

Course Information

Grade(s):	Grade PK
Discipline/Course:	Mathematics
Course Title:	Pre-K Mathematics
Prerequisite(s):	0-36 months
Course Description: <i>Program of Studies</i>	<p>Mathematically rich preschool environments immerse children in playful and experienced-based mathematics. Young children are exposed to and explore the power of mathematics to understand and shape their world. Children develop mathematical understanding through recognition of relationships of numbers, quantities, and patterns as they explore our number system in natural situations. Mathematics and numeracy are tools for thinking, problem solving, and communicating. The preschool curriculum allows children to learn how mathematics helps build a community of learners through thoughtfully planned numeracy work that exposes children to the big ideas in mathematics: counting and cardinality, operations and algebraic thinking, numbers and operations, measurement and data, and geometry. Mathematics is taught throughout the day and integrated into daily activities. The standards addressed in preschool are directly linked to the standards that will be addressed in kindergarten. The curriculum demonstrates how the important work in preschool classes helps lay the groundwork for further mathematical learning as they enter kindergarten. “Doing more mathematics increases oral language abilities, even when measured during the following school year. These include vocabulary, inference, independence, and grammatical complexity. Given the importance of mathematics to academic success in all subjects, all children need a robust knowledge of mathematics in their earliest years.” (Sarama et al., and Sadlier & Tai, summarized in <i>Math in the Early years: a Strong Predictor of Later School Success</i>, 2013, p.2)</p>
Course Essential Questions:	<ul style="list-style-type: none"> ● Why do we count? ● How do we count? ● What are numbers?

	<ul style="list-style-type: none"> • How do we write numerals? • How can we compare quantities? • How can we discriminate between letters from numerals? • How do we match numerals to a corresponding set?
Course Enduring Understandings:	<ul style="list-style-type: none"> • There are patterns in our counting sequence and our number system. • Cardinality - the last number tells ‘how many’ when counting. • Ordinal numbers are numbers that are counted once and only once in conventional order. • Numbers can be composed and decomposed (eg. 5 is 2 and 3). • Quantities within 10 can be compared using less than, more than or the same. • Hierarchical inclusion- numbers are contained in other numbers (eg. 4 is in 5 and 5 is 1 more than 4). • Conservation of number - the arrangement of objects does not affect how many there are. • Subitizing (perceptual) is the instant recognition of a number of objects. • Numbers can be added and subtracted (eg. Adding 2 more to a group of 3 gives you 5). • Objects can be described and compared using measurable attributes. • Objects can be sorted and classified by attributes. • Shapes can be identified, analyzed and compared. • Shapes can be combined to make other shapes. • Objects can be identified by describing their location and relative position.
Duration:	Age 3 to Kindergarten
Course Materials/Resources:	Bridges 2nd edition

Units integrated into Daily Activities

Learning Goals		
Ages	3-4 year olds	4-5 year olds
<p>Standard(s): <i>Students may use any modality to demonstrate the learning goal.</i></p>	<p>Counting and Cardinality M.48.2 Count up to at least five objects using one-to-one correspondence, using the number name of the last object counted to represent the total number of objects in a set.</p> <p>Know number names and the count sequence. M.48.1 Say or sign the number sequence up to at least 10.</p> <p>Count to tell the number of objects. M.48.3 Count out a set of objects up to four.</p> <p>Compare Numbers M.48.6 Compare sets of 1 to 5 objects using a visual matching or counting strategy and describing the comparison as more, less than or the same.</p> <p>Measurement and Data M.48.8 Recognize measurable attribute of an object such as length, weight or capacity. M.48.9 Sort objects into two groups, count, and compare the quantity of the groups formed (e.g.,</p>	<p>Counting and Cardinality M.60.2 Count up to 10 objects using one-to-one correspondence, regardless of configuration, using the number name of the last object counted to represent the total number of objects in a set.</p> <p>Know number names and the count sequence M.60.1 Say or sign the number sequence up to at least 20.</p> <p>Count to tell the number of objects. M.60.3 Count out a set of objects up to five.</p> <p>Compare Numbers M.60.6 Compare sets of up to 10 objects using a visual matching or counting strategy and describing the comparison as more, less than or the same.</p> <p>Measurement and Data M.60.9 Compare the measurable attributes of two or more objects (e.g., length, weight and capacity) and describe the comparison using appropriate vocabulary (e.g., longer, shorter, same length, heavier, lighter, same weight, holds</p>

	<p>indicate which is more).</p> <p>Sort and Classify Objects M.48.10 Sort and classify objects by one attribute into two or more groups (e.g., color, size, shape)</p> <p>(Reference: CT ELDS, 2014)</p>	<p>more, holds less, holds the same amount).</p> <p>M.60.10 Begin to use strategies to determine measurable attributes (e.g., length or capacity of objects). May use comparison, standard or non-standard measurement tools.</p> <p>M. 60.11 Represent data using a concrete object or picture graph according to one attribute.</p> <p>Sort and Classify Objects M.60.12 Sort and classify a set of objects on the basis of one attribute independently and describe the sorting rule. Can re-sort and classify the same set of objects based on a different attribute.</p> <p>(Reference: CT ELDS, 2014)</p>
<p>Practice Standards <i>Students may use any modality to demonstrate the learning goal.</i></p>	<p>Math Practices</p> <p>MP.1: Make sense of problems and persevere in solving them. <i>Completes tasks that are challenging or less preferred despite frustration, either by persisting independently or seeking help from an adult or other child.</i> <i>Tries different strategies to complete work or solve problems including with other children.</i> <i>As the teacher poses problems and encourages children to share their thinking, preschoolers begin to use both verbal and nonverbal means (e.g., manipulating objects, demonstrating on their fingers), to explain to themselves and others the meaning of a problem and look for ways to solve it.</i></p> <p>MP.2: Reason abstractly and quantitatively <i>When counting objects, says or signs the number names in order, pairing one number word that corresponds with one object, up to at least 10.</i> Child compares numbers. <i>Identifies whether the number of objects in one group is more than, less than, or the same as objects in another group for up to at least five objects.</i> <i>Pre-K children begin to use numerals to represent specific amounts (quantities). For example, a child may</i></p>	

write the numeral 4 to represent the number of dots rolled on a die, find the numeral card that matches the number of shapes on a card along the number path, or count out a number of objects to match a numeral card. Preschoolers also begin to manipulate objects or use their fingers to express quantitative ideas such as a joining or a separating situation.

MP.3: Construct viable arguments and critique the reasoning of others.

Child expresses creativity in thinking and communication. *For example, uses multiple means of communication to make sense of math tasks and to ask questions*
Preschool students are weighing and measuring pumpkins. The children use the pan balance to explore different weights. The teacher guides the conversation by asking questions. How did you figure that out? Will the pumpkin still be heavier if we add two blocks?

In preschool, children begin to express and explain their math thinking using both words and actions e.g., finger patterns, hand and arm motions, charts, graphs, and so on. Through opportunities that encourage exploration, discovery, and discussion, preschoolers begin to learn how to listen and respond to others, and express their own solutions and strategies, opinions and ideas.

MP.4: Model with mathematics.

Child shows interest in and curiosity about the world around them.

- *Asks questions and seeks new information.*
- *Demonstrates eagerness to learn about and discuss a range of topics, ideas, and activities.*

Preschoolers begin to use fingers, manipulatives, and numerals to model mathematical situations. They also begin to use mathematics to model and solve problems that emerge in the classroom. Too many children want to play in the puppet theater at the same time? They ask a teacher to get down the egg timer so they can see when it's time to let another pair use the theater. The tower of foam blocks won't stand up? They get some of the triangular blocks to steady the tower at its base.

MP.5 Use appropriate tools strategically.

Child compares and categorizes observable phenomena. *Uses measurement tools, such as a ruler, balance scale, eye dropper, unit blocks, thermometer, or measuring cup, to quantify similarities and differences.*
Preschoolers choose from a variety of concrete materials (e.g., Unifix cubes, pattern blocks, minibboards, ten frames, counters of various types, Attribute blocks), visual displays (e.g., graphs, charts), and technological

materials (e.g., virtual manipulatives, apps, interactive websites) to explore mathematical concepts.

