Mathematics Developmental Continuums

Preschool children's mathematics abilities are an important predictor of their later school success in all areas of the curriculum[1]

[1] Duncan et al., 2007

Early Childhood Mathematics Developmental Continuum - Overview

- The **Mathematical Developmental Continuum** was designed using information from the following resources: HighScope COR Advantage, NYS Pre-K FCC, HighScope KDIs, RCSD Math Stage Cards, (developed in 1996) and the Common Core Curriculum Map in Mathematics (draft.)
- It identifies the mathematics milestones from beginning development to the kindergarten entry point. This document reads as columns; left column top to bottom, then right column top to bottom.
- As the child moves along the developmental continuum, he/she will reach milestones that are COR Advantage levels. These levels are identified on the chart, i.e. S-0, S-1, S-2. When a level is reached, remember to enter the anecdote into COR Advantage. The detailed COR Advantage Scoring Guide for the content area follows each section.
- The goal for teachers will be to move children along the continuum, which aligns with the kindergarten entry point.
- After each Content Area, you will find the corresponding COR Advantage Scoring Guide page.

Mathematics Developmental Continuum - Numbers and Counting

Child looks at, touches, or handles a single object (S-0)		Child consistently counts (with 1:1 correspondence) up to 10 objects (S-3)	
Child uses a word, sign or phrase to ask for "more" (S-1)		Child identifies four or more single-digit numbers (S-4)	
Child explores numbers through the use of manipulatives and real life experiences		Child says that one number is "more" than another (i.e. "Four is more than three.")	
Child uses number words or rote counts (not necessarily without skipping a number) (S-2)		Child identifies the number of objects in a group are "more" or "less" than the number of objects in another group	
Child rote counts consistently 1-5 (S-2)		Child counts with 1:1 correspondence more than 10 objects and says the last number counted tells how many (S-5)	
Child identifies "first" and "last "related to order or position		Child identifies the number of objects in a group are "greater than," "less than " or "equal to" the number of objects in another group	
Child rote counts to 10 (S-2)		Child says how many more or fewer are in one set than in another set (S-6)	
Child counts 1:1, 5 objects knowing that the last number counted says "how many"		Child subitizes up to 6 objects	

Mathematics Developmental Continuum - Numbers and Counting

Child counts with 1:1 correspondence 15 objects			
Child counts with 1:1 correspondence 20 objects			
Child begins writing numbers			
Child demonstrates an understanding of addition and/or subtraction			
Child composes and/or decomposes a number in two or more ways (S-7)			
Child represents a number of objects with a written numbers 0-5			
Child writes the numbers 1-10 (may have some reversals)			

MATHEMATICS

S Number and counting

Children learn to count by counting things — objects, people, and events. For infants, developing number sense is as basic as grasping the "oneness" of an object. Toddlers learn number words. Through everyday experiences, preschoolers learn that number words (*one, two, three*) refer to quantity and gradually realize that the last number counted tells "how many" there are. Later, children begin to compare quantities and combine and separate numbers into their components.

LEVEL 0

Child looks at, touches, or handles a single object.

The child begins to develop the concept of "one" by viewing, touching, and/or manipulating single objects, such as a face, a hand or foot, or a rattle.

- 8/3 Lying on the mat, CJ looked at the ball next to him.
- 7/22 Outside, Blake held a pine cone, turning it over and over.

LEVEL 1

Child uses a word, sign, or phrase to ask for "more."

The child indicates that he or she wants more of something. Requesting more indicates that the child understands that a quantity can be increased by more or one more.

- 2/13 At lunch, Maria held her empty bowl toward the bowl with the corn in it and said "More."
- 7/11 During choice time in the block area, Joshua said "Mo'" and went to get more blocks.

LEVEL 2

Child uses a number word or rote counts.

The child rote counts but does not yet have an understanding of what number means (that is, does not count with one-to-one correspondence).

- 1/14 While sitting on her teacher's lap and looking at a number book, Elizabeth spontaneously said the words "three" and "one" as the teacher turned the pages.
- 10/29 During choice time in the block area, Mikey counted his cars, saying "1, 2, 3, 5, 3, 4, 5, 7!" while counting the same three cars over and over.

LEVEL 3

Child consistently counts (with one-to-one correspondence) up to 10 objects.

