

Prekindergarten

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The Learner at This Level

The Prekindergarten Child:

- Learns best through play, exploration, acting out stories.
- Enjoys picture books with repetitive themes or phrases, parallel reading, and math within stories.
- Learns more using large muscles than small muscles, e.g., painting on an easel instead of writing with pencil on paper.

ALGEBRAIC REASONING: PATTERNS AND FUNCTIONS

- Observes patterns through meaningful exploration and play both at school and at home and begins to acknowledge that patterns are important.
- Distinguishes the elements in simple AB auditory and kinesthetic patterns that repeat.
- Uses one attribute of an object at a time, e.g., just color or just shape, to create patterns.
- Describes patterns using terms that describe position, e.g., next, in front of, under, etc.

NUMERICAL AND PROPORTIONAL REASONING

- Compares two sets of objects and identifies them as more than, less than or the same.
- Counts real world objects, sounds and movements to develop number sense from “hand to head.”
- Learns number names through rote counting.
- Uses one-to-one correspondence to systematically match number names with objects by touching or pointing when counting.
- Solves practical problems using the meanings of numbers (e.g., “I have a snack for each person in my group.”).
- Notices that the terms “first” and “last” describe the position of an object.
- Discovers cardinality: that the last number stated in a sequence answers the question, “How many?”
- Discovers that a whole object can have two equal parts called halves.

GEOMETRY AND MEASUREMENT

- Uses the senses to identify objects based on attributes such as color, size, position or texture.
- Builds understanding of attributes, properties, locations and positions of objects through the manipulation of materials such as clay, blocks and puzzles.
- Groups geometric shapes and solids by their similarities.
- Sorts and classifies objects through direct comparison of measurable attributes such as length and weight.
- Describes time through sequencing familiar events.
- Measures and compares the length, area or capacity of objects with nonstandard units using terms such as more, less or the same.

WORKING WITH DATA: PROBABILITY AND STATISTICS

- Organizes objects by observable attributes.
- Uses seemingly nonmathematical language such as “pointy,” “the same color as an apple,” and “looks like a house” to describe objects.
- Creates real graphs to answer questions. For example, how many different color cars do we have in the play area? Children line the cars up by color to create a “real” graph that provides the answers.

Mathematics Background for Teachers

MATHEMATICS BACKGROUND FOR PREKINDERGARTEN TEACHERS

ALGEBRAIC REASONING: PATTERNS AND FUNCTIONS

Patterns and functional relationships can be represented and analyzed using a variety of strategies, tools and technologies.

Central Understanding: Patterns are found in our environment.

Background: Repetitive patterns contain recognizable core elements that are repeated. These patterns can be represented in more than one way. Patterns are found in many physical and geometric situations in a child's environment as well as in number. Identification of patterns is a basic building block for algebraic thinking. Children make predictions and generalizations in their informal pattern explorations. As these generalizations are investigated, they help build a foundation for both number and geometry.

NUMERICAL AND PROPORTIONAL REASONING

Quantitative relationships can be expressed numerically in multiple ways in order to make connections and simplify calculations using a variety of strategies, tools and technologies.

Central Understanding: Our environment can be described in a quantitative way using number concepts.

Background: Number concepts are intimately tied to the world around us. Recognizing and applying number relationships in our environment is the foundation of making sense of the world in a mathematical way (van de Walle, p.115). Determining and comparing quantities enables children to form ideas about number and develop number sense. Counting is the determination of the total number of objects in a set and requires much more than the recitation of words in a correct sequence. Counting is a foundation for children's early work with number, patterns and sets.

MATHEMATICS BACKGROUND FOR PREKINDERGARTEN TEACHERS

GEOMETRY AND MEASUREMENT

Shapes and structures can be analyzed, visualized, measured and transformed using a variety of strategies, tools and technologies

Central Understanding: The attributes of objects in the environment can be measured.

Background: Children can identify and describe attributes of objects in their environment. Similarities and differences of objects can be explained based on color, orientation, texture and measurable attributes such as size, shape, weight or length. Opportunities for direct comparisons of measurable attributes help children solve problems such as categorizing objects that are the same as, longer than or heavier than another object. Spatial sense can be defined as an intuition about shapes and the relationships among shapes (van de Walle p.347). Children develop spatial sense when they have opportunities to observe, feel, build, describe and take apart two- and three-dimensional shapes and solids.

WORKING WITH DATA: PROBABILITY AND STATISTICS

Data can be analyzed to make informed decisions using a variety of strategies, tools and technologies.

Central Understanding: Objects in the environment can be organized based on attributes and spatial relationships.

Background: The ability to observe, identify, qualify and quantify attributes develops the foundation for classification and data analysis. Comparisons of quantity, physical attributes, spatial relationships and use of objects provide structure for the analysis of various ways that things can be categorized.

Correlated Grade-Level Expectations

[Click here](#) to access correlated grade-level expectations for prekindergarten on the State Department of Education Web site.

Sequenced Grade-Level Expectations

PREKINDERGARTEN SEQUENCED GLES

Grade-Level Expectations	Fall	Winter	Spring
ALGEBRAIC REASONING			
1.1 Understand and describe patterns and functional relationships.			
1. Sort and classify familiar objects by a single attribute (size, shape, color, texture, orientation and position) and explain the reason.			
2. Recognize, copy, extend and create simple AB patterns using objects, movement or sounds.			
NUMERICAL AND PROPORTIONAL REASONING			
2.1 Understand that a variety of numerical representations can be used to describe quantitative relationships.			
1. Represent quantities of up to 20 objects in a set.			
2. Compare two sets of up to 20 objects, and identify which set is more, less or the same.			
3. Identify the ordinal position of objects: first and last.			
4. <i>Explore a whole and half of an object</i>			
2.2 Use numbers and their properties to compute flexibly and fluently and to reasonably estimate measures and quantities.			
5. <i>Count by rote to at least 20.</i>			
6. <i>Count as one more object is added to a set of up to 20 objects.</i>			
7. <i>Act out and solve story problems using sets of up to 10 objects.</i>			
GEOMETRY AND MEASUREMENT			
3.1 Use properties and characteristics of two- and three-dimensional shapes and geometric theorems to describe relationships, communicate ideas and solve problems.			
1. Identify and describe familiar shapes (triangles, squares, rectangles and circles) and solids (cubes, spheres, cylinders and prisms) in the environment and contextual situations.			
2. Compare and sort familiar shapes and solids in the environment and contextual situations.			
3. Construct shapes using a variety of materials.			

