Grade: Kindergarten  
**Strand:** Numbers and Numerical Operations  
**Topic:** Number Sense, Numerical Operations, Estimations  

**Stage 1: Desired Results:**  

**Enduring Understanding:** Being able to communicate number sense by choosing appropriate types of numbers, operations, and estimations are essential skills for real world applications  

**Essential Questions:**  
1. Why is number sense the foundation for all mathematics?  
2. What makes a computation strategy effective and efficient?  
3. How do operations affect numbers?  
4. How can we use math information to choose an operation?  
5. When should an exact number be used? When should an estimate be used?  

**Common Core Standards**  

**KCC – Kindergarten Counting and Cardinality**  
1. Count to 100 by ones and by tens.  
2. Count forward beginning from a given number within the known sequence (instead of having to begin at 1).  
6. Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group, e.g., by using matching and counting strategies.  
7. Compare two numbers between 1 and 10 presented as written numerals.  

**KOA – Kindergarten Operations and Algebraic Thinking**  
1. Represent addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations.  
2. Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem.  
3. Decompose numbers less than or equal to 10 into pairs in more than one way, e.g., by using objects or drawings, and record each decomposition by a drawing or equation (e.g., $5 = 2 + 3$ and $5 = 4 + 1$).  
4. For any number from 1 to 9, find the number that makes 10 when added to the given number, e.g., by using objects or drawings, and record the answer with a drawing or equation.  
5. Fluently add and subtract within 5.  

**KNBT – Kindergarten Numbers and Operations in Base Ten**  
1. Compose and decompose numbers from 11 to 19 into ten ones and some further ones, e.g., by using objects or drawings, and record each composition or decomposition by a drawing or equation (e.g., $18 = 10 + 8$); understand that these numbers are composed of ten ones and one, two, three, four, five, six, seven, eight, or nine ones.
Knowledge and Skills:
Students will begin to:

**Number Sense**
1. Understand the meaning, uses, and rep of numbers  
   - Use manipulatives to model the numbers 20 – 30  
   - Show fingers to model the number, tally marks  
   - Money, temperature, calendar, time  
   - Show number on number line
2. Identify equivalent names for numbers  
   - Name collection boxes (drawings, tally marks) 20
3. Understand common numerical relations
4. Compare and order whole numbers through hundreds  
   - Up to 100 (circle the larger number, place numbers in order)
5. Demonstrate an understanding of place value  
   - Tens (trading ten straws to a bundle)
6. Use proper fractions  
   - \( \frac{1}{2} \) - show it in a picture
7. Count and compute computations with coins – pennies, nickels, dimes
8. Identify even/odd numbers  
   - Up to 20 (counting by twos)
9. Skip Count  
   - 2s – 30  
   - 5s – 100  
   - 10s – 100

**Numerical Operations**
1. Develop the meaning of +, -  
   - Up to 10
2. Explore the meaning of multiply and divide  
   - Skip counting  
   - Modeling number stories
3. Develop proficiency with basic +/- number facts  
   - Up to 5
4. Use Mental Math calculations  
   - 5
5. Use calculators to explore math procedures  
   - +, -
6. Use pencil/paper procedure with whole numbers  
   - Addition – up to 10 – single digit numbers  
   - Subtraction up to 10 – single digit numbers
7. Check reasonableness of calculations  
   - Exposure
8. Understand and use fact families for + / -  
   - Up to 10 (single digit #)
Estimation
1. Decide whether objects have less, more, same number objects
   - Compare visually
2. Determine the reasonableness of an answer by estimating
   - Exposure
3. Explore a variety of strategies for estimating both quantities and results of computation
   - Exposure

Stage 2: Evidence of Understanding:

Millstone Township Benchmarks:
- Periodic Assessments
- On-going Assessments
- Projects/Performance Assessments
- Appropriate report card grades
- District-created word problems involving computation
- Benchmark performance assessments