The child is developing a sense of number and counts up to 10 objects, associating one and only one number with each object counted (using one-to-one correspondence). The child may occasionally double-count (for example, 1, 2, 3, 4, 4, 5) or skip a number (for example, 1, 2, 3, 4, 5, 6, 8). He or she may not realize that the last number counted represents the total. [*Note:* If a child consistently double-counts (counts the same objects over again), score at level 2.]

- 5/30 At work time in the toy area, Cheyenne counted out toy monkeys — "1, 2, 3, 3, 4, 5" — and gave them to her teacher.
- 8/19 At snacktime, Keira counted seven goldfish crackers on her plate. She touched each cracker as she counted (and there were seven crackers).

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LEVEL 4

Child identifies four or more single-digit numerals.

The child can identify four or more numerals from 0 to 9. [*Note:* Check off each numeral *at any time* you observe the child identifying that numeral, for example, by reading (naming) it, or by pointing to it spontaneously or in response to a comment or question.]

- 5/18 At choice time in the house area, Samuel called the doctor. He said, "3, 7, 5, 2" as he punched those numbers into the cell phone.
- 6/19 At work time in the toy area, while playing a board game, Anyna spun the number spinner (with numerals 1–9 on it). She said the numeral when the spinner stopped on it and moved her game piece that many spaces. She did this for the numerals 4, 1, 5, and 8.

LEVEL 5

Child counts (with one-to-one correspondence) more than 10 objects and says the last number counted tells how many.

The child correctly counts more than 10 objects and knows that the last number he or she says tells how many objects there are in total (for example, the child counts correctly to 12 and says there are 12 objects).

- 4/14 At work time in the toy area, Maggie counted 13 pegs. She said, "I've got 13!"
- 7/23 Upon arrival, Akio counted each child's cubby symbol. He turned to his uncle and said, "There are 18 kids in my room!" (He was correct.)

LEVEL 6

Child says how many more or fewer are in one set than in another set.

The child counts two sets of objects and says whether they have the same number (quantity) or, if they are different, how many more or fewer there are in one set than the other. [*Note:* If a child says one set has more than the other but cannot yet say by "how many more," do not score at this level.]

- 1/28 During center time, Anton counted the black cubes and Michaela counted the blue cubes. "I have 15!" Anton said. "There's 14 blues," replied Michaela. "Mine are one more," said Anton. [Anecdote is for Anton]
- 9/22 During math time, Naomi passed out papers to two table groups. She counted eight children at the red table. Then she counted five children at the yellow table and said, "There's three more kids at the red table."

LEVEL 7

Child composes and/or decomposes a number in two or more ways.

The child puts together or takes apart items in sets of up to nine objects. He or she knows, for example, that five can be put together (composed) of two plus three, four plus one, or two plus two plus one. Likewise, the child knows five can be divided (decomposed) in these same combinations.

- 2/10 During center time, Jonathan rolled the big dice to make sums. He rolled 3 and 1. He said, "Hey, that's 4. Know what else is 4? — 2 and 2, and 0 and 4."
- 5/19 During math workshop, Gretchen made tally marks on her whiteboard for the ways to make 7. She tallied 1 and 6, 3 and 4, and 2 and 5.

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Mathematics Developmental Continuum - Geometry and Spatial Awareness

Child tracks a moving object (T-0)		Child accurately names a square	
Child fits an object into an opening that is the correct size (T-1)		Child accurately names a rectangle (Child recognizes and names two-dimensional shapes - circle, traingle, square, rectangle) (T-3)	
Child explores shapes and makes a picture using them		Child recognizes shapes in the environment	
Child creates and builds shapes from components		Child uses position words ("on" and "under," "up" and "down," "in" and "out," "in front of," "behind," and "next to")	
Child moves self or objects in response to a simple position or direction word (T-2)		Child transforms (composes and decomposes) shapes into another shape and identifies the resulting shape (T-4)	
When asked, child points to a circle		Child describes what makes a shape a shape (identifies shape attributes) (T-5)	
When asked, child points to a triangle		Child names a cube (T-6)	
When asked, child points to a square		Child names a cylinder (T-6)	
When asked, child points to a rectangle		Child names a pyramid (T-6)	
Child accurately names a circle		Child describes three-dimensional shapes to compare their similarities and differences (T-7)	
Child accurately names a triangle			

MATHEMATICS

T Geometry: Shapes and spatial awareness

Infants look at shapes, and toddlers instinctively match and sort them, long before they learn the names of shapes. Infants and toddlers move their bodies and objects, eventually attaching simple position, direction, and distance words to them. Preschoolers begin to recognize what makes a shape a shape (triangles have three sides and three corners) and compare shapes. Older children master a variety of shape and spatial concepts and use them to solve spatial problems.