Grade-Level Expectations	Fall	Winter	Spring
3.2 Use spatial reasoning, location and geometric relationships to solve problems.			
4. Describe location, direction, and position of objects using terms such as under, over, inside, next to, near, in front of, first and last.			
5. Complete simple shape and jigsaw puzzles and explain the reasoning used to complete the puzzle.			
3.3 Develop and apply units, systems, formulas and appropriate tools to estimate and measure.			
6. Use patterns to determine events that reoccur.			
7. Sequence events and describe time periods using terms such as morning, afternoon, night, yesterday, today and tomorrow.			
8. Use nonstandard units or reference objects to compare length, area and capacity and to order, estimate and sort objects by size (length or area). Describe the comparisons using language such as more, longer, shorter or taller.			
9. <i>Discuss strategies to estimate and compare length, area, temperature and weight.</i>			
WORKING WITH DATA			
4.1 Collect, organize and display data using appropriate statistical and graphical methods.			
1. Create real graphs using familiar objects and pictures that represent information about the group of children.			
4.2 Analyze data sets to form hypotheses and make predictions			
2. Describe real graphs using comparative language such as more, less, most, least and the same.			
4.3 Understand and apply basic concepts of probability			
3. Use patterns to describe some events that repeat.			
4. Explain why events are likely or unlikely to happen, based on personal experiences.			

**Correlated GOALS 2000
Criterion Referenced Test**

PREKINDERGARTEN CORRELATED GOALS 2000 CRT

The Goals 2000 Mathematics Curriculum was written as a companion to the 1998 Mathematics Framework. The Goals 2000 resources cited in this 2008 Model for Mathematics Curriculum are aligned to the 2005 Mathematics Curriculum Framework, 2007 Curriculum Standards and the fourth generation Connecticut Mastery Test.

The Prekindergarten Criterion Referenced Test Part A from the Goals 2000 Mathematics Curriculum is aligned to the prekindergarten sequenced GLEs and can be used for pre- and post-assessment. The Prekindergarten Criterion Referenced Test Part B may also be used for pre- and post-assessment and integrated when appropriate. Student progress must be recorded by keeping a record of observations or a folder of student work samples. It is important to integrate items from Part B into the assessment process.

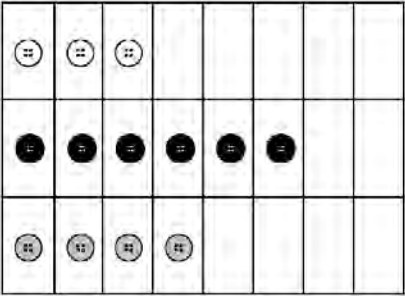
Please use the link below to access the electronic version of the complete document, which includes other activities, such as opportunities for open-ended and challenge experiences that must be examined for alignment prior to use.

<http://www.sde.ct.gov/sde/cwp/view.asp?a=2618&q=321084>

Standard	State Framework	Performance Activity	Performance Task
Algebraic Reasoning	PK 1.1.1	<p>Single Attributes In advance, prepare a set of about 20 objects that can only be sorted by color, such as Unifi cubes, Color Tiles or construction paper squares, so that only four different colors are available — red, yellow, green, and blue. Ask the student to sort them. Successful performance is the ability to organize the objects into four piles. If successful, you may ask the student to name the colors. [Fall, Winter]</p>	<p>Multiple Sorts/Multiple Rules Ask the student to sort a set of objects and describe the rule; then sort the same set of objects in a different way, and describe the second rule. [Fall]</p>
Numerical and Proportional Reasoning	PK 2.1.1	<p>Counting Objects Place three counting mats on a table and put five blocks on one mat, eight blocks on another mat, and 10 blocks on the third mat. Ask the student “How many blocks are on this mat?” as you indicate the first mat. Observe how the student performs the task (touch counts, counts without touching the blocks, or immediately states the number without counting). If the student correctly states, “There are five blocks,” then repeat the question with the remaining mats. Successful performance is the ability to state the correct number of blocks on each mat, regardless of the strategy used. Record the highest number counted correctly on the record card. [Fall]</p> <p>Repeat the task as needed. [Winter]</p> <p>Repeat the task as needed. [Spring]</p>	<p>Identifying Numerals Ask the student to tell each number as you show a set of number cards.</p>

Standard	State Framework	Performance Activity	Performance Task
Numerical and Proportional Reasoning	PK 2.1.2	<p>Comparing Sets Give the student five red and six white Unifi cubes (loose, not attached). Ask the student to tell you how many of each color there are. Then ask the student to tell you which color set of cubes is more. If successful, remove one of the white cubes and ask the student to compare the two sets again (they are the same or equal). [Fall]</p> <p>Repeat the task. If the student correctly says that the white set has more, ask, “How many more?” [Winter]</p> <p>Repeat the task but rather than ask which set is more, ask which set is less. [Spring]</p>	<p>Estimating and Comparing Ask the student to estimate which of two sets is more; (ask why they made that choice); then have the student count each set and tell which is more. Ask the student to name the number which is one more than the larger set.</p>
Numerical and Proportional Reasoning	PK 2.2.5	<p>Rote Counting Ask the student to count out loud starting from one. If the student counts beyond 100, ask the student to stop. Record the highest correct number. Successful performance is the ability to count correctly to 30 by the end of the year. [Fall]</p> <p>Assess rote counting three times during the year and enter the highest number on the record card each time. [Winter]</p> <p>Assess rote counting for a third time and enter the highest number on the record card. [Spring]</p>	<p>Recording Highest Number Observe the student rote count and record the highest number.</p>