Quizzes, Tests, Prompts:
- Periodic Assessments
- Fact Power Assessments
- Teacher-Created Assessments
- Mid-Year and End-of-the Year Assessments
- Worksheets
- “Developing” and “Secure” Test

Other Evidence and Student Self-Assessment:
- Teacher Observations
- Oral Assessments
- Slate Assessments
- Product/Performance Assessments
- Class Checklists
- Self-Assessment Charts
- Individual Profiles of Progress
- Anecdotal Records
- Portfolio Selections
- Math boxes
- Checklist
- Teacher observation
Stage 3—Learning Plan

**W:** Students will know expectations of this unit through:
- Math-related Literature
- Pre and Post Tests
- Routines
- Conferencing
- Models/Manipulatives
- Homework
- Class work
- Family Letters
- Classroom Newsletters

**H:** This unit will hook and hold students’ attention by:
- Using real-world connections
- Using calculators
- Students making their own examples to practice
- Participating in daily “jobs”
- Experimenting with manipulatives
- Using math tools
- Read *Twelve Ways to Get Eleven*

**E:** The following learning experiences will help students explore the big ideas and essential questions:
- Top-it Game
- Spin a number Game
- Matching Coin Game
- Tricky Teens Game
- I have . . . who has (numbers, coins)
- Roll & Record Game
- Monster Squeeze Game
- Disappearing Train Game
- Guess the missing numbers on a number grid
- Number Bingo
- Pin the number on 100 grid
- Number Hunt
- Dice Addition
- High Roller Game
- Ten Frame Game
- The Raft Game
- Tactile numbers 0 use various beans to trace number information and reinforce patterning
- Estimation Jar
- Number Book
- Count by 10s, 5s, 2s, with songs
• Calendar Countdown
• Number Grid
• Intro of coins (Dr. Jean Song) $1, $10
• Have a class store/bank (coin exchanges)’assemble a number grid
• Create number stories/illustrate
• Name Collection Box (flower shaped)
• Clean up count (10s, decades)
• Tens and ones using butterfly pasta and nets

R: Students will reflect, rethink, revise, and refine by:
• Journal reflective writing
• Pre and Post Tests editing
• Rewriting open-ended word problems
• Utilizing rubrics
• Peer Coaching

E: Students will exhibit understanding through:
• Assessments
• Projects
• Portfolio Selections
• Exit Slips
• Games
• Homework
• Class Work Activities
• Journal Reflections

T: Differentiation opportunities will include:
• Provide wait time
• Use “Jigsaw” strategy
• Provide visual references
• Vary Game Levels
• Choose One/Multi-Step Problems
• Tier activities
• Provide Flexible Grouping
• Use Graphic Organizers
• Provide “Center” Activities
• Use Words, Symbols, Pictures
• Customize lessons
• Model lessons concretely, visually, physically
• Provide organizational tools
• Make connections to everyday life
• Summarize the lesson
O: Organization and sequencing considerations include:
• Problem of the Day/Routines
• Notebook for reflective writing and computation strategies
• Step by step directions for computation
• Modeling by teacher
• Introduction, Discussion, Practice of each lesson

Time Allotment:
The unit on numbers and operations requires approximately six weeks but concepts are revisited throughout the year. Skills should improve as the school year progresses.

Resources:

Student Materials:
• Notebook
• Folder
• Portfolio
• Number lines/grids
• Textbooks
• Consumable Books
• Everyday Math

Technology:
• Math Games
• Computer Lab
• Assessment Assistant
• Internet Resources

Teaching Materials:
• Teacher Editions
• Teacher-Created Materials
• Math Literature
• Supplemental Books
• Manipulatives
• Everyday Math resources

Teaching Resources:
• New Jersey Core Curriculum Content Standards
• Millstone Township Math Curriculum Guide
• Teacher’s Resource Manual
• Student Reference Book
• Assessment handbook
• Home Connection book
Grade: Kindergarten  
Strand: Geometry and Measurement  
Topics: Geometric Properties, Coordinate Geometry, Measuring Geometric Objects, Transforming Shapes, Units of Measurement

Stage 1—Desired Results:  
Enduring Understanding:  
- Everyday objects have a variety of attributes and can be measured in many ways.