LEVEL 0

Child tracks a moving object.

The child follows an object or person with his or her eyes. As the child's focus improves, he or she can better distinguish the outlines of objects. This eventually allows the child to become aware of the contours of distinct shapes.

- 12/6 As Kristin sat in her bouncy seat, her eyes followed Kimmy (her caregiver) when she walked back and forth across the room.
- 6/12 Outside, while sitting on Jessa's (the caregiver's) lap, Mario watched the swing moving back and forth.

LEVEL 1

Child fits an object into an opening that is the correct size.

The child fits an object into an opening of the appropriate size. If the child discovers an opening is too small, he or she may look for something with a bigger opening.

- 3/16 During choice time in the toy area, Aiden put the shapes into the correct slots of the shape sorter.
- 10/11 During outside time, Juana placed rubber balls into a tennis ball canister.

LEVEL 2

Child moves him- or herself or objects in response to a simple position or direction word.

The child moves his or her own body or an object to demonstrate an understanding of basic spatial words such as *on* and *under, up* and *down,* and *in* and *out.*

- 4/16 During cleanup time, when her caregiver told her to put the ball in the basket, Avery did so.
- 9/27 During choice time, when Cody called "Sue?" Sue (his caregiver) said, "Cody, I'm here, under the loft." Cody walked to the loft and looked underneath it to find her.

LEVEL 3

Child recognizes and names two-dimensional shapes (circle, triangle, square, rectangle).

The child can say the names of basic two-dimensional shapes. The child may recognize and name shapes from everyday objects in the classroom environment.

- 4/30 During work time, Braden looked up at the clock on the wall and said, "Hey, the clock is a circle!"
- 3/19 During small-group time, Ashley named both the triangle and the rectangle sticker as she put them on her picture.

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LEVEL 4

Child transforms (composes and decomposes) shapes into another shape and identifies the resulting shape.

The child puts together (composes) and takes apart (decomposes) shapes to make another shape, aligning and rotating them as needed, and says the name of the resulting shape.

- 3/10 During small-group time, while working with the Magna-Tiles, Lucas put two triangles together and said, "I made a square."
- 11/2 During work time at the sand table, Olinda filled two square molds with sand and dumped them out next to each other. She said, "Look, I made a rectangle!"

LEVEL 5

Child describes what makes a shape a shape (identifies shape attributes).

The child describes the characteristics of a shape, for example, that triangles have three sides, rectangles have four edges and four corners, squares are like rectangles but all the sides are the same, and/or circles are round.

- 10/7 During work time in the toy area, Payton put a rubber band on the geoboard and said, "I made a square. It has four sides."
- 2/16 During work time in the toy area, while working with the pattern blocks, Adam fit many pattern blocks together in a mosaic-type design. He pointed to an opening and said, "I'm looking for one with three points. I need a triangle."

LEVEL 6

Child names a three-dimensional shape (cube, cylinder, pyramid).

The child identifies basic three-dimensional shapes. These shapes may include cube, cylinder, or pyramid.

- 9/20 At center time, Jaden said, "These are blocks, but I can call them cubes." (They were cube shaped.)
- 4/19 During art, Prema chose a tube to create her sculpture. "I need the cylinder to make the neck," she said.

LEVEL 7

Child describes three-dimensional shapes to compare their similarities and differences.

The child identifies the characteristics of three-dimensional shapes and says what is the same and/or different about them. For example, the child compares the number of sides in a cube versus a pyramid and/or notes whether their sides are "flat" or "slanted."

- 2/12 During a meeting on the carpet, Juan explained that "cylinders have circles on the top and bottom, but cubes have squares."
- 3/5 During math workshop while working with geometric solids, Kahn said, "This pyramid has four triangles and one square. This box has four rectangles and two squares."

