"We do math all day long in my PreK classroom at Lakeview Elementary School. As we arrive, we move a photo of ourselves from the Home column to the At School column. Then, at circle time, we count how many children are in each row. I like to count! Both at circle time and investigation stations, we sing counting songs and read counting books. One time, I counted all the connecting cubes it took to go from one end of the table to the other. My teacher, Kevin, helped me when I got to nineteen. I couldn't remember what came next. It's fun to build things with the different shapes in the block area. I tried to build a rainbow with only the rounded ones but they kept falling down. I figured out that I needed to stack some rectangles on the bottom to make it stand. At the manipulatives table, we have baskets to sort different things into and pattern cards to help us create colorful, geometric patterns. I like when we have measuring cups and pitchers at the water and sand table. Kevin gives me a challenge: How many little cups of water will fill the pitcher? He writes it down on a clipboard so we won't forget!"

Children's development of mathematical understanding begins in the very first months of life and continues to grow and expand as they interact with others and with the world around them. Babies begin to see patterns in the world in familiar caregiving routines and attend to objects and sounds relative to themselves. Toddlers begin to understand the words "one" and "more" and maneuver through their world with growing spatial understanding. Preschoolers begin to make sense of numbers as they play with counting. Their math understanding is directly related to their playful explorations of blocks, water, sand, puzzles, and games.

The expectations that are set out in the Minnesota Early Indicators of Child Progress (ECIPs) recognize that young children are developing the foundational knowledge and skills that will lead to more rigorous academic study in the Mathematics domain in the elementary school years. The alignment of the ECIPs with the Minnesota Academic Standards for Kindergarten is included and, as the kindergarten standards are revised, this alignment will be updated.

The Mathematics domain includes five components:

    Component M1-6 Number Knowledge

    Component M7 Measurement

    Component M8 Patterns

    Component M9-11 Geometry and Spatial Thinking

    Component M12-13 Data Analysis

The subcomponents and indicators identified for the ages of birth through kindergarten entry address the specific expectations across the developmental spectrum.

- For infants, indicators focus on the children's beginning understanding of patterns and predictability as they anticipate familiar routines, spatial awareness as they respond to objects and sounds relative to themselves, and recognition of similarities and differences among people and objects.

- Toddlers are growing in their mobility and independence in exploring the environment. Therefore, the indicators focus on the imitation of counting and early understanding of one-to-one correspondence, awareness of full and empty, following simple patterns, beginning awareness of shape and place in space, and matching and sorting.

- The growing language capabilities of preschoolers include their use of an ever-increasing vocabulary of mathematical terms to describe and make sense of their world. They recite numbers and count objects with one-to-one correspondence to higher quantities. Preschoolers identify geometric shapes and use the comparative language of measurement. Developing sorting strategies that grow in complexity and duplicating and creating patterns using various rules are skills best developed within the context of preschooler's play

While the terminology and concepts in the domain of mathematics are unique and explicit, they are interrelated with children's development in other domains as well. Mathematics is highly correlated with the domain of Language, Literacy, and Communications.

…research suggests there are rich connections between early literacy and early numeracy skill development that may help us think more broadly about children's early academic learning. Ultimately, we can use this information to create rich environments that support both early literacy and numeracy skill development." (Hojnoski 2014)

As children investigate mathematical concepts in hands-on experiences, they grow in their approaches to learning. They solve problems, think creatively, and apply concepts. Their social-emotional skills are enhanced as they develop greater confidence as learners and work collaboratively with others. Mathematics and science are linked easily in a rich, engaging early childhood environment where children experiment with water, sand, construction materials, and living things.

The indicators in the ECIPs are designed to work toward mathematics knowledge and skills; these goals are met most successfully as teachers and providers interact with children throughout each and every day. Children's interest and understanding of mathematics is best supported by showing the importance of mathematics in daily life.

