



## **ANGELA RUSS –AYON**

### **MATH, MOTION, AND CONNECTING THE THOUGHTS**

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## **EARLY MATH DEVELOPMENT INCLUDES**

### **LEARNING THAT NUMBERS...**

- 1)...have a corresponding WORD
- 2)...refer to a particular QUANTITY
- 3)...can be represented in DIFFERENT WAYS
- 4)...are used to COUNT
- 5)...help us COMPARE and ORDER QUANTITIES.
- 6)...are a MEANS for SOLVING PROBLEMS

## **BEYOND THE STANDARDS, WE WANT CHILDREN**

### **TO...**

- Be curious
- Keep working and persevere
- Reason abstractly and quantitatively
- Practice and build upon their skills
- Use appropriate tools strategically
- Share their findings
- Discuss & defend their results
- Feel comfortable and confident in their abilities

Young children are naturally curious, observant, and develop their own understanding of math over time - based on their life experiences. They build upon concepts they already know and have been exposed to, practicing early math skills every day.

## **EARLY MATH**

Early math/STEM includes concepts other than number sense, counting, sizes, and shapes:

- Speed: fast/slow
- Measurement: empty/full, heavy/light, near/far
- Composition: whole/pieces/parts
- Lines & Pathways: straight, zigzag, wavy, curved, horizontal, diagonal, vertical, etc.
- Positions and directions in space (spatial sense): up, down, forward, back, around, near, over, under, beneath, between, beside, etc.
- The passage of time/routines
- Patterns

It's up to us to help make learning concepts fun. Model language and mathematical behavior! Help children intuitively use math to:

- plan what to do
- share experiences & strategies
- predict possibilities
- accomplish goals
- reflect on what they are doing/have done
- solve problems
- discuss alternatives
- explore how and why questions
- justify thinking & actions

## **Alternative language tools when communicating with children:**

- gestures
- physical activity
- pictures (in and out of books)
- songs
- games
- charts & polls
- diagrams & posters



### **MATHEMATIZE EACH DAY!**

Math should be as common in informal settings as in any formal math activity. Help children make discoveries. Children often need fresh and new suggestions for what to do next. They often don't know what else they can do with what they have, nor do they know if they have permission to do it.

*What would happen if you...?*

Give them an **invitation** to take their learning to the next level and **permission** to explore further by asking open-ended questions that present an alternative to the actions they have taken. Especially when play stalls. Open-ended questions cannot be answered with one word, such as yes, no, five, or yellow.

Always begin your open inquiry with the simplest form of question.

*What do you know about...?*

*What do you notice...?*

*Describe what you see.*

*Tell me about what you have.*

### **CREATE SERVE AND RETURN EXPERIENCES**

Ask thought-provoking questions (serve), then WAIT for children to process the information and formulate a response (return). You might be tempted to chime in and start teaching, but don't. Slow down your day and give children time to teach you!

### **USE MATH IN TRANSITIONS**

- *How can you move with "1, 2, 3 Freeze" on the way to the door?*
- *How can you clean up before the countdown bell rings?*
- *Let's count down and "Blast-off!" like a rocket.*
- Form a caterpillar line and count steps together.
- Count small vs. large steps
- Find a certain number of objects in the room or outside
- Play "I Spy Shapes" or "Size," or "Colors."
- Arrange objects in a specific mathematical order (e.g., from smallest to largest, or thinnest to widest).
- Complete a motor skill any number of times.
- Touch a body part any number of times
- Release children by the shapes, colors, numbers, sizes, characteristics, etc. on /of their clothing.

**EMBED MATHEMATICAL CONCEPTS** throughout each day using terms and expressions that give children more exposure to math language.

Moving to commands using math language helps children understand spatial concepts and relationships.

#### **Addition:**

- Altogether
- Put together
- In all
- Mix
- Combine
- Include

#### **Subtraction:**

- How many are left?
- Take away/take out
- The difference between
- Minus
- Remove

### Division:

- Equal parts
- Share equally
- Split it up
- Give each one
- Break apart
- Separate
- Distribute



### ENCOURAGE CHILDREN TO START A COLLECTION...

Preschoolers can develop foundational math skills through simple and enjoyable collecting activities. They use their observation skills to compare and contrast colors, shapes, sizes, weights, textures, age, condition, and other relevant characteristics. Ask children to bring items from home.