Essential Questions:  
- How can geometry and measurement relate to real world connections?  
- How do geometric relationships help solve problems?  
- How does measurement help solve problems?  
- Why is geometry important?

Common Core Standards

KG – Kindergarten Geometry  
1. Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as above, below, beside, in front of, behind, and next to.
2. Correctly name shapes regardless of their orientations or overall size.
3. Identify shapes as two-dimensional (lying in a plane, “flat”) or three dimensional (“solid”).
4. Analyze and compare two- and three-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, parts (e.g., number of sides and vertices/“corners”) and other attributes (e.g., having sides of equal length).
5. Model shapes in the world by building shapes from components (e.g., sticks and clay balls) and drawing shapes.
6. Compose simple shapes to form larger shapes. For example, “Can you join these two triangles with full sides touching to make a rectangle?”

Knowledge and Skills:  
Students will begin to:

Geometric Properties  
- Understand Spatial relationships – longer/shorter  
- Identify and use two-dimensional and three-dimensional objects: Cube, rectangular prism, sphere, cone, cylinder, triangle, circle, rectangle, square, hexagon, rhombus, trapezoid, oval  
- Identify and create lines of symmetry  
- Create designs with geometric shapes

Transforming Shapes  
- Use simple shapes to make designs, patterns & pictures  
- Recognize geometric shapes in real world

Coordinate Geometry - NA
Units of Measurement
- Compare and order objects using measurable attributes (short-shorter-shortest, long-longer-longest)
- Use appropriate units of measure
  - Length: inch
  - Weight: heavier/lighter
  - Capacity: exposure
  - Time: exposure to intervals, time to the nearest hour, days of week, months of year
  - Temperature: degrees Fahrenheit
- Estimate measures – exposure
- Measure using nonstandard units such as connecting cubes, human feet, etc.

Measuring Geometric Objects - NA
Stage 2: Evidence of Understanding

Millstone Township Benchmarks:
- District-created problem-solving samples involving geometry and measurement
- Passing grades on assessments
- Appropriate report card grades
- Benchmark performance assessments

Quizzes, Tests, Prompts:
- Formative assessment
- Rubrics for scoring prompts
- Periodic assessments
- Teacher-created assessments

Other Evidence and Student Self-Assessment:
- Teacher observations
- Oral/slate assessments
- Class check lists
- Self-assessment charts
- Anecdotal records
- Portfolio selections
- Project/product/performance assessments

Stage 3: Learning Plan:

W: Students will know expectations of this unit through:
- Discussion of essential questions
- Prior knowledge activities
- Family letters
- Classroom newsletters
- Rubrics used for scoring problems related to geometry and measurement
- Class work
- Homework
• Conferencing with teacher/peers
• Unit pre-test

H: This unit will hook and hold student’s attention by:
• Using real-world experiences
• Personalizing word problems
• Relating geometry and measurement to art and music
• Reading appropriate literature
• Working with peers on activities
• Experimenting
• Using measuring tools
• Using computer programs
• Using geometric manipulatives

E: The following experiences will help students explore the big ideas and essential questions:
• Make geometric gift wrap
• Make attribute block designs
• Make measurement book
• Sort shapes
• Test for symmetry
• Make shapes on geo board
• Read books about shapes
• Explore symmetrical designs
• Make cm cube arrays
• Explore tangrams
• Construct pyramids
• Make geometric/measurement booklets
• Create a shapes poster
• Read The Math Curse; How Big is a Foot?
• Write “What Am I?” riddles
• Shape scavenger hunt
• I have, who has – shapes
• Spin on attribute game
• Find the block game
• Shape, I spy . . .
• Test for symmetry
• Attribute spinner game
• ‘Rock Around the Clock’ game
• Read “How Big is a Foot?” – use children’s feet to measure
• Measure life size penguins, compare measurements
• Measure museum/poster/collage
• Marshmallow/toothpick 3D shapes
• Create attribute block designs
• Use geo-boards to create shapes
• Create geometric gift wrap
• Symmetry Painting (snowman, butterfly)
• Use template to draw shapes and create a picture out of them
• Body and rope shapes
• What am I riddles
• Venn Diagram (compare/contrast shapes)

