

Preschool Math Academic Standards

In High Quality Early Childhood Care and Education Settings



Preschool Mathematics Academic Standards in High Quality Early Childhood Care and Education Settings

How to use this document

Colorado Preschool Program staff developed this document to help link the new Colorado preschool academic standards with the early childhood best practices that are already present in high quality early childhood care and education settings. While this document is intended for early childhood teachers in classroom settings that will be adopting the standards, we wanted to give some examples of how the standards might look in family childcare homes and in other early care configurations.

The preschool academic standards form the “what” of early childhood teaching – the objectives and goals for children to experience in their formative preschool years. To make a connection between early childhood best practices and the new academic standards expectations, we relied on the Building Blocks to the Colorado Content Standards, the Colorado Quality Standards for Early Childhood Care and Education, and Results Matter assessment tools for examples and descriptions. These sources provide the “steps for getting there” or the “how” of early childhood teaching. Young children require a much different environment than their elementary school counterparts. For each standard and its evidence objectives, we describe what should be in place to ensure children have opportunities to master the objectives and goals of the standards in enriching, developmentally appropriate ways. We also provide examples of children and adults in various settings showing the standards in action so that connections can be made from the small and large moments of early childhood experiences that build towards more formal learning.

As you go through each standard domain, you will see the standard table as it appears in CDE documentation with the 21st Century Skills and Readiness competencies. On the next page, you will see the evidence outcomes, the steps for getting there, and the examples from early childhood settings. Each pair of tables is color-coded to help match the pages. These sections are not meant to be inclusive; they are guidance to begin thinking about the preschool academic standards and how they link to early childhood best practices.

Resources:

Preschool Standards & Assessments Crosswalk to Results Matter Systems, Building Blocks, and Head Start Early Learning Framework
<http://www.cde.state.co.us/scripts/ECCCrosswalks/crosswalk.asp>

The Colorado Quality Standards for Early Childhood Care and Education
<http://www.cde.state.co.us/cpp/qualitystandards.htm>

Building Blocks to the Colorado K-12 Content Standards (2007)
<http://www.cde.state.co.us/cpp/download/PPDocs/BuildingBlocksNov2010.pdf>

Building Blocks to the Colorado K-12 Content Standards Mathematics (2003)
<http://www.cde.state.co.us/cpp/download/PPDocs/OldMathBuildingBlocks.pdf>

Preschool Mathematics Academic Standards in High Quality Early Childhood Care and Education Settings

Mathematics helps young children make sense of the world around them and understand their physical world. Children are inclined to make comparisons, notice similarities and differences in objects and group their toys and materials. The ability to organize information into categories, quantify data and solve problems helps children to learn about time, space and numbers.

When children play in the sandbox, cook applesauce and complete a puzzle, they are engaging in activities that allow them to develop the thinking skills that are naturally used in daily life. Children learn the uses of mathematics to describe and explore relationships among objects and materials in the environment. They increasingly develop the vocabulary and skills to measure, describe patterns and to express order and position.

Preschool Math Expectations at a Glance	
1. Number Sense, Properties, and Operations	1. Quantities can be represented and counted
4. Shape Dimension, and Geometric Relationships	1. Shapes can be observed in the world and described in relation to one another 2. Measurement is used to compare objects.

(Standards 2 and 3 are reflected in older grade level expectations)

Preschool Mathematics Academic Standards in High Quality Early Childhood Care and Education Settings

Content Area: Mathematics	
Standard: 1. Number Sense, Properties, and Operations	
Prepared Graduates: <ul style="list-style-type: none">➤ Understand quantity through estimation, precision, order of magnitude, and comparison. The reasonableness of answers relies on the ability to judge appropriateness, compare, estimate, and analyze error.	
Grade Level Expectation: Preschool	
Concepts and skills students master: <ol style="list-style-type: none">1. Quantities can be measured and counted	
Evidence Outcomes	21st Century Skills and Readiness Competencies
Students can: <ol style="list-style-type: none">a. Count and represent objects including coins to 10 (Personal Financial Literacy)b. Match a quantity with a numeral	Inquiry Questions: <ol style="list-style-type: none">1. What do numbers tell us?2. Is there a biggest number?
	Relevance and Application: <ol style="list-style-type: none">1. Counting helps people to determine how many such as how big a family is, how many pets there are, how much money is in a wallet.2. People sort things to make sense of sets of things such as sorting pencils, toys, or clothes.
	Nature of Mathematics: <ol style="list-style-type: none">1. Numbers are used to count and order both real and imaginary objects.

Preschool Mathematics Academic Standards in High Quality Early Childhood Care and Education Settings

How does this standard look in high quality early childhood settings?