- *What do you notice about the items you have?*
- *Why did you add this one to your collection?*
- *How did you decide which ones to keep and which ones to leave behind?*
- *Why do you think this rock is rough and this one is smooth?*
- *How will you move your rocks inside if you don't have any pockets?*
- *Why do you think the rock sank to the bottom?*
- *What kind of names would you give these rocks based on their size / color?*

**COLLECTIONS:** Here are some ideas for items that can be collected to introduce and reinforce basic math concepts:

- **Blocks & manipulatives**
- **Buttons or beads** of various shapes and colors

- **Items in nature** like leaves, rocks or pebbles, acorns, seeds, sticks, or pinecones.
- **Seashells** can be a fun way to introduce counting, sorting, and comparing sizes.
- **Small toy cars or animals** can be grouped based on different criteria.
- **Stickers**
- **Cotton Balls or Pom-Poms**
- **Pretend fruit or vegetables:** plastic, fabric, or wooden fruits and vegetables can help children practice counting, sorting, and categorizing by food group.
- **Craft Stamps** with different shapes or patterns can be collected and used to create simple math-related art projects.
- **Plastic Bottle Caps**



*Music prompts greater connectivity between the brain's **left and right hemispheres** and between the areas responsible for **emotion and memory** than does almost any other stimulus.*

- Dartmouth, Petr Janata, *Science* 2002

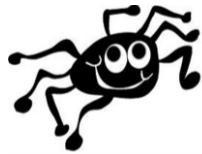
### **WHEN CHILDREN SING NURSERY RHYMES...**

They learn the math skill of natural comparisons. Select a song or chant and emphasize the different tempos, tones, volumes, etc. Encourage children to duplicate

the sounds and beats they hear by clapping, dancing, or playing an instrument.

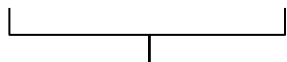
There are also wonderful opportunities to delve deeper into math concepts using lullabies and nursery rhymes:

- *What if no baby ducks came back to Mama?*
- *What happened after the first little monkey fell and bumped its head?*
- *In which direction does the spider go when he climbs the spout? Why?*
- *Do you think you can count the stars that are twinkling in the sky? Why? Why not?*
- *How can you tell which stars are bigger than the others?*
- *What happens when the clock strikes three?*
- *How much water do you think will fit in Jack and Jill's pail?*



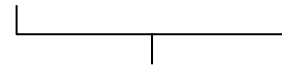
Rewrite popular nursery rhymes and lullabies to introduce MATH concepts. Be sure to count out the syllables and follow the same rhythm. Here is an example of a revised "The Itsy-Bitsy Spiders."

The itsy-bitsy spider  
crawled up the water SPOUT.  
Down came the rain  
and washed the spider OUT.  
Out came the sun  
and dried up all the RAIN.  
And the itsy-bitsy spider  
crawled up the spout AGAIN.



The itsy-bitsy spiders

came to visit me.  
1, 2, 3, 4  
in a family.  
Brought 5 cookies  
they just got for free.  
So, I brewed the tiny spiders  
a little pot of tea.



The itsy-bitsy spider  
saw the number 4.  
Took 4 steps, then  
gently shut the door.  
Thought, well maybe  
I can add 1 more.  
So, the itsy-bitsy spider  
took 5 steps on the floor.



### **MOTOR SKILLS:**

Direct children to move, count, and change direction - to speed up and slow down to the beat of a drum - or interpret the feeling or tempo of a song. Inject positional and descriptive math language when prompting to complete motor skills.

- *How do you know how far you jumped?*
- *Let's mimic animal moves while counting: flap, stomp, bear walk, step sideways (crab), etc.*
- *Show me how you would jump / sidestep/ hop/stomp in a straight/zigzag/curved/ wavy line five times.*

- How many hops do you think it would take to get to the other side of the room? Let's check and see.
- What do you have to do to make your body move fast/slow?
- How many claps can you do before I ring this bell? Let's see.
- What will happen if you change your steps from tiptoes to STOMPS?

Research shows that when teachers ask children to communicate about things that are important to them, children are more likely to become engaged in a mathematical or data analysis process.

**More examples of open-ended, thought-provoking MATH questions that can be asked throughout the day:**



### OUTSIDE

- *You broke the stick. What do you notice about it now?*
- *How do you know how much sand you need for the castle?*
- *How many times do you think we can catch it before it we drop it? Let's see.*
- *What if you looked for different-shaped leaves?*
- *What do you notice about the way the water is flowing? Why do you think it does that?*
- *What numbers do you think of when you hold your fingers up?*

- *How can you arrange these rocks in a line from shortest to tallest?*
- *How can you make a shape using these rocks?*
- *How can you show me the answer by jumping?*
- *Why do you think this insect has fewer/more legs than that one?*
- *What's the same/difference between the acorn and the pinecone?*
- *What if you looked for something longer than/shorter than your shoe?*



### MEALTIME

Introducing math to preschoolers at mealtime can be a fun and natural way to incorporate early mathematical concepts into their daily routines:

- One-to-one correspondence: Count the number of plates, cups, or utensils as you set the table and match it to the number of people at the table.
- *How can we make sure everyone gets a spoon?*
- Sort different food items into categories, such as fruits, vegetables, or proteins, and then eat it.
- Sort utensils or napkins by size or color.
- *What's the difference between the fork and the spoon?*
- *How do you know where the utensils go in the tray?*
- Compare the sizes of different food items and tools.