R: **Students will reflect, rethink, revise, and refine by:**
• Conferencing with teacher/peers
• Using teacher comments to improve thinking
• Using a rubric
• Revisit topic
• Journal writing

E: **Students will exhibit understanding through:**
• Entrance/exit slips
• Use of appropriate math vocabulary
• Designing, building structures
• Using appropriate measurements
• Homework
• Class work
• Assessments
• Teacher observations
• Playing games

T: **Differentiation opportunities include:**
• Tiered assignments
• Scaffolding assignments
• Jigsaw activities
• Flexible-Grouping
• Center activities
• Higher-level questioning
• Varying game levels
• Extra time

O: **Organization and sequencing considerations include:**
• Portfolio selections
• Modeling of activity for organization
• Perform tasks using graphic organizer
• Journal writing
• Scaffolding activities

**Time Allotment:**
Initially, the unit of study requires approximately eight weeks of preparation. However, the concepts are not expected to be mastered at that time and will continuously be revisited throughout the school year.
Resources:

Student Materials:
- Notebook for journal writing
- Student workbooks
- Various measurement tools
- Various geometric tools
- Template
- Calculator
- Reference guide
- Everyday Math

Technology:
- Computer lab
- Computer software
- Calculators
- Internet access/websites

Teaching Materials:
- Worksheets
- Graphic organizers
- Resource books
- Supplemental materials
- Math literature
- Manipulatives
- Everyday Math resources

Teacher Resources:
- New Jersey Core Curriculum Content Standards
- Millstone Township Mathematics Curriculum Guide
- Rubrics for scoring
- Teacher resource manuals
- Math Literature Library
Grade: Kindergarten
Strand: Patterns and Algebra
Topics: Patterns, Functions and Relationships, Modeling, Procedures,

Stage 1—Desired Results:
Enduring Understanding:
- Patterns play an important role in having students solve problems and analyze algebraic concepts.

Essential Questions:
- How can patterns and algebra relate to real world connections?
- How do patterns help solve problems?
- How can students use modeling to identify math processes?
- Why is algebra important? How can it be of importance to students in their everyday lives?

Common Core Standards
None Listed

Knowledge and Skills:
Students will begin to:
Patterns:
- Recognize, describe, extend, and create patterns
  - Use manipulatives to show a pattern / extend a pattern
  - Draw pictures to show a pattern / extend a pattern
  - Label patterns using AB, ABC, AABB . . .
  - Recognize patterns on a grid – 2s, 5s, 10s
  - Locate patterns in real world
  - Repeat patterns by drawing, clapping . . .

Functions and Relationships
- Be introduced to Function Machines

Modeling
- Recognize / describe the changes of daily temperature and represent the changes with a color chain
- Use missing number problems (single digit numbers) using number line
- Measure the height of ourselves & plants, and observing changes

Procedures
- Be exposed to commutative property, fact families

Stage 2: Evidence of Understanding

Millstone Township Benchmarks:
- Appropriate scores on periodic assessments
- Appropriate report card grades
- Oral and written communication of patterns and algebraic expressions
- Benchmark performance assessments
Quizzes, Tests, Prompts:
- Rubrics for scoring prompts
- Unit tests
- Periodic assessments
- Teacher-created assessments
- Formative assessments

Other Evidence and Student Self-Assessment:
- Teacher observations
- Oral/ slate assessments
- Class check lists
- Self-assessment charts
- Anecdotal records
- Portfolio selections
- Project/product/ performance assessments