MP.6: Attend to precision.

Child understands and uses a wide variety of words for a variety of purposes.

- Shows recognition of or familiarity with key domain-specific words heard during reading or discussion.
- With multiple exposures, uses new domain-specific/math vocabulary during activities.

Preschoolers begin to express their ideas and reasoning using words. As their mathematical vocabulary increases in response to exposure, modeling, and practice, children become more precise in their communication, calculations, and measurements.

MP.7 Look for and make use of structure.

Child understands simple patterns.

- Duplicates simple patterns in a different location than demonstrated, such as making the same alternating color pattern with blocks at the table that was demonstrated on the rug. Extends patterns, such as making an eight block tower of the same pattern that was demonstrated with four blocks.
- Identifies the core unit of sequentially repeating patterns, such as color in a sequence of alternating red and blue blocks.

Preschoolers begin to look for patterns and structures in the number system and other areas of mathematics. Presented with patterned sequences of objects or pictures, they begin to make predictions based on the available information. Asked to identify a hidden number on the number path, they begin to use the numbers they can already see along the path to help.

MP.8 Look for and express regularity.

Child shows understanding of word categories and relationships among words.

- Categorizes objects into groups based on attributes (i.e., weight, size, shape)

Pre-K children begin to make generalizations about shapes and numbers. When searching for triangles around the room, for example, they begin to notice that some triangles are larger than others or come in different colors—yet they are all triangles. While exploring the part-whole relationships of a number using double-sided counters, children begin to realize that 5 can be partitioned in various ways (4 and 1, 2 and 3, and so on) without changing the total.

(Adapted from Math Learning Center p. 25)

Enduring Understanding(s):	<ul style="list-style-type: none"> ● Counting helps students to understand how numbers are related. ● Numbers can be represented by numerals, sets, and number names. ● Counting objects requires synchrony and tagging (Synchrony: remembering the word that comes next and using only one word for each object. Tagging: touching each object once and only once.) ● Numbers grow by one, and exactly one, each time. (Hierarchical Inclusion) ● When counting a set the number they end on is the number of objects in a set. (Cardinality) ● One to one correspondence (if there is a corresponding object matched to each object in a set, the sets are equivalent) is necessary to the understanding of equivalency. ● The number of objects in a set remains the same regardless of the arrangement of the set. (Conservation of a Number) ● The number of objects can be recognized at a glance without counting. (Subitizing)
FPS Academic Expectation(s):	<p>Exploring and Understanding <i>When students engage in problem solving situations, they should be able to understand the problem, determine relevant information, and ask relevant additional questions.</i></p> <p>Synthesizing and Evaluating <i>Engaging in a problem solving situation, students should be able to analyze the most efficient approach, and reflect on the process used to solve the problem.</i></p> <p>Creating and Constructing <i>Engaged in a problem solving situation, students should implement a plan.</i></p> <p>Conveying Ideas <i>Students should be able to use correct mathematical language and logically display their work for the desired problem.</i></p> <p>Collaborating Strategically <i>Students should be able to work collaboratively to solve problems.</i></p> <p>Using Communication (Media) Tools <i>Students should be able to explore and choose the correct tools to illustrate their mathematical work to solve a specific problem.</i></p>
Learning Goal(s): <i>Students will be able to use their learning</i>	Develop and use models to represent numerals, sets, and number names.

<i>to:</i>	<p>Ask questions and investigate how numbers are related and represented.</p> <p>Construct explanations using patterns, structures and relationships of quantities of numbers.</p> <p>Use tools and clear and precise language to defend conservation of a number and cardinality.</p> <p>Trusts the count and, without prompting, chooses ‘counting’ as a way of solving problems.</p> <p>Investigate, generalize and reason about patterns in numbers.</p> <p>Investigate equivalence through conservation and compensation using tools, models, numbers and pictorial representations.</p> <p>Identifies how 2 and 3-D shapes are alike and different using attributes.</p> <p>Ask questions and investigates the attributes of shapes.</p> <p>Construct explanations to describe relative positions of objects (ex. above, below, to the left, to the right of, under, etc.).reached.</p>
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