- *Which apple is bigger, and which one is smaller?*
- *Is your cup taller or shorter than your friend's cup? How can you tell?*
- Compare the quantities of different foods on the plate.
- *Do you have more grapes or more carrot sticks?*
- *How can you tell which glass holds more milk?*
- *How do you know when to stop pouring?*
- *Do you have more grapes or more crackers on your plate? How do you know?*
- Discuss the shapes of the food items, tools, and objects on the table. Point out circles (e.g., slices of cucumber), rectangles (e.g., a sandwich), or triangles (e.g., slices of pizza).
- *What shapes do you notice on your plate? Describe them to me.*
- *Show me the different shapes you can make with your napkin?*
- *What do you notice about the shape/size of your cup when you compare it to the shape of your plate?*
- Use cookie cutters to create fun and recognizable shapes with certain foods before dining.
- Talk about measurement concepts in a simple way. For example, discuss whether a glass is full or empty.
- Use terms like "more/most" or "less/least" when serving portions and encourage children to use these words.
- *How can we tell which fruit is liked the most?*
- Create simple patterns with different food items on the plate. For instance, arrange carrot sticks, cherry tomatoes, and cucumber slices in a repeating

pattern before eating them. Encourage your child to continue the pattern or create their own, and then eat.

- *How can we serve the fruit on a skewer in a pattern?*
- Sing simple math-related songs or rhymes while setting the table or eating. Songs that involve counting or basic math concepts can make learning more enjoyable. Make them up on the spot using any familiar melody.



### ARTWORK

Preschool educators can seamlessly integrate math concepts into art activities through creative activities like drawing, painting, and crafting. Introduce foundational mathematical concepts such as shapes, patterns, and spatial awareness. Encouraging children to explore geometric shapes in their artwork helps develop an early understanding of basic mathematical principles.

- **Cutting and pasting:** Measure and compare sizes during art projects.
- **Draw numbers, shapes, or pathways/lines** using paint, gems, playdough, sand, shaving cream, rocks and sticks, exposure to the sun, collages, sensory bags filled with colorful gels, buttons, and other manipulatives.
  - *What would happen if you pushed the red paint into the white paint?*
  - *How long do you think it will take the paint to dry?*

- Tell me about the different shapes/sizes (length, width, height, or volume) of materials you used.
- How did you know how much material you needed?
- How many dots/lines/shapes do you think there are in your drawing? How can you check?
- What happens if you add more dots (or lines, or shapes) to your drawing?
- How did you decide where to place the big shapes/small shapes?
- How can you share the materials with your friend?



### **DRAMATIC PLAY**

- How did you know which sweater would fit your doll?
- How can you sort your toys into two groups, like soft and hard toys?
- How would you organize your shoes by color / size?
- What's the difference between these cookies and those donuts?
- How can you make a parking space for each car?
- How do you know how many sandwiches to pack for your teddy bear picnic?
- How do you know if you have enough money to pay the bill?



### **STORYTIME**

- What do you think this story is about?
- What happened first/next/last in the story?
- How did the Hungry Caterpillar get so big?
- How can we make a very long caterpillar?
- What's the difference between one fish and two fish?
- What will happen if she eats all three bowls of porridge?
- Which fish has more scales, the Rainbow Fish at the beginning or the one at the end? Why do you say that?
- Show me the fish that is above / below / beside the Rainbow Fish?

### **CIRCLE TIME**

- How can we all sit where we won't trip our friends?
- How do we know it's Monday?
- When I ask you to sit on the square, how do you know where to sit?
- Tell me about the shape you're sitting on.
- What will happen if there aren't enough books for all of you to pick one?
- How would you describe this book/toy/instrument?
- If you were given \$50, how would you spend it?
- Would you rather be as small as an ant or as big as an elephant? Why?
- What is the first thing you do when you wake up in the morning/get home?

- *What does it mean when someone has a birthday?*
- *What does someone mean when they say they are four years old?*



### **PATTERNING & SEQUENCING**

Most everything in our world has a logical order, and we understand events in our lives by understanding the logical order in which they occur.

