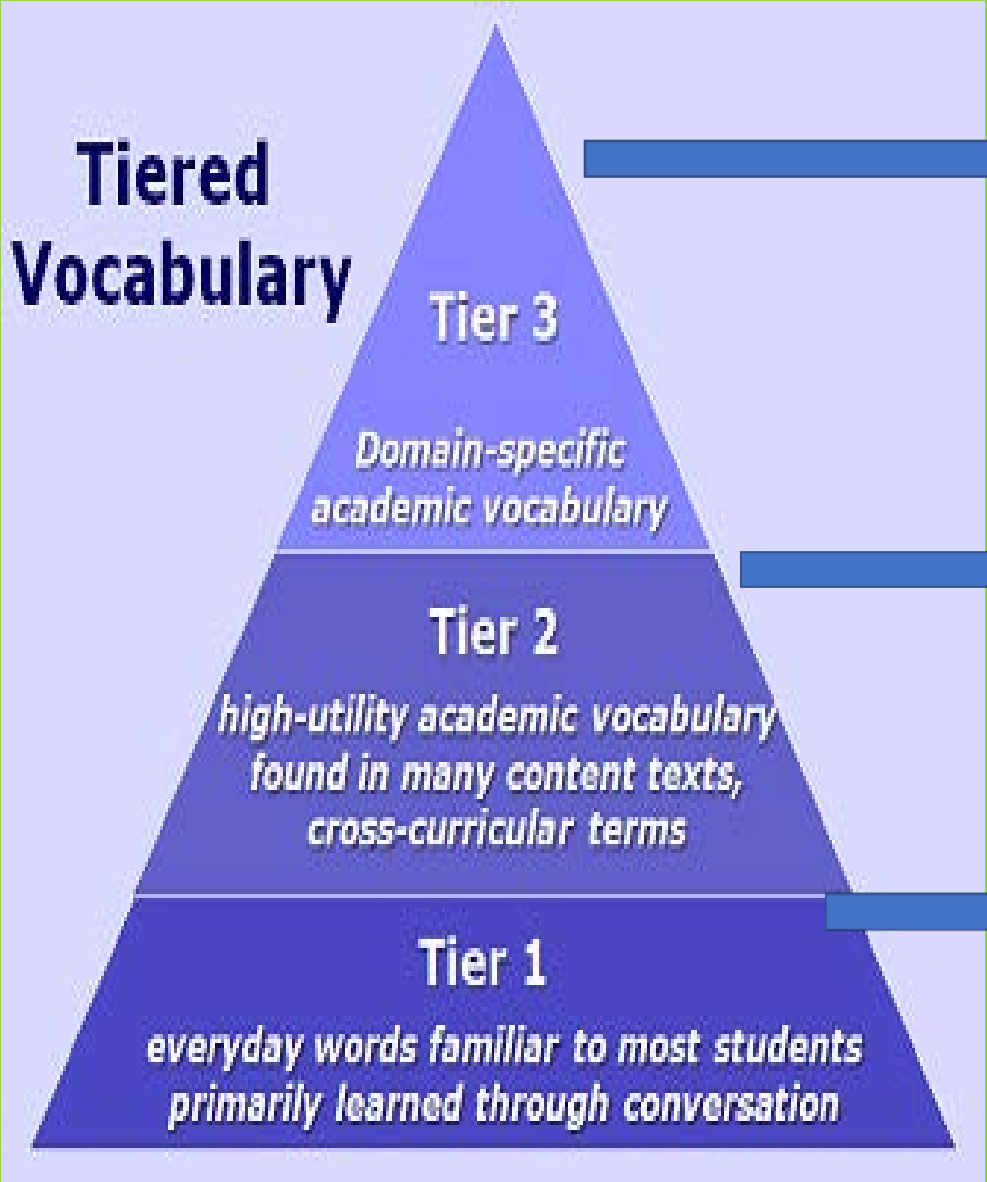
Uncommon technical terms that are typically associated with a specific domain.
Amino Acid, Peninsula Array, equivalent,

Deliberate direct instruction needed. It helps students build a web of word knowledge.
Distribute, secure, contribute, parallel, predict, contrast

Commonly used social language. We generally acquire these words through basic interpersonal communication or natural exposure.
bed, happy, sad, cold, hungry

Speaking and Listening strategies:

Anticipatory Guides

Think-pair-share

Gallery Walks

My Math Talk Sentence Starters

1. I agree with you because...
2. I disagree with you because...
3. Can you explain how...
4. So I hear you saying that...
5. Your strategy reminds me of...
6. My strategy was to...
7. To add on...
8. I wonder...
9. How did you...
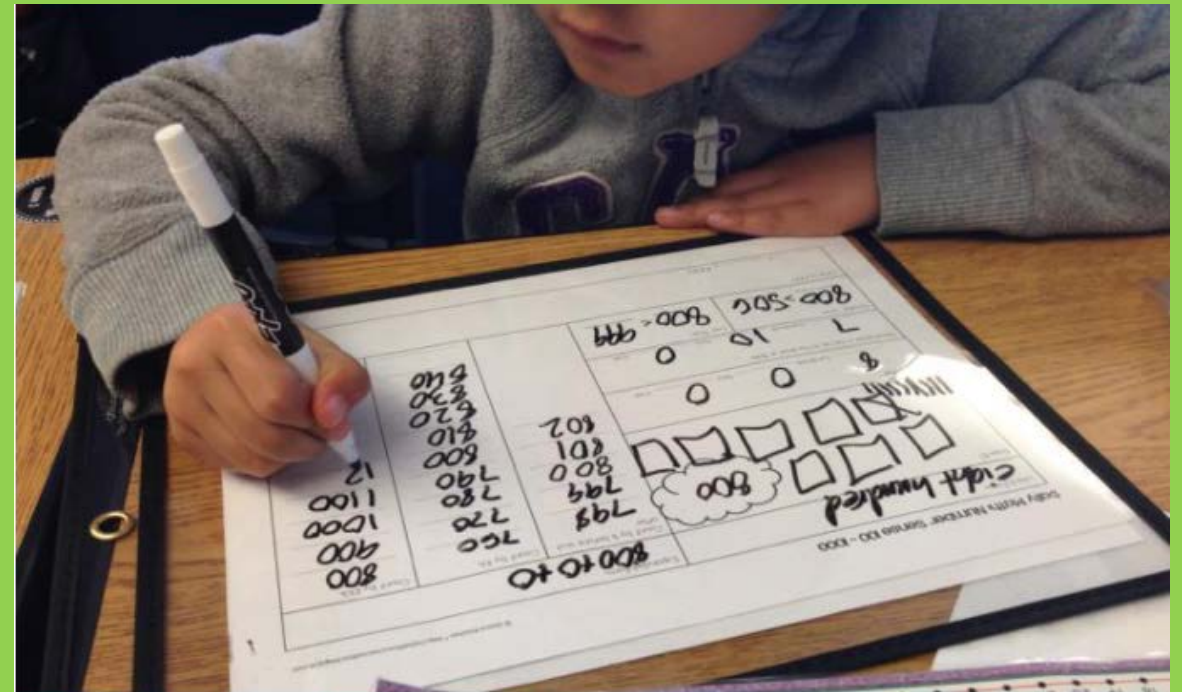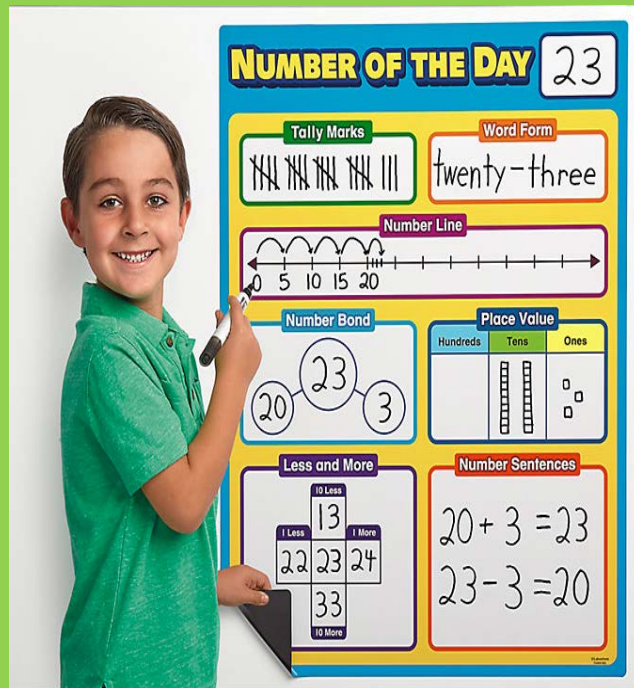10. What would happen if...

