

KINDERGARTEN MATH CURRICULUM 2008

COURSE DESCRIPTION: In kindergarten, the math curriculum will include number and numerical operations, geometry and measurement, patterns and algebra, data analysis, probability, discrete mathematics, and mathematical processes. All students will develop number and spatial sense, perform numerical operations, represent and analyze data, solve problems, develop an understanding of data analysis, probability, and discrete mathematics. The students will use mathematical processes of problem solving, communication, connections, reasoning, representations, and technology to solve problems and communicate mathematical ideas.

These skills will be introduced/delivered through hands on activities, and the use of manipulatives, books, student work, games, ActivBoard flipcharts, and/or United Streaming Segments.

CORE CURRICULUM CONTENT STANDARDS:

STANDARD 4.1 (Number and numerical operations) All students will develop number sense and will perform standard numerical operations and estimations on all types of numbers in a variety of ways.

STANDARD 4.2 (Geometry and measurement) All students will develop spatial sense and the ability to use geometric properties, relationships, and measurement to model, describe and analyze phenomena.

STANDARD 4.3 (Patterns and algebra) All students will represent and analyze relationships among variable quantities and solve problems involving patterns, functions, and algebraic concepts and processes.

STANDARD 4.4 (Data analysis, probability, and discrete mathematics) All students will develop an understanding of the concepts and techniques of data analysis, probability, and discrete mathematics, and will use them to model situations, solve problems, and analyze and draw appropriate inferences from data.

STANDARD 4.5 (Mathematical processes) All students will use mathematical processes of problem solving, communication, connections, reasoning, representations, and technology to solve problems and communicate mathematical ideas.

STANDARD 8.1 (Computer and information literacy) All students will use computer applications to gather and organize information and to solve problems.

CUMULATIVE PROGRESS INDICATORS:

A. Number Sense

1. Use real-life experiences, physical materials, and technology to construct meanings for numbers (unless otherwise noted, all indicators for grade 2 pertain to these sets of numbers as well).

- * Whole numbers through hundreds
- * Ordinals
- * Proper fractions (denominators of 2, 3, 4, 8, 10)

2. Demonstrate an understanding of whole number place value concepts.
3. Understand that numbers have a variety of uses.
4. Count and perform simple computations with coins.
 - * Amounts up to \$1.00 (using cents notation)
5. Compare and order whole numbers.

B. Numerical Operations

1. Develop the meanings of addition and subtraction by concretely modeling and discussing a large variety of problems.

- * Joining, separating, and comparing

2. Explore the meanings of multiplication and division by modeling and discussing problems.

3. Develop proficiency with basic addition and subtraction number facts using a variety of fact strategies (such as "counting on" and "near doubles") and then commit them to memory.

4. Construct, use, and explain procedures for performing addition and subtraction calculations with:

- * Pencil-and-paper
- * Mental math
- * Calculator

5. Use efficient and accurate pencil-and-paper procedures for computation with whole numbers.

- * Addition of 2-digit numbers
- * Subtraction of 2-digit numbers

6. Select pencil-and-paper, mental math, or a calculator as the appropriate computational method in a given situation depending on the context and numbers.

7. Check the reasonableness of results of computations.

8. Understand and use the inverse relationship between addition and subtraction.

C. Estimation

1. Judge without counting whether a set of objects has less than, more than, or the same number of objects as a reference set.

2. Determine the reasonableness of an answer by estimating the result of computations (e.g., $15 + 16$ is not 211).

3. Explore a variety of strategies for estimating both quantities (e.g., the number of marbles in a jar) and results of computation.

A. Geometric Properties

1. Identify and describe spatial relationships among objects in space and their relative shapes and sizes.

- * Inside/outside, left/right, above/below, between
- * Smaller/larger/same size, wider/ narrower, longer/shorter
- * Congruence (i.e., same size and shape)

2. Use concrete objects, drawings, and computer graphics to identify, classify, and describe standard three-dimensional and two-dimensional shapes.

- * Vertex, edge, face, side
- * 3D figures - cube, rectangular prism, sphere, cone, cylinder, and pyramid
- * 2D figures - square, rectangle, circle, triangle
- * Relationships between three- and two-dimensional shapes (i.e., the face of a 3D shape is a 2D shape)

3. Describe, identify and create instances of line symmetry.

4. Recognize, describe, extend and create designs and patterns with geometric objects of different shapes and colors.

B. Transforming Shapes

1. Use simple shapes to make designs, patterns, and pictures.

2. Combine and subdivide simple shapes to make other shapes.

C. Coordinate Geometry

1. Give and follow directions for getting from one point to another on a map or grid.

D. Units of Measurement

1. Directly compare and order objects according to measurable attributes.

- * Attributes - length, weight, capacity, time, temperature

2. Recognize the need for a uniform unit of measure.

3. Select and use appropriate standard and non-standard units of measure and standard measurement tools to solve real-life problems.

- * Length - inch, foot, yard, centimeter, meter
- * Weight - pound, gram, kilogram
- * Capacity - pint, quart, liter
- * Time - second, minute, hour, day, week, month, year
- * Temperature - degrees Celsius, degrees Fahrenheit

4. Estimate measures.

E. Measuring Geometric Objects

1. Directly measure the perimeter of simple two-dimensional shapes.
2. Directly measure the area of simple two-dimensional shapes by covering them with squares.

A. Patterns

1. Recognize, describe, extend, and create patterns.
 - * Using concrete materials (manipulatives), pictures, rhythms, & whole numbers
 - * Descriptions using words and symbols (e.g., "add two" or "+ 2")
 - * Repeating patterns
 - * Whole number patterns that grow or shrink as a result of repeatedly adding or subtracting a fixed number (e.g., skip counting forward or backward)

B. Functions and Relationships

1. Use concrete and pictorial models of function machines to explore the basic concept of a function.

C. Modeling

1. Recognize and describe changes over time (e.g., temperature, height).
2. Construct and solve simple open sentences involving addition or subtraction.
 - * Result unknown (e.g., $6 - 2 = \underline{\quad}$ or $n = 3 + 5$)
 - * Part unknown (e.g., $3 + \underline{\quad} = 8$)

D. Procedures

1. Understand and apply (but don't name) the following properties of addition:
 - * Commutative (e.g., $5 + 3 = 3 + 5$)
 - * Zero as the identity element (e.g., $7 + 0 = 7$)
 - * Associative (e.g., $7 + 3 + 2$ can be found by first adding either $7 + 3$ or $3 + 2$)

A. Data Analysis (or Statistics)

1. Collect, generate, record, and organize data in response to questions, claims, or curiosity.
 - * Data collected from students' everyday experiences
 - * Data generated from chance devices, such as spinners and dice
2. Read, interpret, construct, and analyze displays of data.
 - * Pictures, tally chart, pictograph, bar graph, Venn diagram
 - * Smallest to largest, most frequent (mode)

B. Probability

1. Use chance devices like spinners and dice to explore concepts of probability.
 - * Certain, impossible
 - * More likely, less likely, equally likely
2. Provide probability of specific outcomes.
 - * Probability of getting specific outcome when coin is tossed, when die is rolled, when spinner is spun (e.g., if spinner has five equal sectors, then probability of getting a particular sector is one out of five)
 - * When picking a marble from a bag with three red marbles and four blue marbles, the probability of getting a red marble is three out of seven

C. Discrete Mathematics—Systematic Listing and Counting

1. Sort and classify objects according to attributes.
 - * Venn diagrams
2. Generate all possibilities in simple counting situations (e.g., all outfits involving two shirts and three pants).

D. Discrete Mathematics—Vertex-Edge Graphs and Algorithms

1. Follow simple sets of directions (e.g., from one location to another, or from a recipe).
2. Color simple maps with a small number of colors.
3. Play simple two-person games (e.g., tic-tac-toe) and informally explore the idea of what the outcome should be.
4. Explore concrete models of vertex-edge graphs (e.g. vertices are "islands" and edges are "bridges").
 - * Paths from one vertex to another

A. Problem Solving

1. Learn mathematics through problem solving, inquiry, and discovery.
2. Solve problems that arise in mathematics and in other contexts (cf. workplace readiness standard 8.3).
 - * Open-ended problems
 - * Non-routine problems
 - * Problems with multiple solutions
 - * Problems that can be solved in several ways
3. Select and apply a variety of appropriate problem-solving strategies (e.g., "try a simpler problem" or "make a diagram") to solve problems.
4. Pose problems of various types and levels of difficulty.
5. Monitor their progress and reflect on the process of their problem solving activity.

B. Communication

1. Use communication to organize and clarify their mathematical thinking.

- * Reading and writing
 - * Discussion, listening, and questioning
2. Communicate their mathematical thinking coherently and clearly to peers, teachers, and others, both orally and in writing.
 3. Analyze and evaluate the mathematical thinking and strategies of others.
 4. Use the language of mathematics to express mathematical ideas precisely.

C. Connections

1. Recognize recurring themes across mathematical domains (e.g., patterns in number, algebra, and geometry).
2. Use connections among mathematical ideas to explain concepts (e.g., two linear equations have a unique solution because the lines they represent intersect at a single point).
3. Recognize that mathematics is used in a variety of contexts outside of mathematics.
4. Apply mathematics in practical situations and in other disciplines.
5. Trace the development of mathematical concepts over time and across cultures (e.g., world languages and social studies standards).
6. Understand how mathematical ideas interconnect and build on one another to produce a coherent whole.

D. Reasoning

1. Recognize that mathematical facts, procedures, and claims must be justified.
2. Use reasoning to support their mathematical conclusions and problem solutions.
3. Select and use various types of reasoning and methods of proof.
4. Rely on reasoning, rather than answer keys, teachers, or peers, to check the correctness of their problem solutions.
5. Make and investigate mathematical conjectures.
 - * Counterexamples as a means of disproving conjectures
 - * Verifying conjectures using informal reasoning or proofs.
6. Evaluate examples of mathematical reasoning and determine whether they are valid.

E. Representations

1. Create and use representations to organize, record, and communicate mathematical ideas.
 - * Concrete representations (e.g., base-ten blocks or algebra tiles)
 - * Pictorial representations (e.g., diagrams, charts, or tables)
 - * Symbolic representations (e.g., a formula)
 - * Graphical representations (e.g., a line graph)
2. Select, apply, and translate among mathematical representations to solve problems.
3. Use representations to model and interpret physical, social, and mathematical phenomena.

F. Technology

1. Use technology to gather, analyze, and communicate mathematical information.
2. Use computer spreadsheets, software, and graphing utilities to organize and display quantitative information.
3. Use graphing calculators and computer software to investigate properties of functions and their graphs.
4. Use calculators as problem-solving tools (e.g., to explore patterns, to validate solutions).
5. Use computer software to make and verify conjectures about geometric objects.
6. Use computer-based laboratory technology for mathematical applications in the sciences.

A. Basic Computer Skills and Tools (8.1)

1. Use basic technology vocabulary.
2. Use basic features of an operating system (e.g., accessing programs, identifying and selecting a printer, finding help).
3. Input and access text and data, using appropriate keyboarding techniques or other input devices.
4. Produce a simple finished document using word processing software.
5. Produce and interpret a simple graph or chart by entering and editing data on a prepared spreadsheet template.
6. Create and present a multimedia presentation using appropriate software.
7. Create and maintain files and folders.
8. Use a graphic organizer.
9. Use basic computer icons.

B. Application of Productivity Tools

Social Aspects

1. Discuss the common uses of computer applications and identify their advantages and disadvantages.
2. Recognize and practice responsible social and ethical behaviors when using technology, and understand the consequences of inappropriate use including:
 - * Internet access
 - * Copyrighted materials
 - * On-line library resources
 - * Personal security and safety issues
3. Practice appropriate Internet etiquette.
4. Recognize the ethical and legal implications of plagiarism of copyrighted materials.

Information Access and Research

5. Recognize the need for accessing and using information.

6. Identify and use web browsers, search engines, and directories to obtain information to solve real world problems.

7. Locate specific information by searching a database.

8. Recognize accuracy and/or bias of information.

Problem Solving and Decision Making

9. Solve problems individually and/or collaboratively using computer applications.

10. Identify basic hardware problems and solve simple problems.

SUGGESTED ACTIVITIES THAT ADDRESS THESE STANDARDS MAY INCLUDE BUT ARE NOT LIMITED TO: (arranged by standard)

STANDARD 4.1 (Number and numerical operations)

- *Roll and Stand*: Divide the class into small groups. Give each group a cube and a set of cards. The first person in each group rolls the cube and takes the number card that shows the same number. When all of the children have cards, they hold the cards and stand in order starting with 0. They have to decide the correct numerical order. The children put the number card back in a pile and repeat the activity.

- Number cubes
- Numeral cards 0-10
- Number line (optional)

- *Simon Says "First" to "Fifth"*: Children count off by fives and form lines of 5 children teacher will give directions that use ordinal numbers - (example)

- Simon says "first" child hold up your right hand
- Simon says "fourth" child sit down
- Simon says "second" child turn around

Continue until children have had several opportunities to follow directions.

- *Clay Snake Numbers*: Write numbers on the board or pass out number cards 0-9 (up to 20). Demonstrate how to make a long thin roll of clay using your hands. The children make these "snakes" and twist them to show numbers 0-9 (up to 20). Have children trace the numbers with their fingers; use them to form the numerals.

- Number cards 0-9 (up to 20)
- Clay (for each student)

- *Number Books*: Create a number book that will show numerals 0-10 (up to 20) . Students will include a corresponding visual (foam shapes, stickers, magazine pictures) to match the number. (One number and corresponding visual per page).

- Construction paper
- Crayons/markers
- Scissors
- Magazines

- *Ten Sly Piranhas (introduction to subtraction)*; Read the book: Ten Sly Piranhas by William Wise. Use goldfish (edible goldfish or fish manipulatives) on a math mat to model subtraction (take away). As the teacher reads the story, students will act out the book and show subtraction by taking away (or eating) the goldfish (according to the story).

- Ten Sly Piranhas book
- Edible goldfish or fish manipulatives
- Math mat

STANDARD 4.2 (Geometry and measurement)

- *Can You Buy It?*: Prepare envelopes by putting coins into each that total between 5¢ and 10¢. Write an amount on the outside of each envelope. (Some amounts will equal the coins inside; others will be more or less than the amount.) Give each child one envelope. Direct the children to find out if the coins inside match the amount written on the outside of the envelope. Children with more money than is written on the envelope put the extra coins on a table. The children who need more coins take the coins that they need.

- Envelopes - blank/marked
- Coins (pennies, nickels, dimes)
- Pens/markers

- *Money Bank*: Set up a money learning center that includes the following materials: graph paper, baby food jars, a bank, and 25 assorted coins. Give the children a cup containing five coins - any combination of pennies, nickels, and/or dimes. Students make a bar graph for the number of coins in each category for each day. Each day they receive a new set of coins to be graphed. On Friday, the coins they have graphed will be compared to the collective coins placed in the piggy bank.

- *What's in the Bag (shape recognition)*: Read the book Shapes, Shapes, Shapes by Tana Hoban. Place a shape in the bag. Show one student the shape. That same student will describe the shape according to its attributes (i.e. 3 points, 3 sides) to the class. The class will have to identify the name of the shape and draw it on a piece of paper.

- Large plastic shapes
- Paper bag
- Drawing paper

- *Color and Shape Bingo*: Create Bingo boards using the 4 basic shapes (square, circle, rectangle, and triangle) in various colors. Use small manipulatives as Bingo chips (counters, buttons, etc.). Create index cards with the same shapes and colors that are on the Bingo boards. Pull one card at a time, have the students identify the color and shape. The students will put a Bingo chip on the color and shape that has been shown.

- Bingo boards (different combinations of colors and shapes)
- Bingo chips (manipulatives)
- Index cards (different color and shapes)

- *Positional Words*: Students will create a bridge out of unifix cubes. Each student will receive a little plastic animal (manipulative). The teacher will give verbal directions and the students will place the animal in the correct position (i.e. Put the animal “under” the tunnel. Put the animal “over” the tunnel).

- Unifix cubes
- Plastic animal (manipulative)

STANDARD 4.3 (Patterns and algebra)

- *Pattern Game*: Students will create shape patterns using triangles, circles, squares, and rectangles. They will draw the pattern on drawing or graph paper. The students will trade patterns and orally identify the shapes that will come next.

- Shapes
- Drawing or graph paper.

- *Creating Patterns*: (Incorporates NJCCS 8.1) View United Streaming Segment: [Mathica's Mathshop: Patterns](#). After discussing different types of patterns, give each student a pile of pattern blocks (different colors and sizes). Say a specific type of pattern (i.e. AB pattern). Ask the students to create that type of pattern. When finished, ask some volunteers to show and explain their pattern to the class.

- ActivBoard/Internet
- Pattern blocks

- *Snaps, Claps, and Stomps*: Review patterns. The teacher will create a pattern by snapping, clapping, stomping or a combination of all three. After the pattern is set, the class will repeat the pattern. The teacher will choose volunteers to come to the front of the classroom and create their own patterns and have the class repeat them.

- *Pattern Packs*: Each student will create a Pattern Pack. Each Pattern Pack will contain pages of different types of patterns (AB, AAB, AABB, ABC). Each pattern will be labeled on the top of the page and created by using different colored paper squares. After the Pattern Pack is completed, students will share their patterns with the class. The class will copy the pattern at their seat using unifix cubes.

- Paper squares
- Unifix cubes

- *Extending Patterns*: Each student will create a pattern using unifix cubes. The pattern will be determined by the teacher (AB, AAB, AABB, ABC). After each student has created a pattern, the class will move to another seat in a clockwise position and extend the pattern that was created by the previous student. The class will keep on rotating until the teacher switches to another type of pattern.

- Unifix cubes

STANDARD 4.4 (Data analysis, probability, and discrete mathematics)

- *Cube Comparison*: Separate the class into small groups. Give each group a bag of cubes, graph paper, and crayons. Each student will reach into the bag and scoop up a handful of cubes. Each student counts their cubes and records the number of cubes on the graph paper. After recording each student's number of cubes, the group will decide which student had the most, least, or the same. These graphs can then be shared with the entire class in order to compare the results.

- Graph paper
- Connecting cubes
- Crayons

- *Name Graph*: Students work together in small groups. One at a time, the students print their first names on the graph paper, one name below the other. Have the children count and compare the number of letters in each name. Do some names have the same number of letters? Does one name have more letters or fewer letters than another? Challenge children to compare their names. After comparing each name, students will create a chart representing the number of letters in each name in the group.

- Graph paper
- Pencils / crayons

- *Sorting and Graphing Information*: (Incorporates NJCCS 8.1) View United Streaming segment: [Learning About Sorting and Grouping](#). Break students up into small groups. Use small objects such as small toys, blocks, colored bear counters, etc. Sort objects into groups by color, shape, and size. Create a graph for each attribute (color, shape, and size), or use plastic rings on the ground to create a Venn Diagram.

- ActivBoard / internet
- Manipulatives (various objects of different sizes, shapes, colors)
- Graph paper
- Plastic rings (large enough for sorting objects)

- *Class Favorites*: Choose/pose a question to students with 4 response choices (i.e. choose your favorite pet - cat, dog, bird, fish, or choose your favorite subject – math, language arts, science, social studies). Select 4 students who will have calculators and appropriate name tags. As each student is asked the question, the assigned student will press 1 on his/her calculator (only 1 choice per student). When all students have been polled, the small groups and work together to chart answers.

- Calculators
- Name tags
- Chart paper
- Pencils / paper

- *Bar Graph Activity*: Allow students to sort themselves by gender. Put boys on one side of the room and girls on the other side of the room. Have the boys count the number of

girls and have the girls count the number of boys. After counting the numbers of boys and girls in the room, determine which group had more / less. Write the numbers on the chalkboard. The students will return to their seats and create a bar graph representing the number of boys and girls in the classroom. Choose a color to represent the boys and a color to represent the girls.

- Students
- Chalkboard
- Graph paper
- Crayons / pencils

STANDARD 4.5 (Mathematical processes)

- *Class Favorites:* (Incorporates NJCCS 8.1) Ask a class question (i.e. What is your favorite color?). Create a flipchart on the ActivBoard (empty bar graph). As each student answers the question, have them fill in a box on the bar graph to represent their answer. After the entire class has filled in their answers, ask comprehension questions to the class, (i.e. How many students like the color red?) and have them write their answers on a piece of paper.

- ActivBoard or large graph paper
- Writing paper
- Pencils

- *Question of the Day:* Give each student a piece of paper. Every morning or during math time, ask the class an opening question (i.e. What shape am I?). Give one clue at a time. When the student has an answer, ask them to draw it on their paper and turn their paper over. When there are no more clues, ask each student to flip over their page and show their answer. Discuss.

- Chalkboard
- Math paper
- Pencils / paper

- *Guess Who?:* The teacher will silently choose a student. Students will use reasoning skills to ask questions that will lead them to the answer of what student was chosen, (i.e. Is the student a boy or a girl? Does the student wear glasses?). Once the class figures out who the student is, he or she will silently chose a student and conduct the question and answer session.

- *Where is the Hiding Spot?:* The teacher will break the class up into small groups. The teacher will hide an object somewhere in the classroom and give clues as to where the object is hidden. After giving the clues, each team will have time to discuss with their teammates where they think the object is. When time is up, each team has to draw a picture or write down where they think it is. After each team has shared their guess, the teacher will reveal the answer.

- Object to hide

- *What Object Comes Next?*: The teacher will break the class up into small groups. The teacher will create a specific pattern consisting of different shapes, colors, and objects. Each group will be provided with the objects that are in the pattern created by the teacher. After showing the pattern to the whole class, each group will get a chance to discuss which object comes next in the pattern. When the timer goes off, each group will hold up the object that would come next in the pattern. Continue the game by creating a new pattern.

- Objects for patterns

STANDARD 8.1 (Computer and information literacy)

- NJCCCS 8.1 will be incorporated throughout the math curriculum by the use of the ActivBoard, student laptops, the internet, United Streaming, etc.

United Streaming segments can be found via the internet using the website:

www.unitedstreaming.com. Searches can be conducted by grade level, subject, and/or NJCCCS.

INSTRUCTIONAL STRATEGIES:

These standards can be delivered through the use of:

- Manipulatives
- Games (small groups)
- Student Participation
- Worksheets
- Books
- ActivBoard
- Internet (i.e. United Streaming)

EVALUATION / ASSESSMENT OF STUDENTS:

To determine if the students meet the standards, the following assessments / evaluations may be used:

- Student work
- Artifacts
- Teacher checklist
- Assessment sheet (one per student)
- Class participation
- End of the Year Checklist

EVALUATION / ASSESSMENT OF CURRICULUM:

This course of study will be evaluated/assessed by instructional staff during the first year of implementation for the purpose of necessary revision at the end of the first year. In addition, this course of study will be reviewed according to the Five-Year Curriculum Review Schedule.

RESOURCES:

ActivBoard / flipcharts
Book: Shapes, Shapes, Shapes by Tana Hoban
Book: Ten Sly Piranhas by William Wise
Calculators
Construction paper
Flash Cards (#0-20)
Graph paper
Internet
Large plastic rings (Venn diagram)
Magazines
Manipulatives: counters, buttons, plastic animals, etc.
Math mats
Number line
Paper squares
Pattern blocks
Pencils / crayons
Plastic money
Plastic shapes
Scissors
Unifix Cubes
United Streaming Segments

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