Skip counting, addition, and times tables all require an understanding of and proficiency in patterning, as do everyday activities in our lives.

- We buy tickets for an event.
- We go to the venue.
- We present our tickets for entry.
- We find our section, row, then seat.

Relate patterns to real-life experiences that can be seen, recognized, and experienced.

Patterns and sequences that are put to a melody are easier to recognize and extend.

Activities involving patterns and sequencing, include creating bead necklaces, threading colored buttons, drawing repeating designs, etc.

- *Show me a pattern you created with your art materials.*

Developmental stages for patterns:

- Recognize
- Describe
- Copy
- Extend
- Create



### **GEOMETRY, ENGINEERING, AND DESIGN:**

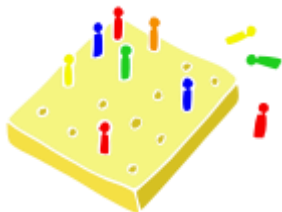
When children play with blocks and puzzles, we expand their understanding of geometry & engineering. There are examples of design and engineering in everyday objects.

Consider the different concepts found in design and engineering:

- **Length & number of sides**
  - *What's the difference between the triangle and the square?*
- **Size & number of angles**
  - *How can you build a pen to hold all the piglets?*
  - *What do you have to do to make room for a door?*
  - *How will you support the roof?*
- **2 vs. 3 dimensions**
  - *How can you turn your squares into a box?*
- **Curved vs. straight lines**
  - *Show me how your arms would look if they were straight/curved.*
- **Comparing & contrasting**
  - *I see that you have solid walls. Now, how can you make a window?*
  - *What's the difference between the pen and the barn?*



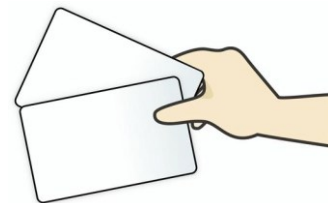
- **How shapes form & fit together**
  - *That's cool. How did you know those pieces fit together?*
- **Composition / decomposition, construct / deconstruct, combine / separate:** This can help children understand that a larger object can be broken down into smaller parts.
  - Construct and deconstruct playdough creations or block structures.
  - Create different shapes, animals, or objects using playdough by combining smaller pieces, and then taking them apart.
  - Count the objects: Create a group by combining a specific number of items. Separate and sort the objects into smaller sets using their attributes reinforcing the concept of breaking down a whole into its parts. Recount.
  - Gather natural materials like leaves, sticks, and flowers to create a collage. Identify the different components.
  - Read a story or create one. After telling the story, discuss each character and scene separately.
- **Problem-solving**
  - *What else can you try?*
  - *What if more people want to walk on the bridge?*
  - *How can you make the tower stable?*
  - *How can you make the track long enough to reach the wall?*
- **Symmetry (identical reflection)**
  - *How can you make the other side look the same?*



### TAKING MATH TO THE NEXT LEVEL

A child proudly displays his peg board with all the holes filled using different colored pegs.

- *How can you group the colors together?*
- *How can you arrange the pegs by color/size (length, width, height, or volume)?*
- *How do you know which size/color you have more of / fewer of?*
- *How do the pegs fit on top of /into each other?*
- *What if you made a pattern?*
- *How can you use the pegs to make different lines/shapes?*
- *What if you built something with those pegs?*
- *How can you show me one peg, then two pegs, all the way up to five pegs?*
- *Tell me about what you did.*
- *What else can you do with your pegs?*



### SOME SIMPLE EARLY MATH GAMES

- **Passing Game: Circle Count!**

Just a reminder that young children hesitate to pass items they want to keep because they don't think they will get them back. Passing is a skill all by itself.

  1. Children sit or stand in a circle.
  2. Pass an object around and count together as the object is passed.
  3. Slow down or speed up!

○ **Number CARD Game: Stand Up - Sit Down**

1. Stand when you see the number 1 and say the number out loud and sit when you see a 2.
2. Change the numbers.

○ **Number CARD Game: Pick or Roll, and Move!**

1. Roll dice or pick a card.
2. Add that number of manipulatives to the group, bucket, etc.
3. Expand on this by having the children toss back and forth that number of times or toss bean bags into receptacles.

○ **Number CARD Game: Pick or Roll, and Make!**

1. Roll dice or pick a card.
2. Construct the number with paint, clay, pipe cleaners, laces, drawn in sand, etc.

○ **Number Game: Seek & Find**

1. Cut large numbers out of cardboard (can use number cards or plastic numbers)
2. Hide them inside or outside.
3. Challenge the children to go find them.
4. Expand on this by asking the children to work together to put them in numerical order.