Content Area: Mathematics

Standard: 1. Number Sense, Properties, and Operations

Prepared Graduates: Understand quantity through estimation, precision, order of magnitude, and comparison. The reasonableness of answers relies on the ability to judge appropriateness, compare, estimate, and analyze error

Grade Level Expectation: Preschool

Concepts and skills students master: 1. Quantities can be represented and counted.

Evidence Outcomes	Steps for Getting There	Examples from Early Childhood Settings
<p>Students can:</p> <ul style="list-style-type: none"> a. Count and represent objects including coins to 10 (Personal Financial Literacy) b. Match a quantity with a numeral 	<ul style="list-style-type: none"> • Adults engage in conversations with children about quantity and comparisons as they interact with materials throughout the day. • The environment includes different quantities of a variety of materials and math manipulatives. • The environment contains objects with naturally occurring numbers and number words such as clocks, timers, calendars, thermometers, computers, calculators, measuring cups, etc. • The adult uses number words and numerals, including zero, in meaningful everyday activities. • The adult uses a variety of strategies (questions, comments, counting) to prompt children to think about quantity and number words. • Adults provide opportunities to count objects in the environment. 	<ul style="list-style-type: none"> • A child blows bubbles on the playground and says, "Look, three bubbles!" The teacher replies, "One, two, three, four bubbles!" while pointing a finger at the bubbles floating through the air. • Baskets containing shells, rocks, counting bears, and other objects are placed in math center. Marisol takes a basket of shells and lines them up on the table. Miss Hannah sits with her and helps her count them. • Oliver takes a book from the math center shelf. He gives it to Mr. Murray, a volunteer grandparent and asks, "Would you read <i>One Fish, Two Fish</i> to me?" Mr. Murray helps Oliver count the fish on each page. • The children go for a walk, collecting items from nature. Andrew says, "I have a million rocks" Ms. Bowers says, "A million? That's lot! I wonder how many Alex has?" Alex, using sign language, says, "I have five rocks!" • Will and Xavier play a file folder game. Inside the folder are ten caves numbered from 0 to 9. The boys have dinosaurs to count and match the number of dinosaurs to the number on the cave.

Preschool Mathematics Academic Standards in High Quality Early Childhood Care and Education Settings

Content Area: Mathematics

Standard: 4. Shapes, Dimension, and Geometric Relationships

Prepared Graduates:

- Make sound predictions and generalizations based on patterns and relationships that arise from numbers, shapes, symbols, and data

Grade Level Expectation: Preschool

Concepts and skills students master:

1. Shapes can be observed in the world and described in relation to one another

Evidence Outcomes

Students can:

- a. Match, sort, group and name basic shapes found in the natural environment
- b. Sort similar groups of objects into simple categories based on attributes
- c. Use words to describe attributes of objects
- d. Follow directions to arrange, order, or position objects

21st Century Skills and Readiness Competencies

Inquiry Questions:

1. How do we describe where something is?
2. Where do you see shapes around you?
3. How can we arrange these shapes?
4. Why do we put things in a group?
5. What is the same about these objects and what is different?
6. What are the ways to sort objects?

Relevance & Application:

1. Shapes and position help students describe and understand the environment such as in cleaning up, or organizing and arranging their space.
2. Comprehension of order and position helps students learn to follow directions.
3. Technology games can be used to arrange and position objects.
4. Sorting and grouping allows people to organize their world. For example, we set up time for clean up, and play.

Nature of Mathematics:

1. Geometry affords the predisposition to explore and experiment.
2. Mathematicians organize objects in different ways to learn about the objects and a group of objects.
3. Mathematicians attend to precision. (MP)
4. Mathematicians look for and make use of structure. (MP)

Preschool Mathematics Academic Standards in High Quality Early Childhood Care and Education Settings

How does this standard look in high quality early childhood settings?

<p>Content Area: Mathematics Standard: 4. Shapes, Dimension, and Geometric Relationships Prepared Graduates: Make sound predictions and generalizations based on patterns and relationships that arise from numbers, shapes, symbols, and data Grade Level Expectation: Preschool Concepts and skills students master: 1. Shapes can be observed in the world and described in relation to one another</p>		
Evidence Outcomes	Steps for Getting There	Examples from Early Childhood Settings
<p>Students can:</p> <ul style="list-style-type: none"> a. Match, sort, group and name basic shapes found in the natural environment b. Sort similar groups of objects into simple categories based on attributes c. Use words to describe attributes of objects d. Follow directions to arrange, order, or position objects 	<ul style="list-style-type: none"> • Adults encourage children to explore materials and environment through movement and hands-on experiences. • The environment includes objects in various sizes, color, shapes, textures, and qualities that can be arranged in order. • Adults use appropriate vocabulary while supporting and encouraging children to explore, manipulate, and represent geometric shapes. • The environment contains a variety of geometric materials such as unit blocks, stencils and geoboards. • The environment contains many materials for children to create and represent shapes, e.g.: paper, chenille stems, play dough, scissors, tape, wood pieces. • Adults name and call attention to shapes naturally apparent in the environment. • Adults model vocabulary when talking about characteristics of objects in the environment. • Adults build on children’s understanding of seriation by making changes and additions in materials (ie: varying the number of objects, the types of characteristics, and the degree of variation). 	<ul style="list-style-type: none"> • Two sets of parquetry blocks are on the table. Travis uses his fingers to follow the shape of each block saying, “Look, this is a triangle”. Marisa matches the shapes of the blocks to the design board. Niko creates his own design and then uses a pencil to trace the shape. Ariana builds a tower with the blocks. • Rob takes his sisters on a walk to find circles. Alanna finds a cup and a paper plate. Payten says “the wheel on the car is a big circle!” • In the dramatic play area, children sort play money. They place the pennies in one part of the cash register drawer while placing the bills in another part. • While cleaning up the housekeeping materials, Baylor sorts the knives, spoons and forks into the utensil tray. • The Mom and Me playgroup went to the library for story time. The book was <i>Red Leaf, Yellow Leaf</i>, and the children decided to collect leaves on the way home. Once home, Miss Eva suggests they look at their leaves and group the ones that look the same. She brings out a large piece of cardboard and draws columns. The children glue the leaves in columns according to size.

Preschool Mathematics Academic Standards in High Quality Early Childhood Care and Education Settings

Content Area: Mathematics	
Standard: 4. Shapes, Dimension, and Geometric Relationships	
Prepared Graduates: <ul style="list-style-type: none">➤ Understand quantity through estimation, precision, order of magnitude, and comparison. The reasonableness of answers relies on the ability to judge appropriateness, compare, estimate, and analyze error.	
Grade Level Expectation: Preschool	
Concepts and skills students master: <ul style="list-style-type: none">2. Measurement is used to compare objects	
Evidence Outcomes	21st Century Skills and Readiness Competencies
Students can: <ul style="list-style-type: none">a. Describe the order of common eventsb. Group objects according to their size using standard and non-standard forms (height, weight, length, or color brightness) of measurementc. Sort coins by physical attributes such as color or size (Personal Financial Literacy)	Inquiry Questions: <ul style="list-style-type: none">1. How do we know how big something is?2. How do we describe when things happened?
	Relevance and Application: <ul style="list-style-type: none">1. Understanding the order of events allows people to tell a story or communicate about the events of the day.2. Measurements helps people communicate about the world. For example, we describe items like big and small cars, short and long lines, or heavy and light boxes.
	Nature of Reading, Writing, and Communicating: <ul style="list-style-type: none">1. Beginning writers know how to spell many simple words because they know the Mathematics involves pattern seeking. Mathematicians look for patterns and regularity. The search for patterns can produce rewarding shortcuts and mathematical insights.

Preschool Mathematics Academic Standards in High Quality Early Childhood Care and Education Settings

How does this standard look in high quality early childhood settings?

Content Area: Mathematics
Standard: 4. Shapes, Dimension, and Geometric Relationships
Grade Level Expectation: Preschool
Prepared Graduates: Understand quantity through estimation, precision, order of magnitude, and comparison. The reasonableness of answers relies on the ability to judge appropriateness, compare, estimate, and analyze error.
Concepts and skills students master: 2. Measurement is used to compare objects

Evidence Outcomes	Steps for Getting There	Examples from High Quality Preschools
<p>Students can:</p> <ol style="list-style-type: none"> Describe the order of common events Group objects according to their size using standard and non-standard forms (height, weight, length, or color brightness) of measurement Sort coins by physical attributes such as color or size 	<ul style="list-style-type: none"> Adults introduce general concepts of time (wake-up, eat breakfast, brush teeth, get dressed; yesterday-today-tomorrow; morning afternoon-evening) before discussing specific concepts (hours and minutes). The environment contains a variety of time-related materials (pictures of night and day, clocks, stop watches, hour/minute glass). Adults encourage children to informally use and refer to these materials. The environment has measurement tools (rulers, measuring tapes, measuring cups and spoons, clocks, scales) readily available for use by the children. Adults model use of conventional tools and methods in everyday situations. Visual schedules are kept in places where children can refer to them and update them easily. 	<ul style="list-style-type: none"> Maureen helps the children make a large wall chart divided into thirds. She labels the three sections "morning", "afternoon", and "evening". Together, Maureen and the children talk about what happens in each of the time periods. The next day, Caitlin asks, "When can we go outside?" Maureen says, "Let's look at our schedule". She refers to the chart, talks with the children, and then suggests they go to the park. Together, they add the word "park" in the "afternoon" section. Miss Hou reads the book <i>Cookadoodle Doo</i> with a small group of children. Together they discuss the words and measurements used in the book and their different meanings. Miss Hou suggests they make a plan to use the strawberry shortcake recipe to create a dessert for themselves. Using real coins collected in the spare change jar, Mr. Jack helps the children sort the pennies from the nickels and dimes.