Standard	State Framework	Performance Activity	Performance Task
Numerical and Proportional Reasoning	PK 2.2.7	<p>Combining Sets In advance, use a marker to draw a Sets Board arrangement on a large sheet of paper or oaktag. Have available some counting objects, such as blocks of one color, bottle caps or teddy bear counters.</p> <p>Ask the student to put three blocks in one small ring and two blocks in the other. Ask, “How many blocks are there together?” Repeat with other combinations, such as $2 + 2$, $3 + 1$, $1 + 4$.</p> <p>Observe the student’s strategy — does the student count them all again, count on or simply state the sum? If the student recounts all objects in both sets, the student should be given more opportunities to complete similar tasks in the classroom. Do not check the record card for mastery. If the student counts on, or states the sum, the student is ready to move on in the curriculum. Record the task as mastered. [Spring]</p>	<p>Acting Out Story Problems Take out a <i>Workjob</i> material and tell a simple story to the student who uses the material to act out the story, such as “There were three fish in the aquarium. Two more swim in. How many fish are there in all?”</p>
Geometry and Measurement	PK 3.1.1	<p>What shape am I? Show the student each shape in turn and ask the student to name it. You may use wooden blocks from manipulative sets such as Attribute Blocks or Pattern Blocks. Teacher-made cardboard cutouts also may be used. Successful performance is the ability to name each shape. [Fall]</p>	<p>Name the Shape Child will point out and name shapes (circle, triangle, square, rectangle, diamond).</p>
Geometry and Measurement	PK 3.2.4	<p>Vocabulary of Position In advance, draw a rectangle on a sheet of oaktag. Place it in front of the student and give the student a Unifi cube. Ask the student to put the cube inside the rectangle. If successful, continue to ask the student to move the cube so it is outside, to the right, near the bottom, etc. [Winter]</p>	<p>Geoboards: Shapes and Positions Ask the student to build a square on the geoboard. Ask the student to place a Unifi cube inside the square; then place the cube, in turn, near the top, near the bottom, outside, to the left, and to the right of the square.</p>

Standard	State Framework	Performance Activity	Performance Task
Geometry and Measurement	PK 3.3.7	Before and After Give the student a set of three or four picture cards and ask the student to arrange them in order and tell a story. [Winter]	Time Relationships Observe that students use the appropriate language to describe time relationships.
		Calendar Language During the daily classroom activities, observe that the student consistently uses the names of the days of the week, can tell which weekdays are school days and which days are not, and appropriately uses terms such as today, yesterday, and tomorrow. [Winter]	Time Relationships Observe that students use the appropriate language to describe time relationships.
Working with Data	PK 4.2.2	Analyzing Pictographs In advance, make a real graph by placing three colors of buttons (or construction paper pieces) into three rows; for example, a row of three white, a row of six black, and a row of four gray buttons. You may wish to glue the buttons onto 1-inch grid paper and save the graph for use with each student.  Ask the student to tell how many buttons are white, then black, then gray. Ask the student, “Which color has more buttons?” “Which has the least?” Ask the student to tell you something else about the graph. [Winter] Repeat the task in May, but use a simple pictograph. [Spring]	Reading Graphs Ask the student to describe the information in a real graph. Ask the student to tell you about the graph. If necessary, during the interview, ask the student, “Which is the most? The least? How many of each?”

Curriculum Standards Connections

ALGEBRAIC REASONING: PATTERNS AND FUNCTIONS. Patterns and functional relationships can be represented and analyzed using a variety of strategies, tools and technologies.

≈ **COMPONENT STATEMENT: 1.1. UNDERSTAND AND DESCRIBE PATTERNS AND FUNCTIONAL RELATIONSHIPS.**

Grade-Level Expectations

- 1. Sort and classify familiar objects by a single attribute (size, shape, color, texture, orientation and position) and explain the reason. (See also [GLE 3.1.2.](#))**
 - Give children opportunities to identify all objects in the room that have the same attribute, e.g., all red things or all smooth things.
 - Ask the children to respond to the choral question “Why is he/she putting that__there?” by saying “I am putting this here because it is __,” while putting the identified objects in a specific place such as on a table or in a large yarn circle or hula-hoop.
- 2. Recognize, copy and create simple AB patterns using objects, movement or sounds.**

Provide opportunities for children to recognize, copy and create AB patterns using objects, movement and auditory patterns e.g., those in songs, poems and/or rhymes.

- Have children use their own bodies to copy, and create AB patterns such as blinking, clapping and/or hopping.
- Have children identify the core elements in a pattern that the class is making together, such as touching the head and then a knee or snapping and then stomping.

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- Show children a group of objects arranged in a teacher-made AB pattern. Have the children describe the pattern and then copy the pattern using the same objects.
 - When providing opportunities for children to create patterns of their own have children explain their thinking by asking questions such as:
 1. How did you make your pattern?
 2. Can you make your pattern a different way? (Using shapes, colors, size, position, numbers or letters.)
 3. Can you find a pattern that is similar to your pattern? How is it similar?

❖ **Possible Assessment Opportunities**

- ❖ Compare patterns using two given AB patterns (such as circle, square and white, blue) and have the children compare the patterns.

Intervention: Use sentence starters or guiding questions to help children identify the elements of a pattern. Repeat the process with another pattern. Then guide the children in the discussion of how the patterns are different and alike.

Challenge: Have the children explain how these patterns could be used to create two new, similar patterns using different materials.

- ❖ Children recognize, copy, extend and create repeating patterns of two or three elements (objects, songs, rhymes and body movements, e.g., clap, clap, stomp).

Intervention: Limit objects to those that a child can physically manipulate or recreate. Have the child follow the steps used in previously modeled patterns.

Challenge: Provide additional elements for existing patterns so children can create new patterns and extend them.

SAMPLE INTEGRATED LESSON – PATTERNS

Context: Sara and Joel were walking across the playground when they noticed how pretty the different colored leaves were. They decided to bring the leaves back to their classroom and use them to make patterns. Can you create patterns with leaves? How many different patterns can you make with leaves?

Grade-Level Expectations: 1.1.2

Time: One instructional period

Objective: Children will be able to copy a repeating AB pattern using leaves.

Materials: Collections of leaves, paper, glue

Procedure:

1. Collect leaves from the schoolyard and discuss their attributes (size, color, shape, texture, etc).
2. Discuss different ways to use the attributes of the leaves to make a repeating pattern.
3. Ask the children to create an AB pattern (red, brown; or large, small; or maple, oak, etc.) using their leaf collections.
4. In small groups, have each child describe the leaf pattern that another child has created and discuss how that pattern is like the one.
5. Have children record their patterns by gluing them on a paper and displaying the results. Each child should represent that pattern in another way.