Resource:

Hojnoski, Robin. August 11, 2014. What do the connections between early literacy and numeracy mean in preschool? http://www. schoolreadinessblog.com/author/robin_hojnoski/

Domain: Mathematics

Component M1-6: Number Knowledge

Subcomponent	0-1 years	1-2 years	2-3 years	3-4 year, K-Readiness	4-5, K-Readiness	K Alignment
M1 Rote counting: The child attends to sequences and use of number words, with or without items, sets, or numerals and without recognizing the link to quantity	**M1.1** Releases one item to reach for another **M1.2** Uses body language to indicate a desire for more	**M1.3** Imitates use of at least one number word **M1.4** Imitates counting	**M1.5** Recites number words but not necessarily in the correct order **M1.6** Recites number words correctly, up to 3 **M1.7** Names familiar numerals	**M1.8** Shows interest in counting or number oriented play, and notices numbers in the environment during free play **M1.9** Orders a few objects by size with assistance **M1.10** Recites number words in the correct sequence up to 10 **M1.11** Recognizes when others make errors in the number word sequence **M1.12** Points to objects while	**M1.14** Recites number word aloud, forward, up to at least 29 (allow for some mistakes), without objects **M1.15** Recites number words aloud, backward, down from at least 10 without objects **M1.16** Is able to name the next number word for numbers up to 9 **M1.17** Reads and writes numerals from 0 to 10, with some reversals possible	**K.1.1.3** Count, with and without objects, forward and backward to at least 20 **K.1.1.2** Read, write, and represent whole numbers from 0 to at least 31

				reciting number word sequence **M1.13** Begins to write number-like forms		

Component M1-6: Number Knowledge

Subcomponent	0-1 years	1-2 years	2-3 years	3-4 year, K-Readiness	4-5, K-Readiness	K Alignment
M2 Meaningful Counting: The child uses counting to identify how many items are in a set, using one to one correspondence; uses number words to identify "how many"			**M2.1** Imitates one to one correspondence	**M2.2** Correctly uses 1:1 correspondence up to 4 items	**M2.3** Demonstrates and uses 1:1 correspondence with sets larger than four	
M3 Cardinality: The child associates each of one or more number words to a unique and exact quantity, and knows that the final number word used when counting out an item set represents the exact number of items in the set		**M3.1** Responds to request to give a small quantity items (one, two)	**M3**.2 Gives 1 item correctly, upon request **M3.3** Gives 2 items or more upon request for 2, inconsistently	**M3.4** Gives exactly 4 consistently when asked	**M3.5** Gives 5 or more items correctly and consistently when asked	**K.1.2.1** Use objects and draw pictures to find the sums and differences of numbers between 0 and 10. **K.1.2.2** Compose and decompose numbers up to 10 with objects and pictures

Component M1-6: Number Knowledge

Subcomponent	0-1 years	1-2 years	2-3 years	3-4 year, K-Readiness	4-5, K-Readiness	K Alignment
M4 Ordinality: The child matches symbols (digits or numerals) to a position in a sequence			**M4.1** Identifies first or second item in a sequence, upon request	**M4.2** Uses terms like first; most; last; before, to refer to ordinal position	**M4.3** Recognizes that a number can be used to represent a position in a sequence	**K1.1.1**Recognize that a number can be used to represent how many objects are in a set or to represent the position of an object in a sequence

Subcomponent	0-1 years	1-2 years	2-3 years	3-4 year, K-Readiness	4-5, K-Readiness	K Alignment
M5 Comparing numbers and quantities: The child uses organizing strategies to know how many objects they have	**M5.1** Grasps one object and reaches for another	**M5.2** Demonstrates understanding of some descriptive words, such as responding to questions **M5.3** Separates a few items into groups using own method such as color, size, etc. **M5.4** Nests smaller objects inside larger objects	**M5.5** Compares two sets of up to 4 objects accurately using terms like more/less; a little/a lot	**M5.6** Uses terms like more/less; bigger/smaller; a little bit/a lot; to refer to approximate quantities	**M5.7** Verbally estimates quantities without counting, although inconsistently and allowing for mistakes	