Stage 3; Learning Plan:

W: Students will know expectations of this unit through:
- Discussion of essential questions
- Prior knowledge activities
- Family letters
- Classroom newsletters
- Rubrics used for scoring problems related to patterns and algebra
- Class work
- Homework
- Conferencing with teacher/peers
- Unit pre-test

H: This unit will hook and hold student’s attention by:
- Using real-world experiences
- Personalizing word problems
- Relating patterns to art and music
- Reading appropriate literature
- Working with peers on activities
- Experimenting
- Using measuring tools
- Using computer programs
- Using manipulatives

E: The following experiences will help students explore the big ideas and essential questions:
- Make patterns by coloring grids or using colored chalk
- Read *The King’s Chessboard; A Cloak for a Dreamer*
- Make Two-Block patterns
- Identify and complete patterns
- Make function machines
• Explore even/odd patterns in addition and subtraction
• Solve pattern puzzles and mathematical puzzles
• Write number stories
• Follow My Pattern game
• “What’s My Rule?” game
• Plus or minus game
• Read My Mind game
• Guess the Missing Shape
• Create patterns using slices of different shape/color pool noodles
• Use attribute blocks to create patterns (or use templates)
• Sound and motion patterns
• Color patterns
• Macaroni necklaces
• Look for patterns on a number grid and color
• Skip counting
• Count with calculator
• Identify and complete patterns
• Write number stories
• Create paper chain of temperature patterns
• Function machines
• Class number story book
• Calendar countdown

R: Students will reflect, rethink, revise, and refine by:
• Conferencing with teacher/peers
• Using teacher comments to improve thinking
• Using a rubric
• Revisit topic
• Journal writing

E: Students will exhibit understanding through:
• Entrance/exit slips
• Use of appropriate math vocabulary
• Designing, building structures
• Using appropriate measurements
• Homework
• Class work
• Assessments
• Teacher observations
• Playing games

T: Differentiation opportunities include:
• Tiered and scaffolding assignments
• Jigsaw activities
• Flexible-Grouping
• Center activities
• Higher-level questioning
• Varying game levels
• Extra time

O: Organization and sequencing considerations include:
• Portfolio selections
• Modeling of activity for organization
• Perform tasks using graphic organizer
• Journal writing
• Scaffolding activities

Time Allotment:
This unit on patterns and algebra requires approximately eight weeks of preparation. The topics are revisited throughout the school year.

Resources:
Student Materials:
• Notebook for journal writing
• Student workbooks
• Various measurement tools
• Various patterning tools
• Template
• Calculator
• Reference guide
• Everyday Math

Technology:
• Computer lab
• Computer software
• Calculators
• Internet access/websites

Teaching Materials:
• Worksheets
• Graphic organizers
• Resource books
• Supplemental materials
• Math literature
• Manipulatives
• Everyday Math resources

Teacher Resources:
• New Jersey Core Curriculum Content Standards
• Millstone Township Mathematics Curriculum Guide
• Rubrics for scoring
• Teacher resource manuals
• Math Literature Library
Grade: Kindergarten  
Strand: Data Analysis, Probability, and Discrete Mathematics  
Topics: Data Analysis, Probability, Discrete Mathematics  

Stage 1—Desired Results:

Enduring Understanding:
- Being able to read and interpret data are critical elements needed in real-world situations so that students will be able to make decisions and inferences.
- Probability allows students to make predictions and informed decisions.
- Using discrete mathematics allows students to learn to interpret and organize information.

Essential Questions:
- What do you think is the connection between data analysis, probability, and discrete math and the real world?
- How can these topics be of importance to students in their everyday lives?
- How can students use data analysis, probability, and discrete math to identify math processes?
- How can collecting information be useful in solving problems?