❖ **Possible Assessment Opportunities**

- ❖ Have each child use different elements (actions, words or symbols) to create and extend a pattern and describe the core elements of the pattern.

Intervention: Provide multiple copies of cards or pictures that illustrate different elements that can be used to form an AB pattern (such as tree and flower or cat and dog).

Challenge: Allow students to develop their own patterns using three or four different elements.

Note to teacher: This lesson may be adapted to use rocks, flowers or shells depending on seasonal availability.

Interdisciplinary Framework Connections			
Science	English/Lang. Arts	Visual and Performing Arts	Physical Education
A.INQ 3 Make predictions based on observed patterns (e.g., look for patterns in leaves, flowers, etc.)	2.1a Begin to recognize patterns in text (e.g., have children recite simple poems/rhymes)	<ul style="list-style-type: none"> Perform easy rhythmic, melodic and choral patterns accurately (e.g., copy then create simple AB patterns) Echo short rhythms and melodic patterns (e.g., sing songs) <p style="text-align: center;">Art</p> <ul style="list-style-type: none"> Look for patterns in pictures 	<ul style="list-style-type: none"> Recognize and apply the concepts of body space, effort and relationships in developing movement sequences and game strategies (e.g., copy, extend and create body patterns/dance)

Vocabulary: pattern, patterns, next, before, after, over, under, size, shape, color, day, week, year, days of the week, sort, classify, extend

Resources:

Teacher References:

Teddy Bears Go to the Movies and *Teddy Bears Go Hiking*. Primarily Bears, AIMS

Algebra in the PreK-2 Curriculum? Teaching Children Mathematics – NCTM September 2005

Yardsticks: Children in the Classroom Ages 4-14, by Chip Wood

Electronic Resources:

A to Z Teacher Stuff: <http://lessonplanz.com/Preschool/>

Kinderplans: <http://www.kinderplans.com/content.cfm?pageid=132>

KinderArtLittles: <http://www.kinderart.com/littles/dinosaur.shtml>

SuperKids (Educational software Review): <http://www.superkids.com/aweb/pages/reviews/multisub/preschoo/>

Center for Distance and Online Learning: <http://teams.lacoe.edu/teachers/index.asp>

Teach Learn Communicate: http://www.alfy.com/teachers/teach/thematic_units/Patterns_Shapes/PS_1.asp

Properties Everywhere: <http://illuminations.nctm.org/LessonDetail.aspx?ID=L20>

[Structured Observations – Goals 2000](#)

Literature Connections:

A Pair of Socks, by Stuart J. Murphy

Lots and Lots of Zebra Stripes, by Stephen R. Swinburne

Pattern Fish, by Trudy Harris

I Went Walking, by Sue Williams

Elmer, by David McKee

Rosie's Walk, by Pat Hutchins

Over in the Meadow, by Ezra Jack Keats

Classroom materials: collections such as buttons, shells, crayons and colored cubes

Notes:

NUMERICAL AND PROPORTIONAL REASONING. Quantitative relationships can be expressed numerically in multiple ways in order to make connections and simplify calculations using a variety of strategies, tools and technologies.

≈ **COMPONENT STATEMENT: 2.1. UNDERSTAND THAT A VARIETY OF NUMERICAL REPRESENTATIONS CAN BE USED TO DESCRIBE QUANTITATIVE RELATIONSHIPS.**

Grade-Level Expectations (*Italics indicate links not evident in 2005 framework*)

1. Represent quantities of up to 20 objects in a set.

Provide daily opportunities to quantify objects in the environment and develop number concepts.

- Count real world objects from the children’s environment.
- Have children use their bodies and movements such as clapping, hopping or nodding or moving to music to demonstrate quantities 2, 3... 20.

❖ **Possible Assessment Opportunities**

❖ Count the number of objects in a set of up to 20 objects. Ask questions such as:

1. How many objects do we have?
2. Can you show me how to count the same amount using a different objects?
3. Is this set of objects close to very little? Close to 5? Close to 10?

Intervention: Begin with a set of five or fewer objects.

Challenge: Start with two, three or more objects and count on to 30 or as far as the child can count.

2. Compare two sets of up to 20 objects, and identify which set is more, less or the same.

- Use objects such as cardboard circles or masking tape to make a line in the classroom, hallway or play area. Have children decide how many of them can fit on the line, standing shoulder to shoulder or lying head to toe. Have the children line up and count how many of them fit. Ask the children to explain whether more of them fit shoulder to shoulder or head to toe and why.
- Repeat the preceding activity using other objects such as sentence strips with Unifix cubes, teddy bear counters, or other objects in the classroom. Have the children count and make comparisons among the number of objects it takes to fit on the line.

❖ **Possible Assessment Opportunities**

❖ Given a set of up to 10 objects, create a new set that has more than, less than or the same number of objects. Ask questions such as:

1. Can you show me another way to make ____?
2. Is your group a lot more or a lot less? A little more or a little less?
3. How many more are in this group? How is this amount different from ____?

(For example, have four children line up joining hands, then have one more child join or leave the group. Explain why we now have more or less than the original set of children.)

Intervention: Begin with a set of two or three objects. Make sets of one more and one less.

Challenge: Make the original set between 20 and 30. Have the child make multiple sets that are more than and less than the original set.

3. Identify the ordinal position of objects: first and last.

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- Count objects while moving the objects from one place to another and have the children identify which object is first or last.

4. Explore a whole and half of an object.

- During normal classroom activities, divide whole objects such as fruit, a cracker, a paper plate or a piece of drawing paper into two parts and ask the children if the parts are the same, equal (one-half) or unequal.

 **COMPONENT STATEMENT: 2.2. USE NUMBERS AND THEIR PROPERTIES TO COMPUTE FLEXIBLY AND FLUENTLY AND TO REASONABLY ESTIMATE MEASURES AND QUANTITIES**

Grade-Level Expectations (*Italics indicate links not evident in 2005 framework*)

5. *Count by rote to at least 20.*

Provide daily opportunities to quantify objects in the environment and develop number concepts.