Recommendation 5

Dedicate time each day to teaching math, and integrate math instruction throughout the school day.
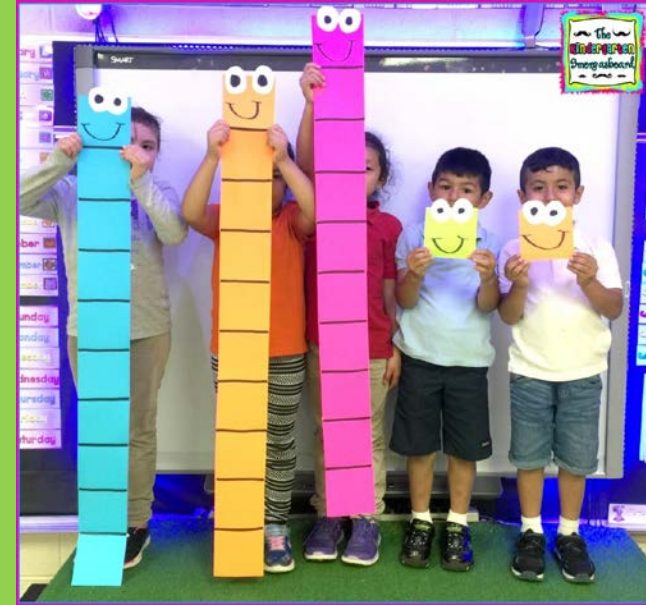
Plan daily instruction targeting specific math concepts and skills.

- Introduce a concept for the first time or illustrate a concept through an example that is **relevant** to children's everyday lives.

- Embed math in classroom routines and activities.

- Highlight math within topics of study across the curriculum.

| Math Content Area					
	Number and Operations	**Geometry**	**Patterns**	**Measurement**	**Data Analysis**
Literacy	*We All Went on Safari*, Krebs *Mouse Count*, Walsh *7 Little Rabbits*, Becker and Cooney	*Bear in a Square*, Blackstone *Mouse Shapes*, Walsh *Shapes*, Silverstein	*A Pair of Socks*, Murphy *Pattern Bugs*, Harris *Pattern Fish*, Harris	*How Big Is a Foot?*, Myller *Spence Is Small*, Chevalier *Tall*, Alborough *The Grouchy Ladybug*, Carle	*It's Probably Penny*, Leedy *The Great Graph Contest*, Leedy *Tiger Math*, Nagda and Bickel
Science	Count collections of natural objects. Count how many days it takes for a plant sprout.	Describe objects from nature (e.g., rocks, leaves, and insects) in geometric terms. Use precut shapes to make animals.	Find and identify patterns in nature (e.g., on butterflies and snakes). Design a model of an insect using a pattern design.	Measure the growth of a plant in the classroom each day and predict how much time it will take before flowers will be visible on the plant.	Graph the amount the classroom plant grows each day. Graph animals with two legs, four legs, and more than four legs.
Art	Count how many objects appear in a piece of artwork.	Identify shapes in artwork. Decorate drawings of shapes.	Use patterns to make pictures or frames for pictures. Find and identify patterns in artwork.	Use measurement to make frames for art out of poster board or card stock.	Make a graph of the children's favorite colors. Tally children's opinions about artwork. For example, ask, "Which painting do you like better?"

Why We Need Math Read Alouds?

- One of the best ways to introduce a new math concept or math skill is by using books, poems or songs. Math read alouds are a visual way to show math concepts and the stories help promote a high level of student engagement by sparking their imaginations.

- Math achievement when they enter kindergarten can predict reading achievement.