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Mathematics Developmental Continuum - Measurement

Child explores (looks at, touches, handles) one or more objects with measurable attributes (size, weight) (U-0)		**Child measures using non-standard unit**	
Child fills a container (U1)		**Child uses standard measuring procedures (U-5)**	
Child nests or stacks three objects by size (U-2)		**Child fills a container 1/2 full and states that**	
Child uses a measurement term - (For example "big "and "little") (U-3)		**Child measures something using two different units and explains why the outcome is different (U-6)**	
Child uses terms "full" and "empty"		**Child, on his/her own, correctly measures using a standard measuring unit and says what the unit measures (U-7)**	
Child uses terms "long" and "short"		**Child uses a scale to weigh objects using the terms heavier and lighter**	
Child directly compares or orders things based on measurable attributes using the word "same."		**In conversation uses the measurement words of time: yesterday, today and tomorrow, accurately**	
Child uses the terms "before" and "after"		**Child uses a scale to weigh objects using the terms heavier and lighter**	
Child directly compares or orders things based on measurable attributes using the word "same" and words with er and est endings (U-4)		**In conversation uses the measurement words of time: yesterday, today and tomorrow, accurately**	

MATHEMATICS

U Measurement

The motivation to measure comes from children's interest in comparing things: Who is older? Whose road is longer? Infants explore one object at a time but as children handle two or more things, they become aware of measurable properties that differentiate them (for example, this one feels heavier). As language develops during toddlerhood and preschool, children learn basic measurement terms and explore the tools used to measure. Children gradually learn how to measure correctly by using the same unit, starting at the baseline, and not leaving gaps or overlaps while measuring.

LEVEL 0

Child explores (looks at, touches, handles) one or more objects with measurable attributes (size, weight).

As the child uses all the senses to investigate objects, he or she gradually becomes aware of properties that are measurable. The child has no labels for these properties; he or she simply experiences these differences (for example, something that is big, something that is heavy).

- 6/17 Natima handled both the beanbag filled with rice and the beanbag filled with cotton batting.
- 2/4 Outside, Dev's eyes gazed up and down the large oak tree.

LEVEL 1

Child fills a container.

Size is an attribute the child often pays attention to. He or she enjoys putting things in containers of various sizes.

- 4/6 During choice time, Asia filled a large wooden bowl with pine cones.
- 12/19 During outside time at the water table, Tayshon used a cup to put water in a bucket.

LEVEL 2

Child nests or stacks three objects by size.

The child nests or stacks three objects (such as nesting cups) from the biggest to the smallest and/or the smallest to the biggest.

- 11/3 During choice time, Jerry put the small bowl inside the medium bowl and then placed them both in the large bowl.
- 2/8 During choice time, Aleena stacked four nesting blocks from largest to smallest.

LEVEL 3

Child uses a measurement term.

The child uses a measurement term to describe one thing but does not compare it to another thing. The term is simply used to name or identify a specific characteristic. For example, at this level, a child may use the words *big, bigger,* and *biggest* all to describe something as big, without comparing it to the size of something else. [*Note:* If a child describes something using the word endings *er* or *est,* determine whether this is a true comparison. If so, score at level 4. If not, score at level 3.]

- 2/7 Outside, when going down the hill on a sled, Jinhai said, "My sled is the fastest too."
- 10/7 During work time in the block area, Ayla said, "Look, my barn is really big."

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LEVEL 4

Child directly compares or orders things based on measurable attributes using the word *same* and words with *er* and *est* endings.

The child orders things by directly comparing them with each other and describes them by using the word *same* and the word endings *er* and *est*. [*Note:* If a child describes something using *er* or *est* word endings, it is important to determine whether or not this is a true comparison. If so, score at level 4. If not, score at level 3.]

- 1/18 During small-group time, Zachary stacked pegs and compared them to Ian's stack. He said, "Ours are the same." He added several more pegs and said, "Mine is taller now."
- 4/11 During work time in the art area, Regina cut lengths of yarn. She laid them out on the table next to one other and said, "The red one is the longest."

LEVEL 5

Child uses standard measuring procedures.

When measuring, the child follows standard procedures, that is, measures using the same unit, begins measuring at the baseline, and neither leaves gaps nor overlaps units while measuring.

- 2/26 At small-group time, Carla measured her tape line with inch cubes. She started at the beginning of the tape and lined up her inch cubes one after another. She said, "My line is 18 blocks long."
- 8/4 At work time in the block area, Justin wanted to see how tall his "castle" was. He stacked pegs next to his castle. He counted them and said, "My castle is 15 pegs and a little bit of this extra one."

LEVEL 6

Child measures something using two different units and explains why the outcome is different.

At this level, the child knows that measuring something with two different units will result in two different outcomes, even though the size of the object stays the same. For example, he or she may anticipate that measuring something with a smaller unit (a paperclip) will result in a larger outcome (number of units) than measuring the same object with a longer unit (a pencil).