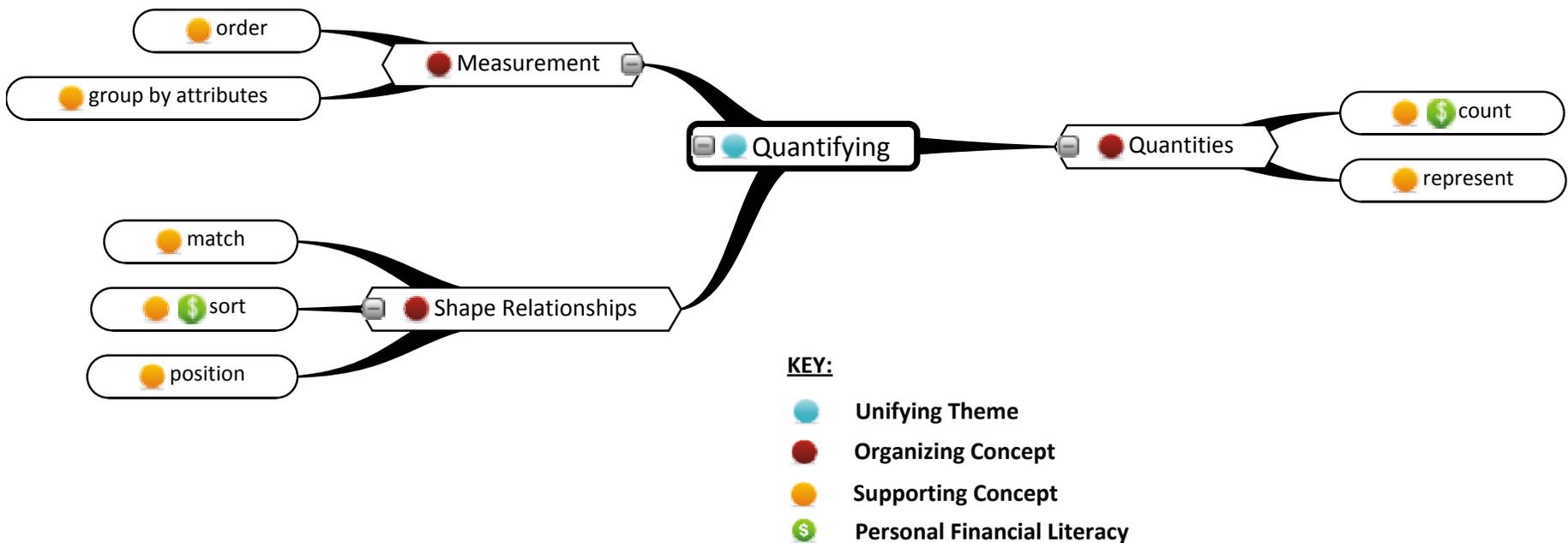
Using the Discipline Concept Maps

Discipline Concept Maps (DCM) provide a visual representation of unifying themes and organizing and supporting concepts at each grade level. The DCMs provide a central purpose for that discipline at that grade level and depict how concepts relate to each other for intentional planning. They provide a framework for entering the standards in a way that honors the emphasis on 21st Century learning and interdisciplinary connections across the content areas.

Three key terms are used in the discipline concept maps:

- **Unifying themes** provide an overview of content at a grade level. They are found in the center of the DCM and denoted by a blue dot.
- **Organizing concepts** connect multiple grade level expectations (GLEs) and evidence outcomes (EOs). They are the first node out from the center and are denoted by a red dot.
- **Supporting concepts** elaborate on and show the depth of an organizing concept. They are second node out from the center and are denoted by a yellow dot.

Mathematics Preschool



Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Preschool Mathematics Academic Standards in High Quality Early Childhood Care and Education Settings



Primary Authors
Colorado Preschool Program Staff
2012