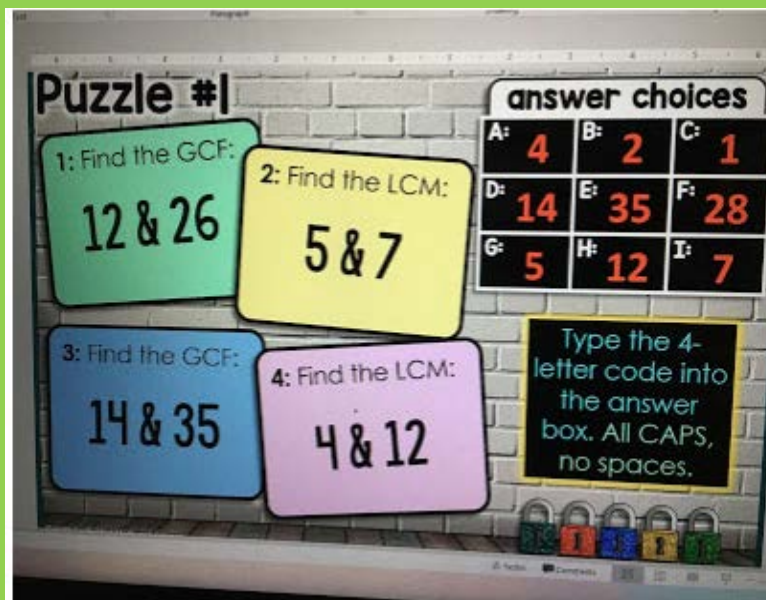- Foundational skills in number and operations sets the stage for reading skills.
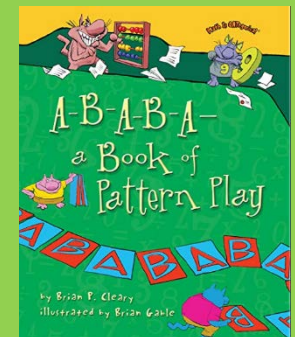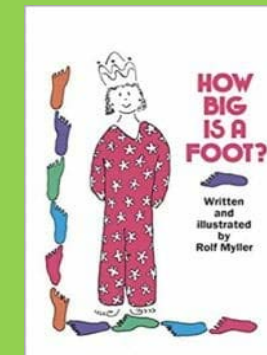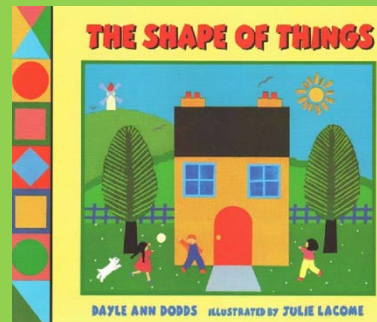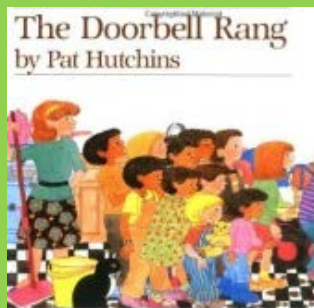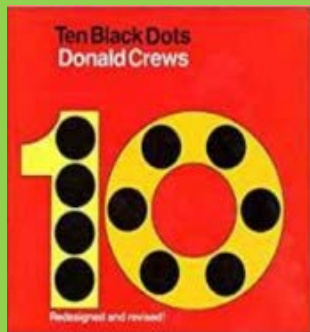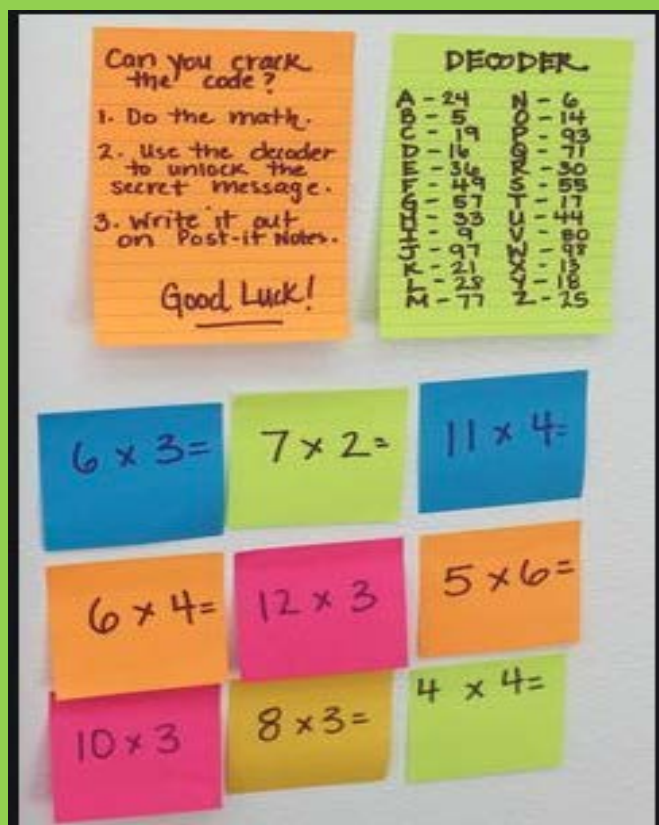
Create a math-rich environment where children can recognize and meaningfully apply math.

	Number and Operations	Geometry	Patterns	Measurement	Data Analysis
Objects and Tools	blocks abacuses number lists number puzzles	geoshapes precut foam shapes traffic signs for classroom areas	beads different-colored cubes art materials, such as stamps and markers	rulers tape measures clocks scales measuring spoons and cups	clipboard and paper for tallying the "question of the day" hula hoops or small hoops that bend for Venn diagrams sorting bins
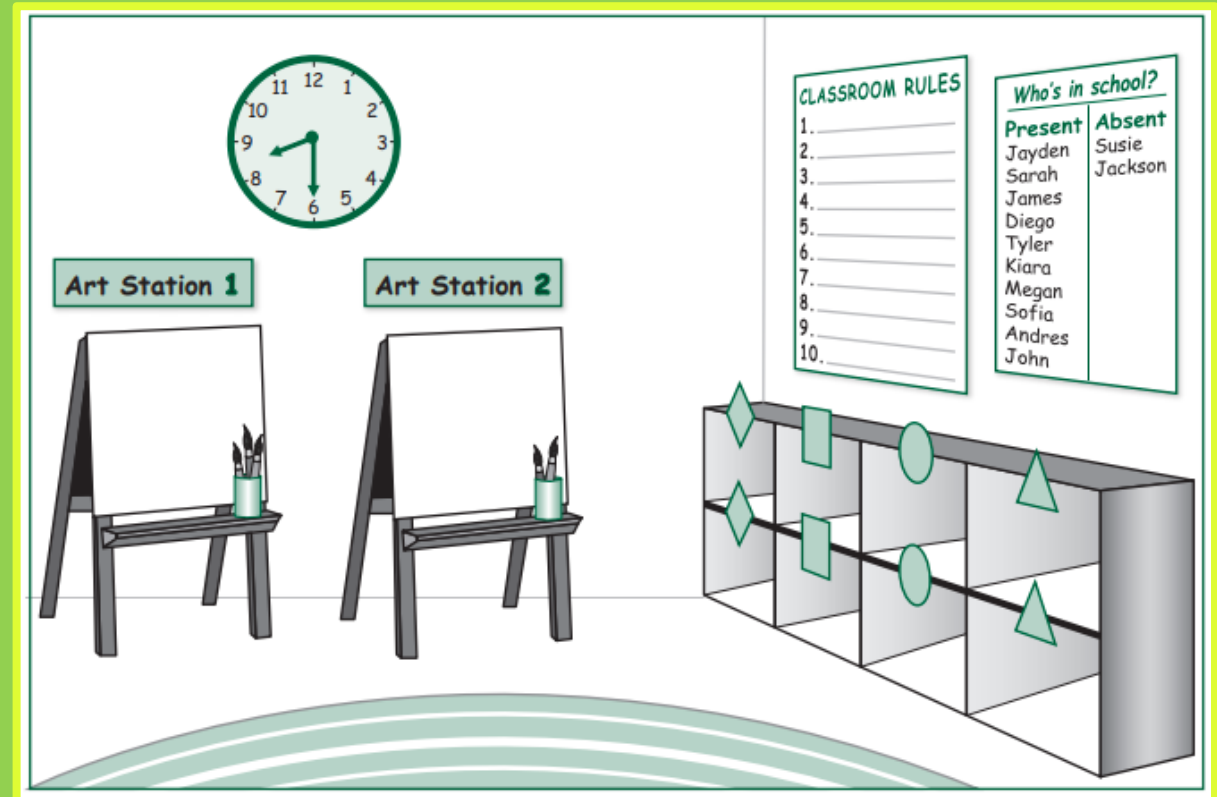
Use games to teach math concepts and skills and to give children practice in applying them.

These can provide an engaging opportunity to practice and extend skills.

Ticket Out the Door