- 6/2 At center time, Moira lined up the Unifix cubes along her notebook. She counted the cubes and said, "It's 10." When Mrs. Kim wondered what else she could use to measure, Moira said "Crayons." She measured her notebook with crayons and said, "It only took four. The crayons are bigger."
- 11/7 Outside on the playground, Jessa counted the bricks on the low wall. She said, "This wall is 34 bricks long." She measured the wall with a jump rope and said, "It takes three and a bit more jump ropes. The jump rope is way bigger than the bricks."

LEVEL 7

Child, on his or her own, correctly measures using a standard measuring unit and says what the unit measures.

The child uses standard units when measuring and says what each type of unit measures. The units include those for length, weight, and volume and are appropriate to what is used in that country (for example, inches and feet in the US versus centimeters and meters in Canada).

- 12/8 During math workshop, Sara added scoops of beans to the balance scale. She carefully added more. When Mr. Thompson asked what she was doing, she said, "I want it to be 20 ounces. I think I need one or two more beans to make it right."
- 2/22 At recess, Cecilia used a yardstick to measure how far she jumped. She jumped, drew a line in the dirt to mark where she landed, and measured the line. She said, "I jumped 15 inches!"

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Mathematics Developmental Continuum - Algebra/Patterns and Sequences

Child looks at or handles one object and then another (V-0)		**Child copies a complex pattern (AABBAABB)**
Child gathers three or more objects (V-1)		**Child creates own complex pattern with 3 repeats (AABBAABBAABB) (V-5)**
Child lines up three or more objects one after another (V-2)		**Child translates a written pattern into sounds, symbols, movements and physical objects on own (V-6)**
Child looks at 2 or more objects and says they are the same and why		**Child explains how increasing and decreasing patterns work (V-7)**
Child sorts by 2 attributes		**Child sees the pattern in a number line**
Child looks at 2 or more objects and says they are different and why		
Child copies a simple pattern (ABABAB) (V-3)		
Child recognizes a simple pattern (ABABAB) (V-3)		
Child extends a simple pattern (ABABAB) (V-3)		
Child recognizes, copies, or extends an existing simple pattern (V-3)*		
Child creates a unique simple pattern with 3 repeats (V-4)		

*Please note: This is the actual wording of V-3. Since it uses the word "or," a child can technically be marked at V-3. if he/she does only one of the skills.

MATHEMATICS

V Patterns

Children become aware of patterns in objects, movements, sounds, and events. They do this through their own observations and when adults call their attention to them. This awareness grows as children progress from handling single objects, to lining up and ordering objects, to noticing regularities in the arrangement of objects. For example, some patterns repeat (for example, red-blue-red-blue-red-blue), while others change in predictable ways (for example, as age increases, so does height). Working with patterns and relationships is the basis for studying algebra later in school.

LEVEL 0

Child looks at or handles one object and then another.

At this level, the child works with single objects (looking at or touching one object and then another, transferring something from hand to hand), rather than attending to more than one object at time. When the child is finished exploring one object, he or she may move on to another object.

- 1/19 Lucy looked at the rattle that Justine (her caregiver) had placed in her hand and then looked back at Justine.
- 6/7 Dante picked up a large metal jar lid, turned it around in his hands, and looked at it. He dropped it and picked up a different lid.

LEVEL 1

Child gathers three or more objects.

The child now works with more than one object at a time. He or she groups objects into sets of three or more. Although the child does not yet explore the relationship between objects, just seeing them together lays the foundation for organizing them later on.

- 2/17 During choice time, Armondo carried a pail and put a cup, a toy horse, and a Mason jar ring in it.
- 9/16 Outside, Augustina found a stick, a rock, and several leaves. She put them all in a pile.

LEVEL 2

Child lines up three or more objects one after another.

The child lines up objects (not necessarily in a straight line). Although the objects are not arranged in order, seeing them beside one another helps the child become aware of their properties so he or she can later spot patterns and relationships.

- 2/6 At group time, Anna took the rocks from her basket and placed them in a line.
- 11/19 At choice time in the house area, Hakim lined up the cups on the table.

LEVEL 3

Child recognizes, copies, or extends an existing simple pattern (such as ABABAB or AABBAABBAABB).

The child attends to simple alternating patterns (such as ABABAB or AABBAABBAABB). The child demonstrates his or her awareness by naming the pattern (for example, red-blue-red-blue-red-blue), copying the pattern, and/or extending an existing pattern.