○ **Number Game: Find a Friend!**

1. Find a peer by hunting for a matching number written on paper or paper plates they are wearing or holding.
2. Mix up the numbers and go again!

○ **Number CARD Game: Mice & Elephants!**

1. Display number cards and say the number.
2. Children expand their bodies bigger or smaller depending upon whether the next numbers are greater or fewer.

**Music Reference List:**

- ♪ “When I See Shapes”  
CD: *Math Music & Motion*
- ♪ “Shake, Mix, Pound, Roll”  
CD: *Smart and Tasty 1*
- ♪ “Two Clapping Hands”  
CD: *Math Music & Motion*
- ♪ “Shake Your Boom Boom”  
CD: *Smart Moves 3*



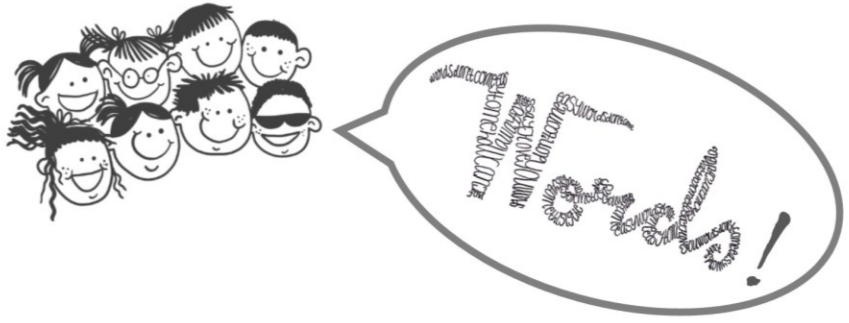
**Resource Book:** *The BIG Book of Open-Ended Questions to Intentionally Support Young Children in Learning*, ISBN: 978—1-958627-07-5

**Free Math Reading Guides:**

DREME – Develop and Research in Early Math Education out of Stanford University has created FREE math reading guides based on over 60 explicit and implicit storybooks. Online and in PDF format.  
<https://familymath.stanford.edu/activities/reading-together/?lang=english&role=preschoolers>

**Thank you for listening,  
and welcome to the CLUB!  
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# The Language of Math



Top | Bottom  
Above | Below  
Up | Down | Upside down  
Over | Under | Beneath  
Front | Back | Behind  
Next to | Beside  
Between | Through  
Around | Across  
In | Out  
Within | Among  
On | Off  
Center | Middle  
Inside | Outside  
Left | Right  
Toward | Away from  
Close to | Far from  
Near | Far  
Farther | Farthest  
Backward | Forward  
Lead | Follow  
Sideways  
Balance

Fast | Faster | Fastest  
Slow | Slower | Slowest  
Tall | Taller | Tallest  
Short | Shorter | Shortest  
Long | Longer | Longest  
Small | Smaller | Smallest  
Big | Bigger | Biggest  
Thin | Thinner | Thinnest  
Slim | Slimmer | Slimmest  
Thick | Thicker | Thickest  
Wide | Wider | Widest

Narrow | Narrower  
Large | Larger | Largest  
High | Higher | Highest  
Low | Lower | Lowest

Stop | Go | Continue  
Begin | Start  
Finish | Complete | End  
First | Second | Third...  
Next | Then  
Last | Finally  
Now | Later  
Before | After  
Alike | Similar  
Same | Different  
Zero | None | Nothing  
Every | All  
Few | Some | Many  
More | Less  
Most | Least  
More than | Less than  
Equal | Not Equal to  
A little | A lot  
How many?  
What's left?  
Add to | Take away from  
Add | Subtract  
Together | Apart  
Full | Empty  
All | None | Zero  
Almost enough  
Half | Medium  
Half way | Midway  
Single | Double | Pair

Multiple | Set  
Piece | Part | Whole  
Slice | Section  
Even | Odd  
Heavy | Heavier | Heaviest  
Light | Lighter | Lightest

Line | Point  
Straight | Curved | Wavy  
Zigzag  
Horizontal | Vertical  
Diagonal  
Parallel/Perpendicular  
Cross | Connect | Meet  
Angle | Corner  
Flat | Even | Uneven  
Side | Edge  
Surface  
Dot | Spot | Point  
Arrow

Circle	Sphere
Triangle	Pyramid
Square	Cube
Rectangle	Prism
Oval	Cone
Heart	
Rhombus	
Diamond	
Star	
Crescent	
Hexagon (6)	
Heptagon (7)	
Octagon (8)	