Common Core Standards

KCC – Kindergarten Counting and Cardinality
3. Write numbers from 0 to 20. Represent a number of objects with a written numeral 0-20 (with 0 representing a count of no objects).  
4. Understand the relationship between numbers and quantities; connect counting to cardinality.  
   a. When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object.  
   b. Understand that the last number name said tells the number of objects counted. The number of objects is the same regardless of their arrangement or the order in which they were counted.  
   c. Understand that each successive number name refers to a quantity that is one larger.  
5. Count to answer “how many?” questions about as many as 20 things arranged in a line, a rectangular array, or a circle, or as many as 10 things in a scattered configuration; given a number from 1–20, count out that many objects.

KMD – Kindergarten Measurement and Data
1. Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object.  
2. Directly compare two objects with a measurable attribute in common, to see which object has “more”/“less of” the attribute, and describe the difference. For example, directly compare the heights of two children and describe one child as taller/shorter.

Knowledge and Skills:  
Students will begin to:  

Data Analysis (or Statistics)
- Collect, generate, record data on daily weather and organize into tally charts and bar graphs  
- Be exposed to collecting, generating, and recording data by taking surveys and organize into bar graphs / pictographs  
- Read and interpret data from tally charts, bar graphs, pictures
**Probability**
- Be exposed to chance devices such as spinners, colored cubes and dice
- Be exposed to probability vocabulary such as certain, impossible, possible, likely
- Predict the probability of a specific outcome

**Discrete Mathematics—Systematic Listing and Counting**
- Create Venn Diagrams to compare/contrast attributes of shapes
- Identify and write numbers in numerical order (1-30)
- Use concrete manipulatives to count, organize and orally draw conclusions

**Discrete Mathematics—Vertex Edge Graphs and Algorithms**
- Follow simple set of directions involving one step
- Color simple designs using three colors
- Play games and explore the possible outcomes
- Connect dots in numerical order by 1s, 2s, 5s, 10s, alphabetically
- Use cubes to measure/compare line segments of vertex edge graph

**Stage 2: Evidence of Understanding**

**Millstone Township Benchmarks:**
- District-created problem-solving samples involving probability, data analysis, and discrete mathematics
- Appropriate scores on periodic assessments
- Appropriate report card grades
- Oral and written communication of concepts
- Benchmark performance assessments

**Quizzes, Tests, Prompts:**
- Rubrics for scoring prompts
- Unit tests
- Periodic assessments
- Teacher-created assessments

**Other Evidence and Student Self-Assessment:**
- Teacher observations
- Oral/ slate assessments
- Class check lists
- Self-assessment charts
- Anecdotal records
- Games
- Portfolio selections
- Project/product/ performance assessments
Stage 3: Learning Plan:

W: Students will know expectations of this unit through:
- Discussion of essential questions
- Prior knowledge activities
- Family letters
- Classroom newsletters
- Rubrics used for scoring problems
- Class work
- Homework
- Conferencing with teacher/peers
- Unit pre-test

H: This unit will hook and hold student’s attention by:
- Using real-world experiences
- Personalizing word problems
- Designing and playing games
- Reading appropriate literature
- Working with peers on activities
- Experimenting
- Using computer programs
- Using manipulatives

E: The following experiences will help students explore the big ideas and essential questions:
- Collect data on dice rolls
- Make a “Quick Graph” for data display
- Create a line plot
- Use tallies to count vowels, consonants, or letters in math vocabulary
- Predict the results of rolling dice
- Play probability games
- Sort coins by heads or tails
- Display data with a graph
- Read math literature on probability
- Roll and record game
- “If You Give a Moose a Cookie” activity
- Coin toss game
- Coin sort
- Test spinners
- Pick a cube game (red/blue)
- Birthday / weather / favorites graphs
- Body height comparisons
- Probability tray
- Probability stories
- Tally charts (weather)
- Use tallies to count vowels, sight words, letters, etc.
• How big is your family graph  

**R:** **Students will reflect, rethink, revise, and refine by:**
• Conferencing with teacher/peers
• Using teacher comments to improve thinking
• Using a rubric
• Revisit topic/outcomes
• Journal writing

**E:** **Students will exhibit understanding through:**
• Entrance/exit slips
• Use of appropriate math vocabulary
• Designing and playing spinner games
• Using appropriate materials
• Homework
• Class work
• Assessments
• Teacher observations
• Playing probability games

**T:** **Differentiation opportunities include:**
• Tiered assignments
• Scaffolding assignments
• Jigsaw activities
• Flexible-Grouping
• Center activities
• Higher-level questioning
• Varying game levels
• Extra time

**O:** **Organization and sequencing considerations include:**
• Portfolio selections
• Modeling of activity for organization
• Perform tasks using graphic organizer
• Journal writing
• Scaffolding activities

**Time Allotment:**
This unit of study is taught throughout the school year. Students in kindergarten have opportunities to play games to predict probability and collect data beginning in September and continuing through June.

**Resources:**

**Student Materials:**
• Notebook for journal writing
• Student workbooks
• Graph paper
• Various tools, such as dice, spinners, playing cards
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- Template
- Calculator
- Reference guide
- Everyday Math

**Technology:**
- Computer lab
- Computer software
- Calculators
- Internet access/websites

**Teaching Materials:**
- Worksheets
- Graphic organizers
- Resource books
- Supplemental materials
- Math literature
- Manipulatives
- Everyday Math resources

**Teacher Resources:**
- New Jersey Core Curriculum Content Standards
- Millstone Township Mathematics Curriculum Guide
- Rubrics for scoring
- Teacher resource manuals
- Math Literature Library
- Newspapers (for data, graphs)
Grade: Kindergarten  
Strands: Mathematical Processes  
Topics: Problem Solving, Communication, Connections, Reasoning, Representations, Technology  

Stage 1—Desired Results:

Enduring Understanding:  
- Students will be able to explain their mathematical thinking by using critical thinking skills and making connections with mathematical relationships.  
- Math processes can give students the “tools” needed to help them become problem-solvers.  
- Different math approaches can yield the same results.

Essential Questions:  
- Why is it important to communicate mathematical thinking?  
- How can critical thinking skills be investigated?  
- How can using critical thinking skills help students become better math learners?  
- What connections can be made between different math topics and math processes?  
- What is the best solution to solve problems?  
- How can technology be used to solve problems?

Common Core Standards

KCC – Kindergarten Counting and Cardinality  
6. Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group, e.g., by using matching and counting strategies.

KOA – Kindergarten Operations and Algebraic Thinking  
1. Represent addition and subtraction with objects, fingers, mental images, drawings 2, sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations.  
2. Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem.  
3. Decompose numbers less than or equal to 10 into pairs in more than one way, e.g., by using objects or drawings, and record each decomposition by a drawing or equation (e.g., 5 = 2 + 3 and 5 = 4 + 1).

Knowledge and Skills:  
Students will begin to:  
Problem-Solving  
- Use manipulatives for problem solving  
- Use problem solving strategy – use a picture +, -, one to one correspondence  
- Use a bar graph  
- Be exposed to math vocabulary  
- Give a problem orally
Millstone Township School District

Communication
- Be exposed to math vocabulary
- Be exposed to oral language explanations/think aloud reasoning
- Use pictures to explain
- Solve number sentence using +, -, =
- Give oral expression of mathematical reasoning

Connections
- Use daily attendance to explain subtraction and 100%
- Use daily schedule to explain time (exposure to time and intervals of minutes)
- Read / use a calendar (connection between number and day of week)
- Determine temperature and make a connection between number and type of weather
- Explore / use money (connection that they need money to purchase milk/lunch)
- Make connection that repeated addition = skip counting

Reasoning
- Expose math vocabulary, modeling, think aloud
- Prove that a statement is true by using manipulatives/pictures/fingers

Representations
- Expose and utilize tally charts
- Expose and utilize bar graphs (color bars, compare bars)
- Expose and utilize pictographs
- Expose and utilize place-value representations with straws (up to tens)
- Expose and utilize use of fingers and counters, connecting cubes
- Expose and utilize pictures
- Expose and utilize coins – represent with ¢, $, ·
- Expose and utilize time to the hour, use of colon:
- Expose and utilize symbols +, -, =
- Expose and utilize geo-boards

Technology
- Use calculator for problem solving
  - skip counting (exposure)
  - +/- function keys (one step / single digit)
- Participate in computer lab lessons / activities

Stage 2: Evidence of Understanding:

Millstone Township Benchmarks:
- Oral communication of mathematical processes
- Use symbols, pictures, and numbers to explain mathematical thinking
- Write 1-3 sentences to explain mathematical thinking
- Benchmark performance assessments
- Monthly math problem
Quizzes, Tests, and Prompts:
- Practice assessment
- District-created math prompts
- Teacher-created math word stories
- Rubrics for scoring prompts
- Critical thinking problems: *Roads to Reasoning*
- Unit word problems and “themed” word stories

Other Evidence and Student Self-Assessment:
- Oral/slate assessment
- Teacher observation of informal problem-solving explanations
- Teacher-directed “Why Words” lesson
- Students’ use of “why” words in writing

Stage 3: Learning Plan:

W: **Students will know expectations of this unit through:**
- Comparing an accomplished piece of work and student’s own
- Reviewing the rubric used for scoring
- Using “why” words in student writing
- Being shown models of various works and have teacher model expectations by “dissecting” each part of student writing and improving upon it
- Discussing strategies for writing explanations (I know…, I want to know…)

H: **This unit will hook and hold student’s attention by:**
- Using real-world experiences
- Personalizing word problems (using specific names/places)
- Making their own student problems to be shared by peers
- Drawing pictures or role-playing to understand problem to be solved
- Reading math literature
- Providing time to use technology
- Using specific teaching strategies such as “Think, Pair-Share.”

E: **The following experiences will help students explore the big ideas and essential questions:**
- Projects
- Teacher-generated word stories
- Peer editing
- Use of math journal to explain math thinking
- Using technology such as computer games, computer lab, calculator
- Allowing time to generate ideas
- Use of supplemental teacher materials
- Opportunities to talk about math
- Number concentration game
- Addition Top-it game
R: Students will reflect, rethink, revise, and refine by:
- Peer editing
- Conferencing with teacher
- Using comments written by teacher to help improve thinking
- Using mistakes as a stepping stone
- Creating a student rubric

E: Students will exhibit understanding through:
- Math problem-solving prompts
- Problem-solving situations
- Entrance/exit slips
- Open-ended themed word problems
- Open-ended unit word problems
- Use of math vocabulary in writing
- Teacher observations

T: Differentiation opportunities include:
- Graphic organizers
- Sentence starters
- Specific suggestions
- Individual conferencing
- Extra-time for completion
- Tiered assignments (one-step / multi-step)

O: Organization and sequencing considerations include:
- Daily math messages and reflections to reinforce strategy
- Specific notebook used as problem-solving journal
- Portfolio choices
- Grade-level schedules

Time Allotment:
The unit of study for mathematical processes begins with kindergarten as they begin showing their math thinking through representations such as pictures and manipulatives. Later in the year they are prompted to write a sentence or two to explain their thinking in order to make real world connections.

Resources:

Student Materials:
- Personal notebook used for journal-writing
- Various manipulatives
- Workbooks
- Calculator
- Reference guide
- Everyday Math books
Technology:
- Computer lab
- Calculators
- Variety of computer games
- Internet resources

Teaching Materials:
- Worksheets containing varied math concepts
- Graphic organizers
- Resource books
- Math literature
- Manipulatives
- Everyday Math resources

Teacher Resources:
- New Jersey Core Curriculum Content Standards
- Millstone Township Mathematics curriculum guide
- Rubrics for scoring prompt
- Teacher resource manuals