- Sing nursery rhymes and songs, do finger plays and repeat poems using counting words.
- Read counting books.

6. *Count as one more object is added to a set of up to 20 objects.*

7. *Act out and solve story problems using sets of up to 10 objects.*

SAMPLE INTEGRATED LESSON – COUNTING FLOWER PETALS

Context: Tinesha was shopping with her mom in the grocery store. As they passed by the flowers, Tinesha’s mom noticed the blossoms on one of the flowers. She called Tinesha’s attention to it by saying, “Look at all those petals on that flower! There must be 20 of them!” “How do you know that, Mom?” asked Tinesha. “Oh! I can count them,” she replied. When Tinesha went to school the next day, she noticed a flower on her teacher’s desk. She wanted to know how many petals were on that flower. Can you help Tinesha figure out how many petals are on the flower?

Grade-Level Expectations: 2.1.1, 2.1.2, 2.2.5, 2.2.6, 2.2.7

Time: Multiple sessions including reading the book and matching flowers with Unifix cubes

Objectives: Children will determine how many objects are in a set. Children will create corresponding sets.

Materials: *I Can Count the Petals of a Flower* by John and Stacy Wahl; real, plastic or silk flowers with one to 10 petals per flower (try to get examples of each number)

Procedure:

1. Read the book, *I Can Count the Petals of a Flower*.
 - As the book is read, count the petals on each of the flowers saying, “Count with me, 1, 2, 3, ...”
 - Develop discussions comparing the flowers using ideas such as “more than, less than” as well as exact counting.
2. Distribute Unifix cubes.
3. Show children the collection of flowers. Choose one flower and say, “I wonder how many petals are on this flower? We can find out using the cubes.”
4. Have the children put one Unifix cube on the end of each finger as they count petals with the teacher. Have children count again as they take the cubes off their fingers, one at a time.

❖ Possible Assessment Opportunities

- ❖ Using real, plastic or silk flowers, count the petals on other flowers. Repeat two or three times using flowers with different amounts of petals on them. Ask questions such as:

1. How many petals will be on this flower if it had one more, ... one less petal?
2. What number comes after ____? Show a flower with that many petals.
3. What number comes before ____? Show a flower with that many petals.

Intervention: Use three or four objects such as blocks. Have the child lay the blocks down, one at a time, while counting each. Next, ask the child to place a Unifix cube next to each block and count the cubes. The child should then place the Unifix cubes and on fingers, one at a time, while counting. Ask the child to justify their answer to the question: “Do your fingers match the blocks when you count?”

Challenge: Put some flowers in order from the least to the greatest number of petals on each flower.

Interdisciplinary Framework Connections			
Science	English/Lang. Arts	Visual & Performing Arts	Physical Education
<p>A.3 Count objects in a group and use mathematical terms to describe quantitative relationships such as same as, more than, less than, equal, etc.</p> <p>A.INQ 8 Use nonstandard measures to estimate and compare sizes of objects.</p>	<ul style="list-style-type: none"> • Identify current knowledge and awareness on a selected topic before a reading activity. • Draw conclusions and use evidence to substantiate them by using texts heard, read and viewed. • Select and organize visual and auditory information to answer a specific question. 	<p style="text-align: center;">Art</p> <ul style="list-style-type: none"> • Use different media, techniques and processes to communicate ideas, feelings, experiences and stories. <p style="text-align: center;">Music</p> <ul style="list-style-type: none"> • Sing a song from memory. • Use improvisation to discover and invent movement and to solve movement problems. 	<ul style="list-style-type: none"> • Follow classroom rules, activity-specific rules, safety practices, procedures, etiquette and good sportsmanship in various physical activity settings. • Work cooperatively with peers of varying skill levels.

Vocabulary: more than, less than, same, equal, count, one more, one less, close to, closer to, near, very little, more, less, bigger, smaller, few, most, a lot more, a lot less

Resources:**Electronic Resources:**

Let's Count to 5: <http://illuminations.nctm.org/LessonDetail.aspx?id=U57>

Building numbers to 10: <http://illuminations.nctm.org/LessonDetail.aspx?id=U147>

Understanding a Child's Development of Number Sense: http://illuminations.nctm.org/Reflections_preK-2.html (text and video)

[Chickety, Chickety, Chop – Goals 2000](#)

[Number Assessment Interviews – Goals 2000](#)

Teacher References:

Elementary and Middle School Mathematics, Teaching Developmentally, by J. Van de Walle, 5th Ed p. 116–121

The Young Child and Mathematics, by Juanita V Copley

Yardsticks: Children in the Classroom Ages 4-14, by Chip Wood

Children's Literature:

The Very Hungry Caterpillar, by Eric Carle

What Do Plants Need? An AIMS Booklet for K.

How Many Snails? by Paul Giganti

I Can Count the Petals of a Flower, by John and Stacy Wahl

Classroom Materials: snacks, toys, shoes, clothing, items from nature (shells, rocks, leaves, flowers), items from daily living (silverware, napkins, dishes, chairs, mats), books, markers, crayons, Unifix or interlocking cubes, blocks

Notes:

GEOMETRY AND MEASUREMENT. Shapes and structures can be analyzed, visualized, measured and transformed using a variety of strategies, tools and technologies.

≈ **COMPONENT STATEMENT: 3.1. USE PROPERTIES AND CHARACTERISTICS OF TWO- AND THREE-DIMENSIONAL SHAPES AND GEOMETRIC THEOREMS TO DESCRIBE RELATIONSHIPS, COMMUNICATE IDEAS AND SOLVE PROBLEMS.**

Grade-Level Expectations (*Italics indicate links not evident in 2005 framework*)

1. **Identify and describe familiar shapes (triangles, squares, rectangles and circles) and solids (cubes, spheres, cylinders and prisms) in contextual situations.**
 - Have each child select one shape or solid from a collection of circles, squares, triangles, rectangles, cylinders, spheres, cubes and prisms and say or describe one or two interesting things about the shape or solid. Continue the process by having children select a second item and explain how the two are alike and/or different.
 - Challenge the children to see if observations about one shape will apply to all shapes with the same name. (For example: Circles from a set of attribute blocks may be different colors, sizes and thicknesses. Have children explain or describe the characteristics that make all of them circles.)