- 3/8 At work time in the book area, Sophia looked at the striped fabric on the pillow. She said, "Look, it goes yellow-green-yellow-green."
- 9/28 At work time in the toy area, Caleb noticed that Beth had created a pattern with the pegs. He handed her a red peg and said, "This comes next." [Anecdote is for Caleb]

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LEVEL 4

Child creates a unique (not copied) simple pattern with at least three repeats.

The child makes up a simple pattern that repeats at least three times. The pattern might be visual (such as alternating red and blue beads) or based on movement (such as alternating pats to nose and shoulders). To be scored at this level, it must be an original pattern of the child's, not one copied from someone or somewhere else.

- 12/9 During work time in the art area, Hayden made a bracelet for her sister, stringing the beads in a red-blue-red-blue-red-blue pattern.
- 5/9 During large-group time, Isaac had an idea for a movement pattern. He demonstrated a shoulders-head-shoulders-head-shoulders-head sequence.

LEVEL 5

Child creates his or her own (not copied) complex pattern (such as AABAABAAB or ABCABCABC) with at least three repeats.

The child makes up a more complex pattern (such as AABAABAAB or ABCABCABC) that repeats at least three times. As with the previous level, the pattern might be visual or based on movement, and it must be original rather than copied.

- 7/18 During work time in the art area, Lydia used a marker to create a striped border around her picture. She did red-green-blue-red-green-blue-red-green-blue all the way around.
- 8/12 Outside, Juan showed another child his "fun way" to get to the slide. He went hop-hop-jump-hop-hop-jump-hop-hop-jump all the way to the slide.

LEVEL 6

Child translates a pattern into sounds, symbols, movements, and physical objects on his or her own.

The child uses a pattern in one form (such as a visual pattern) to create a pattern in another form (such as a sound pattern). For example, the child might translate the written pattern 122122122 into a sound pattern that goes soft-loud-loud-soft-loud-loud-soft-loud-loud. The child must originate the idea, and the pattern must be repeated at least three times.

- 10/12 In music class, Cole created a pattern using the bongos to match the symbol pattern on the wall. He hit the drums soft-hard-soft-hard-soft-hard to match the XOXOXO pattern.
- 12/14 During math workshop, Serena looked at the AAABAAABAAAB pattern on the whiteboard and lined up her blocks red-red-red-blue-red-red-red-blue-red-red-red-blue.

LEVEL 7

Child explains how increasing and decreasing patterns work.

An increasing or decreasing pattern (algebraic function) is one in which there is a systematic relationship between one thing going up and another going up or down (for example, as age increases, so does height; for each scoop of cereal added to the bowl, the level in the box goes down). The child at this level recognizes these connections, which sets the stage for further algebraic understanding in later years.

- 4/1 During morning meeting, after Mrs. White pulled two children's name sticks from the helper jar, Justine said, "Every day the helper jar loses two kids and the helped jar gets two more kids. Pretty soon, the helper jar will be empty and the helped jar will be full."
- 3/31 During free play, Tyrone fed the class guinea pig (Sniffy) one scoop of food. He said, "Miss Lockhart, we're going to have to buy more food. Every time we feed Sniffy, the food in the container goes down some more."

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Mathematics Developmental Continuum - Data Analysis

Child shows interest in (looks at, touches, handles) one object from a collection of objects (W-0)					
Child collects objects (W-1)					
Child can generate a list (pg. 115, Mathematics HighScope)					
Child groups things into two or more collections (W-2)					
Child uses the comparison words more or less					
Child represents information (data) in concrete ways (W-3)					
Child represents information (data) in abstract ways (W-4)					
Child interprets information (data) from a representation (W-5)					
Child applies information (data) from a representation (W-6)					
Child poses a question of interest and collects and interprets information (data) to figure out the answer (W-7)					

MATHEMATICS

W Data analysis

Although they do not go about this process as systematically as adults, children nevertheless enjoy gathering and recording quantitative (numerical) information. As with other areas of early mathematics, infants focus on single objects or events. By toddlerhood, children group things into collections that they later learn to quantify and compare. Preschoolers can begin to represent this information on simple charts and make sense of the data. Gradually, children begin to ask their own questions that can be answered by gathering and interpreting data.

LEVEL 0

Child shows interest in (looks at, touches, handles) one object from a collection of objects.

The child, when presented with a set of objects (such as a basket of small blocks or a mobile with several hanging parts), focuses his or her attention on one of the items. He or she might look at the item of interest, reach for or touch it, attempt to grasp it, and so on.

- 11/21 While lying on his blanket, Lucas reached for the shiny ring that was among several toys next to him.
- 1/15 While lying under the animal mobile, Alexis watched the zebra swing back and forth.

LEVEL 1

Child collects objects.

The child gathers objects into a pile. He or she may gather all of them together from a loose arrangement and/or pick out objects from a bigger collection to gather into a smaller pile. [*Note:* The objects the child gathers do not need to be similar or related to one another.]

- 10/25 At choice time in the toy area, Javier took several cars from the car box and put them on the floor next to him.
- 5/16 At free play, Rachel crawled around the rug, picking up yarn balls and putting them in her basket.

LEVEL 2

Child groups things into two or more collections.

The child gathers objects into at least two piles. The child may divide an entire set of objects into two or more sets and/or select only some objects from the set to include in his or her piles. [*Note:* The objects the child groups do not need to be similar or related to one another.]

- 2/19 At group time at the water table, Ellie gathered fish figures. She put some in her cup and some in Evan's cup.
- 6/8 At outside time, Marley made three piles of gravel on the blacktop.

LEVEL 3

Child represents information (data) in *concrete* ways.

The child organizes simple information using concrete objects (for example, a toy, a block, him- or herself) to show what group or category the information belongs in.

- 5/16 Before leaving for a field trip, Miss Johnson asked all the children in Mr. Scott's group to stand on the blue rug and all the children in her group to stand on the red rug so they could be in groups to get on the vans. Annalee went to the red rug (she was in Miss Johnson's group).
- 2/7 At recall time, Dewei put a teddy bear counter on the block area sign to show where he played at work time.

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LEVEL 4

Child represents information (data) in *abstract* ways.

The child records simple information in a less direct way (such as making a tally mark or writing his or her name) on a list, chart, or simple graph.

- 12/4 At snacktime, Josie made a tally mark under the picture of the goldfish on the chart to indicate that she liked the goldfish crackers in the trail mix.
- 6/19 At recall time, Zoey wrote the letter *Z* under the art area, house area, and water table columns on the recall chart to show where she had played that day.

LEVEL 5

Child interprets information (data) *from a representation.*

The child makes sense of the data recorded on a list, chart, or simple graph. For example, the child looks at the number of tally marks and concludes that more children like apples than pears.

- 11/9 At the end of work time, Tomas looked at the sign-up list for the three computers and said, "Man, lots of kids used Computer 2 today."
- 6/19 At recall time, Kevin looked at the recall chart, counted where Zoey wrote her *Z,* and said, "Zoey went to three areas today."

LEVEL 6

Child applies information (data) *from a representation.*

After interpreting the information recorded on a list, chart, or simple graph, the child uses that information to answer a question or solve a problem. For example, after seeing that there are more tally marks next to apples than pears on a chart of children's favorite fruits, the child concludes that the class should buy more apples at the farmers' market.

- 2/2 During morning message, after the class tallied which rainforest animal they wanted to study, Jackson said, "Lots of kids want to do jaguars, but kids didn't pick tapir. Maybe they don't know what it is; that's why they didn't pick it."
- 3/9 During center time, Alexis looked at the bar graph and said, "More kids like chocolate than vanilla. I guess I should bring chocolate cupcakes on my birthday!"

LEVEL 7

Child poses a question of interest and collects and interprets information (data) to figure out the answer.

The child identifies the type(s) of quantitative (countable) data needed to answer a question of interest to him or her. To be scored at this level, the child must do more than ask a question. The child must also collect and interpret the information.

- 1/18 During morning meeting, Dustin asked how many kindergartners rode the bus. Mary said it was a lot. Dustin said he was going to count all the kids that stood in the bus line and all the kids that stood in the walker line. At the end of the day, he did so and told Mrs. Albright that there were "a lot of bus riders — 18," and "not so many walkers, only 4."
- 12/6 At lunchtime, Jasmine wondered how many children received the school lunch and how many children brought their own lunch. When Mrs. Gainsley asked her how she could find out, she said, "I know, I could make a chart." At choice time, she made a chart and tallied what each child in the class did for lunch. She excitedly brought the chart to Mrs. Gainsley and said, "It's almost even. Twelve kids bring their lunch and 11 kids get school lunch."

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