Component M1-6: Number Knowledge

Subcomponent		0-1 years	1-2 years	2-3 years	3-4 year, K-Readiness	4-5, K-Readiness	K Alignment
M6 Relation and operations: The child can create a set or subset based on a rule, can combine or separate sets, and recognize the amount of items in a set does not change when the set arrangement changes				**M6.1** Notices when the quantity of a set of up to 4 objects has increased or decreased	**M6.2** States the number that comes next or before up to 5 **M6.3** Understands that a quantity changes (increases or decreases) when a set of objects is added to/subtracted from (respectively)	**M6.4** States the number that comes next or before up to 10 **M6.5** Understands that the quantity of a set of (more than 4) objects has been changed **M6.6** Without recounting, can add one more to a set, even when the set isn't visible after counting **M6.7** Demonstrates ability to combine and separate items within a small set without changing the total number in the set (up to 5) **M6.8** Uses simple physical	**K.1.1.4** Find a number that is 1 more or 1 less than a given number. **K1.1.1** Recognize that a number can be used to represent how many objects are in a set or to represent the position of an object in a sequence. **K1.2.2** Compose and decompose numbers up to 10 with objects and pictures. **K.1.2.1** Use objects and draw pictures to find the sums and differences of numbers between 0 and 10.

Subcomponent		0-1 years	1-2 years	2-3 years	3-4 year, K-Readiness	4-5, K-Readiness	K Alignment
						strategies to combine or separate sets	

Component M7: Measurement

Subcomponent		0-1 years	1-2 years	2-3 years	3-4 year, K-Readiness	4-5, K-Readiness	K Alignment
M7 Measurement: Child recognizes and makes comparisons of measurable attributes (length, height, width, area, volume, physical distance, time duration.)			**M7.1** Experiments with "full" and "empty" **M7.2** Orders a few objects by size with assistance	**M7.3** Brings objects closer together to compare them **M7.4** Imitates using an object to measure another object **M7.5** Identifies which of two small sets (less than 4) is more upon request **M7.6** Uses language to describe "full" and "empty"	**M7.7** Shows understanding of measurement terms (longer/shorter, taller/shorter, fullest, farthest, closest) **M7.8** Uses terms like more/less; a little bit; a lot; to refer to continuous properties like water, sand, height	**M7.9** Compares and orders more than two items in some way **M7.10** Uses comparison vocabulary (longer/shorter, taller/shorter, farthest/closest)	**K.3.2.1** Use words to compare objects according to length, size, weight and position. **K.3.2.2** Order 2 or 3 objects using measurable attributes, such as length and weight.

Component M8: Patterns

Subcomponent	0-1 years	1-2 years	2-3 years	3-4 year, K-Readiness	4-5, K-Readiness	K Alignment
M8 Repeating patterns: The child can identify create and describe sequences in objects, colors or numbers with sequences that increase, decrease or grow in complexity	**M8.1** Anticipates familiar routines	**M8.2** Carries out familiar routines **M8.3** Follows a familiar simple pattern (sound, body movement sequence like Patty Cake)	**M8.4** Follows an unfamiliar simple pattern (sound, body, color, size, movement)	**M8.5** Recognizes repeating patterns **M8.6** Copies existing pattern with same materials **M8.7** Extends a simple pattern with the same materials	**M8.8** Uses words or pictures to describe a simple pattern **M8.9** Applies a simple pattern rule to different materials or mode (sound, body, color, size, movement) **M8.10** Copies complex patterns with same materials **M8.11** Applies a complex pattern rule using different materials or mode (sound, body, color, size, movement)	**K.2.1.1** Identify, create, complete, and extend simple patterns using shape, color, size, growing or shrinking such as ABB, ABB, ABB or number, sounds and movements

Component M9-11: Geometry and Spatial Thinking

Subcomponent	0-1 years	1-2 years	2-3 years	3-4 year, K-Readiness	4-5, K-Readiness	K Alignment
M9 Knowledge and visualization of shapes: The child recognizes shapes, can describe 2 dimensional (2D) and 3 dimensional (3D) shapes and manipulate shapes with purpose.		**M9.1** Shows interest in shapes	**M9.2** Begins to recognize 2 dimensional (2D) and 3 dimensional (3D) shapes such as circles, spheres, squares, and cubes, such as by sorting or puzzle pieces	**M9.3** Points to familiar 2D and 3D shapes (circle, spheres, squares, cubes, triangles) when asked, thereby showing recognition of shape names **M9.4** Recognizes geometric shapes in the environment	**M9.5** Begins to describe the features (attributes) that define 2D and #D shapes, including sides and corners **M9.6** Puts together (composes) and takes apart (decomposes) shapes **M9.7** Composes and decomposes shapes/ constructions with increasing complexity	**K.3.1.1** Recognize basic two- and spheres. and three-dimensional shapes such as squares, circles, triangles, rectangles, trapezoids, hexagons, cubes, cones, cylinders and sphere

Component M9-11: Geometry and Spatial Thinking

Subcomponent	0-1 years	1-2 years	2-3 years	3-4 year, K-Readiness	4-5, K-Readiness	K Alignment
M10 Transformations and symmetry: The child can locate and manipulate shapes in space	**M10.1** Attends and responds to moving objects and sounds, relative to themselves	**M10.2** Develops increasing ability to change positions and move body from place to place **M10.3** Demonstrates awareness of relationship between over and under, up and down, in and out	**M10.4** Adjusts position and movement of own body relative to objects **M10.5** Explores how objects fit together in space **M10.6** Rotates objects to fit through holes	**M10.7** Rotates, flips, or turns an object to fit once they realize object doesn't fit a defined space	**M10.8** Puts together (composes) and takes apart (decomposes) shapes to create new shapes **M10.9** Recognizes and creates shapes that have symmetry **M10.10** Shows awareness that an object needs to be rotated, flipped, or turned before trying to fit the object into a hole or puzzle	**K.3.1.3** Use basic shapes and spatial reasoning to model objects in the real world

Component M9-11: Geometry and Spatial Thinking

Subcomponent	*0-1 years*	*1-2 years*	*2-3 years*	*3-4 year, K-Readiness*	*4-5, K-Readiness*	*K Alignment*
M11 Location, spatial relationships and landmark use: The child recognizes where a person or object is in relation to other people of objects	**M11.1** Shows preference for familiar toys	**M11.2** Recognizes familiar objects from different vantage points	**M11.3** With verbal cues, uses simple maps to relate to real-world	**M11.4** Uses terms like near/far; under; below; front; middle; end

M11.5 Uses a simple map of a visible area to locate placement | **M11.6** Recognizes and describes position of objects in space with greater accuracy

M11.7 Draws a simple map

M11.8 Matches 2 dimensional (2D) map with surrounding 3 dimensional (3D) layout Include this: (involves transformation, scale, dimension, and orientation distance) | **K.3.1.3** Use basic shapes and spatial reasoning to model objects in the real-world |

Component M-12: Data Analysis

Subcomponent	0-1 years	1-2 years	2-3 years	3-4 year, K-Readiness	4-5, K-Readiness	K Alignment
M12 Sorting: The child recognizes that objects can be sorted by attributes	**M12.1** Recognizes differences among people and among different objects	**M12.2** Matches items based on attributes meaningful to the child	**M12.3** Explores sorting **M12.4** Imitates sorting	**M12.5** Sorts objects based on an observable attribute **12.6** Demonstrates understanding that attributes are measurable	**M12.7** Describes the attribute used for sorting or comparing **M12.8** While sorting, can make a shift to change the attribute being used to sort and describe the new sorting attribute	**K.3.1.2** Sort objects using characteristics such as shape, size, color and thickness

Component M13-14: Data Analysis

Subcomponent	0-1 years	1-2 years	2-3 years	3-4 year, K-Readiness	4-5, K-Readiness	K Alignment
M13 Collects, classifies, and organizes information: The child collects, classifies and organizes data based on distinguishing characteristics.				**M13.1** Participates in simple data collection discussed by an adult or other child **M13.2** Collects information by one or more attribute	**M13.3** Participates as group member in the collection of data that is put on a chart or graph **M13.4** Sorts information by one or more attribute **M13.5** Independently collects data to put on a chart or graph	

Component M13-14: Data Analysis

Subcomponent	0-1 years	1-2 years	2-3 years	3-4 year, K-Readiness	4-5, K-Readiness	K Alignment
M14 Describes data: The child can describe data by using data sets to solve problems or asking questions.				**M14.1** Identifies patterns, differences, or similarities of information collected **M14.2** Uses language to describe those patterns, differences or similarities of data	**M14.3** Uses language to compare data **M14.4** Uses data to answer questions and solve problems **M14.5** Discusses, compares and makes sense of collected data	