❖ **Possible Assessment Opportunities**

- ❖ Supply children with shapes and solids that have been presorted. Ask questions such as:
 1. Can you think of a reason these items are sorted this way?
 2. Could these items be sorted differently?
 3. How would you sort them?

Intervention: Use sentence starters such as, “These shapes are alike because _____.”

Challenge: Provide multiple sets of presorted two- and three-dimensional objects so that children can re-sort them in different ways.

2. Compare and sort familiar shapes and solids in the environment and contextual situations

- Collect objects from home or outdoors and sort them into groups based on size, length, weight, shape, use, location or color (e.g., sort by bigger than a hand, longer than foot, taller than my desk, longer than my pencil, etc.).
- Give each pair of children a paper showing labeled pictures of a triangle, square, circle and rectangle. Work with the children to find examples of the same shapes in the room, around the building and outside (e.g., the clock is the shape of a circle, and the easel is the shape of a rectangle, etc.). After many examples have been found have the children come back together as a group and talk about the objects they found in the environment to match the shapes on their papers.

❖ Possible Assessment Opportunities

- ❖ Have children sort a group of common classroom materials (e.g., toys, blocks, etc.) by one attribute such as use, location, function, size or shape.

Intervention: Say: I am thinking of an object that is _____ and have the child find an object that matches the description.

Challenge: Have the child think of a different category for sorting objects to challenge the teacher and/or other students and then verify their responses.

3. Construct shapes using a variety of materials.

- Provide opportunities to put together, take apart, make and build shapes and solids out of materials such as clay, blocks or paper.

≈ **COMPONENT STATEMENT: 3.2. USE SPATIAL REASONING, LOCATION AND GEOMETRIC RELATIONSHIPS TO SOLVE PROBLEMS.**

Grade-Level Expectations (*Italics indicate links not evident in 2005 framework*)

4. Describe location, direction, and position of objects using terms such as under, over, inside, next to, near, in front of, first and last.

- Stack different colored blocks in a vertical pile or side by side. Ask children to describe the position of the blocks using language such as, “The blue block is on top of or in front of the red block.”
- Have children explain where objects are placed in the room by using terms such as near, next to, under and over.

Describe a child’s place in line using terms such as first, last, in back of or next to.

5. *Complete simple shape and jigsaw puzzles and explain the reasoning used to complete the puzzle.*

- Provide children with opportunities to complete simple shape (e.g., animals, numbers or letters) and jigsaw puzzles.
- Have children put three-dimensional objects in place based on their shape (such as placing round pegs in round holes or using a Shape Sorter). Have the children share how they where a shape will fit.

≈ **COMPONENT STATEMENT: 3.3. DEVELOP AND APPLY UNITS, SYSTEMS, FORMULAS AND APPROPRIATE TOOLS TO ESTIMATE AND MEASURE.**

Grade-Level Expectations (*Italics indicate links not evident in 2005 framework*)

6. Use patterns to determine events that reoccur. (See also [GLE 1.1.2.](#))

- Identify patterns in the child’s environment (e.g., patterns based on daily weather conditions, or relating seasonal weather patterns to activities or clothing).

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- Children explore the patterns in our day, week and year (e.g., daily routines and schedules).
 - Use pictures or photographs of daily classroom and home activities. Have children arrange the pictures according to the time of day they usually occur: morning, afternoon or evening.
- 7. Sequence events and describe time periods using terms such as morning, afternoon, night, yesterday, today, and tomorrow.**
- Have children agree or disagree and explain their reasoning when given statements such as:
 - The sun will rise in the evening.
 - We will eat dinner in the morning.
 - We will go outside wearing only our swimsuit in the winter.
- 8. Use nonstandard units or reference objects to compare length, area and capacity and to order, estimate and sort objects by size (length or area). Describe the comparisons using language such as more, longer, shorter or taller**
- Cut heavy paper or cardboard into strips that are 2 inches wide. Have each child place his or her foot at one end of the strip. Cut a strip to match the length of the child's foot. Choose one child's strip as a reference and ask the other children to state whether their strip is the same as, longer than or shorter than the strip that was chosen. To help children determine the relative length of their strip, have them place their strip next to the strip that was chosen. Once each child has decided whether his or her strip is the same as, longer, or shorter, have the children discuss their observations. Ask questions such as: How did you decide to describe your strip? How does your strip compare to another child's who described her foot the same way?
 - Record each child's name and the date on his or her strips. These strips can be used to make a class graph. The same strips can be used later in the year to compare the changes, if any, in foot lengths.
 - Give each child a rectangular piece of paper. Have the child think about how many scoops or handfuls of a designated object such as counters, beans, buttons or pasta it will take to cover the paper. Allow the children to check their thinking and repeat the activity until the paper is covered. Discuss why changes were or were not made in order to cover the paper.
 - Put out a tub of rice and a variety of containers so that children can explore filling the containers and comparing the amount of rice each container holds. Discuss with the children what they observed about the different containers and their capacity.
- 9. *Discuss strategies to estimate and compare length, area, temperature and weight.***
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SAMPLE INTEGRATED LESSON — I’VE SEEN THAT SHAPE BEFORE! (ADAPTED FROM NCTM ILLUMINATIONS)

SHAPE SPOTTING — CLASSROOM AND BEYOND

Context: A wonderful teacher named Mrs. Ring was tidying up the shopping area in the room when she picked up a can of peas. She held up the can so that the children could see the bottom and asked if anyone had seen the shape before. Jose said he had seen it on the bottom of the ice cream container his mom bought yesterday. Janelle said she had glasses at home that look just like the can. Robert yelled out the silo in the farm corner of the classroom looked just like the can of peas, too! Let’s investigate to see if we can spot some familiar shapes.

Grade-Level Expectations: 3.1.1, 3.1.2, 1.1.1

Time: Multiple instructional periods, including assessment

Objective: To recognize three-dimensional shapes in the real world.

Materials: Physical models of a cube, cylinder, sphere, and prism. Models can be familiar objects such as balls, boxes or blocks, Models are commercially available or models can be made from materials such as clay, craft foam or cardboard.

Procedure:

Solid Shapes in the Classroom

1. Organize and display a labeling system for the children such as yellow Post-its are for cylinders, blue Post-its are for cubes, etc., and give each a collection of the Post-it notes.
2. Model for the children by holding up an object such as a ball and ask the children to identify what shape it is by holding up the post-it that should go on this object. Have a child place the appropriate Post-it on the ball.
3. Ask students to look around the classroom to find examples of the 3-D shapes they have been studying (cubes, spheres, cylinders and prisms).
4. Have the children label each object with the corresponding Post-it note that identifies its geometric shape. Ask questions such as:
 - a. Which of the shapes roll?

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- b. Why can't all shapes roll?
 - c. How are the cube and the rectangular prism alike? Different?
 - d. Can you point to the corners, sides and faces of each of the solid figures?
 - e. What shape are the faces of the solid? What solids have faces in that shape?

❖ **Possible Assessment Opportunities**

❖ Solid Shapes Outside the Classroom

5. Take the class on a walk around the school to identify solid figures, cubes, spheres, cylinders and prisms in the environment. Have children identify all objects found as being man-made or natural and provide a possible reason or explanation for the object's shape. Children can take photographs or draw pictures to record the location of each figure and later use these pictures or photographs to make a bulletin board display or a book for the class or school library.

During the walk and after ask questions such as:

- a. What can you tell me about the shape? What else do you notice?
- b. Is this figure exactly like the model in the classroom?
- c. How is it alike? How is it different?
- d. Does this object have any flat or smooth sides? Corners?

(Help students understand they can recognize shapes even when the objects they see are not exactly like the shapes they can imagine.)

Intervention: Provide students with a rectangular prism and have them identify only that one shape in the environment in two- or three- dimensional objects.

Challenge: Ask children to find or make shapes and solids that are a combination of or contain other shapes and solids (e.g., in various shapes in a tangram square; triangles, trapezoids and rhombuses in hexagon pattern blocks and cones in cylinders).

Interdisciplinary Framework Connections				
Science	English/Lang. Arts	Social Studies	Visual & Performing Arts	Physical Education
<p>Properties of Matter</p> <p>A.1 Use the senses and simple measuring tools, such as rulers and equal-arm balances, to observe common objects and sort them into groups based on size, weight, shape or color.</p> <p>A.2 Sort objects made of materials such as wood, paper and metal into groups based on properties such as natural or man-made, attraction to magnets, and whether they float or sink in water.</p> <p>A.7 Describe and record daily weather conditions.</p> <p>A.8. Relate seasonal weather patterns to appropriate choices of clothing and activities (e.g., discuss patterns in calendar and day)</p> <p>A.INQ 9 Count, order and sort objects by their properties.</p>	<ul style="list-style-type: none"> Recognize when they do not understand and apply appropriate strategies such as asking questions. Generate and respond to questions. Use content vocabulary appropriately and accurately (math, music, science, social studies, etc.). Use oral language to communicate a message. Select and organize visual and auditory information to answer a specific question. 	<p>Humans and Environment Interaction</p> <ul style="list-style-type: none"> Explain ways in which humans use and interact with the environment (e.g., why we make things in certain shapes.) Create timelines that sequence events and people, using days, week, months (e.g., explore the pattern of our day; identify patterns in our community) 	<p>Art</p> <ul style="list-style-type: none"> Use different media techniques and processes to communicate ideas, feelings, experiences and stories. Use elements of art and principles of design to communicate ideas. Select and use subject matter symbols and ideas to communicate meaning. (e.g., use art materials to create sorting pictures, such as cutting out pictures and sorting them, creating pictures of shapes, etc). 	<p>Responsible Behavior</p> <ul style="list-style-type: none"> Follow class rules, activity-specific rules, safety practices, procedures, etiquette and good sportsmanship in various physical activity settings (e.g. following the rules for outside behavior).

Vocabulary: sort, alike, different, diagram, float, sink, shape, same, size, color, under, over, inside, next, near, in front of, first, last

Resources:

Electronic Resources:

Amazing Attributes: <http://illuminations.nctm.org/LessonDetail.aspx?id=U186>

Just Alike: <http://illuminations.nctm.org/LessonDetail.aspx?ID=L47>

I've Seen That Shape Before: <http://illuminations.nctm.org/LessonDetail.aspx?id=L237>

Measuring Length: <http://illuminations.nctm.org/WebResourceReview.aspx?ID=30>

Non-Standard Measuring: <http://illuminations.nctm.org/WebResourceReview.aspx?ID=490>

[Making Comparisons – Goals 2000](#)

Teacher References:

Spring Into Math and Science, by AIMS Education Foundation, 1987

Elementary and Middle School Mathematics, by John Van De Walle

Engaging Young Children in Mathematics, by Douglas H. Clements, 2004

Yardsticks: Children in the Classroom Ages 4-14, by Chip Wood

Children's Literature:

So Many Circles, So Many Squares, by Tana Hoban

Shapes, Shapes, Shapes by Tana Hoban

A Cloak for the Dreamer by Aileen Freidman

The Fine Round Cake by Arnica Esterl

The House by Monique Felix

Notes:

WORKING WITH DATA: PROBABILITY AND STATISTICS. Data can be analyzed to make informed decisions using a variety of strategies, tools and technologies.

≈ **COMPONENT STATEMENT: 4.1. COLLECT, ORGANIZE AND DISPLAY DATA USING APPROPRIATE STATISTICAL AND GRAPHICAL METHODS.**

Grade-Level Expectation

1. Create real graphs using familiar objects and pictures.

- Provide opportunities for children to graph responses to questions such as:
 1. What did you wear to school today? Generate a list from the children’s responses. Choose the top two or three most common items such as hats, sweaters or sneakers. Mark off a space on the floor or play area for the graph. Have the children place each item in the appropriate space or line up in the appropriate space according to the item they are wearing, if placing the actual item on the graph is not appropriate. If children are on the graph, give each child in a category the same color block or piece of paper. Ask the children to mark the spot where they stood with their block or paper , and return to the group or circle area to talk about the graph they have made.
 2. How many people in the room have long hair? Short hair? Repeat the format above. Use pictures of long or short hair or actual photographs of the children.
 3. What is your favorite fruit? Limit to two or three choices such as red and green apples or oranges and bananas. Place the fruit in the appropriate place on a graph drawn on chart, newsprint or butcher paper.

~ **COMPONENT STATEMENT: 4.2. ANALYZE DATA SETS TO FORM HYPOTHESES AND MAKE PREDICTIONS.**

Grade-Level Expectation

2. **Describe real graphs using comparative language such as more, less, most, least and the same.**
 - Using the graphs created in the previous grade-level expectation, ask the children to describe what they see using comparative language and explain or justify the use of the words they chose.

~ **COMPONENT STATEMENT: 4.3. UNDERSTAND AND APPLY BASIC CONCEPTS OF PROBABILITY.**

Grade-Level Expectations

3. **Use patterns to describe some events that repeat.**
 - When discussing the schedule for that day, leave out a detail such as circle time or quiet time. If the children do not offer reminders of the omissions, ask children to think about how today’s schedule is the same or different from other same days of the week (e.g., Tuesdays) or days in general and to justify their responses.
4. **Explain why events are likely or unlikely to happen based on personal experiences.**
 - Challenge the children with statements such as: It is winter, I wonder if the leaves on trees will change color. It is summer and it will probably snow tomorrow.

SAMPLE INTEGRATED LESSON – SORTING AND CLASSIFYING USING FLOATING AND SINKING

Context: Your teacher has announced that a new water table will be delivered to your classroom. The teacher is worried because the water table must be placed near the work centers in the classroom. Only centers that have materials that will float can be placed close to the water table. What can be done to figure out which materials can float?

Grade-Level Expectations: 1.1.1, 2.1.1, 2.1.2, 4.1.1, 4.2.2

Time: One instructional period

Objective: The children will be able to compare objects that float or sink.

Materials: Large see-through container for water; objects for testing and sorting (e.g., crayon, paper clip, marble, rubber band, pencil, packing peanuts, wooden stick, cotton ball, small rock or other easily accessible objects); paper towels; two large yarn circles or two hula hoops to use as a graphic organizer for sorting items; paper; crayons; and pencils

Procedure:

1. Review the problem with the children.
2. Discuss the terms “floating” and “sinking.” Assess background knowledge in these areas.
3. Ask children what kind of activity they would create to test for floating and sinking (scientific method).
4. Make two separate circles using the yarn or hula-hoops, one for floating and one for sinking.
5. Ask children to make predictions about whether an item will sink or float and record their predictions on chart paper.
6. Model the experiment and lay the objects in the appropriate circle on the organizer as each item is tested.
7. Compare the class predictions with the results and discuss any differences.
8. Compare the number of objects that sink and float to determine if there is a larger category.

❖ **Possible Assessment Opportunities**

- ❖ Place children in small groups. Provide each child with a different object.
 - Let each child, in turn, test his/her item and place it on the organizer in the correct circle.
 - Each child will record the results on paper.

Use questioning to guide the children to share, in sequence, how they sorted the objects. Orally share as a whole class what happened. Ask questions such as:

- a. Which items floated? How many were there?
- b. Which items sank? How many were there?
- c. What was the same about the objects that floated? Sank?
- d. Can you describe a difference between the items that floated and sank?

Intervention: Prompt children to orally share using verbal cues, such as “My _____ sank to the bottom of the container and Juleen’s _____ floated on the top of the water because _____.”

Challenge: Give children another set of objects to test and make comparisons with the previous sets of sinkers and floaters. Have the children develop rules for why things will sink or float.

Interdisciplinary Framework Connections				
Science	English/Lang. Arts	Social Studies	Visual & Performing Arts	Physical Education
<p>Properties of Matter</p> <p>A.1. Use the senses and simple measuring tools, such as rulers and equal-arm balances, to observe common objects and sort them into groups based on size, weight, shape or color.</p> <p>A.1. Sort objects made of materials such as wood, paper and metal into groups based on properties such as flexibility, attraction to magnets, and whether they float or sink in water.</p> <p>A.INQ 9 Count, order and sort objects by their properties.</p>	<ul style="list-style-type: none"> Recognize when they do not understand and apply appropriate strategies such as asking questions. Generate and respond to questions. Use content vocabulary appropriately and accurately (math, music, science, social studies, etc.). Use oral language to communicate a message. Select and organize visual and auditory information to answer a specific question. 	<p>Humans and Environment Interaction</p> <ul style="list-style-type: none"> Explain ways in which humans use and interact with the environment (e.g., how we use sorting in everyday life, such as sorting trash and recyclables.) 	<p>Art</p> <ul style="list-style-type: none"> Use different media techniques and processes to communicate ideas, feelings, experiences and stories. Use elements of art and principles of design to communicate ideas. Select and use subject matter symbols and ideas to communicate meaning. (e.g., use art materials to create sorting pictures, such as cutting out pictures and sorting them, creating pictures of shapes, etc). 	<p>Responsible Behavior</p> <ul style="list-style-type: none"> Follow class rules, activity-specific rules, safety practices, procedures, etiquette and good sportsmanship in various physical activity settings (e.g., sorting different types of balls according to their use).

Vocabulary: sort, alike, different, diagram, float, graph, sink, shape, same, size, color, under, over, inside, next, near, in front of, first, last

Resources:

Electronic Resources:

Sinking & Floating: <http://www.sciencenetlinks.com/lessons.cfm?BenchmarkID=4&DocID=164> .

What's My Rule for Sorting: <http://illuminations.nctm.org/LessonDetail.aspx?ID=L494>

Mr. Roger's Sorting & Classifying: http://pbskids.org/rogers/parentsteachers/theme/1461_p_act.html

[Making Comparisons – Goals 2000](#)

Digital Camera

Teacher References:

Spring Into Math and Science, by AIMS Education Foundation, 1987

Elementary and Middle School Mathematics, by John Van De Walle

Engaging Young Children in Mathematics, by Douglas H. Clements, 2004

Yardsticks: Children in the Classroom Ages 4-14, by Chip Wood

Children's Literature:

Sorting All Kinds of Socks, by Margarete Reid

The Button Box, by Betsey Franco

Alligator Shoes, by Arthur Dorros

Is It Red? by Tana Hoban

Is It Rough? by Tana Hoban

Color Zoo, by Lois Ehlert

Sort It Out, by Kari Jensen Gold

Notes: