GRADE 5 MATHEMATICS

August 2008

COURSE DESCRIPTION

The Fifth grade mathematics course reinforces what students have already learned in previous years, while instilling in them new skills which will be required for middle school.

Fifth grade students will focus on mathematical operations such as addition, subtraction, multiplication, and division. They will estimate and round as well, using all operations with whole numbers, decimals, and fractions. Students will learn about geometric ideas and concepts. They will understand patterns, relationships, functions, and statistics. Students will make connections to everyday life and will be able to connect their mathematics to technology. They will be able to exchange ideas with peers about real-life situations involving mathematics.

Students will be assessed based on a daily journal, quizzes, tests, projects, and a weekly computer-based quiz. Teachers will maintain a portfolio for each student to be able to assess which standards need to be addressed for every individual.

CORE CURRICULUM CONTENT STANDARDS:

4.1. Number and Numerical Operations
A. Number Sense
B. Numerical Operations
C. Estimation
4.2. Geometry and Measurement
A. Geometric Properties
B. Transforming Shapes
C. Coordinate Geometry
D. Units of Measurement
E. Measuring Geometric Objects
4.3. Patterns and Algebra
A. Patterns and Relationships
B. Functions
C. Modeling
D. Procedures
4.4. Data Analysis, Probability, and Discrete Mathematics
A. Data Analysis (Statistics)
B. Probability
C. Discrete Mathematics--Systematic Listing and Counting
D. Discrete Mathematics--Vertex-Edge Graphs and Algorithms

4.5. Mathematical Processes
A. Problem Solving
B. Communication
C. Connections
D. Reasoning
E. Representations
F. Technology

CUMULATIVE PROGRESS INDICATORS:
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.

Building upon knowledge and skills gained in preceding grades, by the end of Grade 5, students
will:

A. Number Sense
1. Use real-life experiences, physical materials, and technology to construct meanings for numbers **(unless otherwise noted, all indicators for grade 5 pertain to these sets of numbers as well).**
• All fractions as part of a whole, as subset of a set, as location on a number line, and as divisions of whole numbers
• All decimals
2. Recognize the decimal nature of United States currency and compute with money.
3. Demonstrate a sense of the relative magnitudes of numbers.
4. Use whole numbers, fractions, and decimals to represent equivalent forms of the same number.
5. Develop and apply number theory concepts in problem solving situations.
-Primes, factors, multiples
6. Compare and order numbers.

Suggested Activities That Address These Standards May Include But Are Not Limited To:

-Use decimal models and fractions models to show the decimal equivalents of two fractions.
- Model place value on charts or with base-10 blocks
-Compare and order whole numbers, decimals, fractions, and integers
- Place numbers on a number line
-Identify factors of numbers
-Identify multiples of numbers
-Identify prime numbers
- Round whole numbers to a certain power of ten
- Round decimals to whole numbers

- Round decimals to a certain power of ten
- Find factors of given numbers
- Create factor trees
- Find greatest common factor of two or more numbers
- Identify prime numbers
- Determine prime factorization of a number
- Demonstrate place value from thousandths to billions by writing numbers in expanded form

Numerical Operations

B. Numerical Operations
1. Recognize the appropriate use of each arithmetic operation in problem situations.
2. Construct, use, and explain procedures for performing addition and subtraction with fractions and decimals with:
_ Pencil-and-paper
_ Mental math
_ Calculator
3. Use an efficient and accurate pencil-and-paper procedure for division of a 3-digit number by a 2-digit number.
4. Select pencil-and-paper, mental math, or a calculator as the appropriate computational method in a given situation depending on the context and numbers.
5. Check the reasonableness of results of computations.
6. Understand and use the various relationships among operations and properties of operations.

Suggested Activities That Address These Standards May Include But Are Not Limited To:

-Students will be put into pairs to compete in a racing game. The pair will take turns completing the steps in a division problem including checking with multiplication.
-While using a weekly computer program students will determine which tool is more useful for a given problem.

C. Estimation
1. Use a variety of estimation strategies for both number and computation.
2. Recognize when an estimate is appropriate, and understand the usefulness of an estimate as distinct from an exact answer.
3. Determine the reasonableness of an answer by estimating the result of operations.
4. Determine whether a given estimate is an overestimate of an underestimate.

Suggested Activities That Address These Standards May Include But Are Not Limited To:

***-**Students will use restaurant menus to "have a lunch with friends." They will estimate how much their meal will cost. They will then decide what food they would like to order. They will calculate tax and tip to see how close they come to their estimate.*

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.

Building upon knowledge and skills gained in preceding grades, by the end of Grade 5, students
will:

A. Geometric Properties
1. Understand and apply concepts involving lines and angles.
- Notation for line, ray, angle, line segment
- Properties of parallel, perpendicular, and intersecting lines
- Sum of the measures of the interior angles of a triangle is 180_
2. Identify, describe, compare, and classify polygons.
- Triangles by angles and sides
- Quadrilaterals, including squares, rectangles, parallelograms, trapezoids, rhombi
- Polygons by number of sides
-Equilateral, equiangular, regular
-All points equidistant from a given point form a circle
3. Identify similar figures.
4. Understand and apply the concepts of congruence and symmetry (line and rotational).

Suggested Activities That Address These Standards May Include But Are Not Limited To:

-Students will apply all of the concepts included in geometric properties to construct a backyard using a shoebox. They will label all of their items on their shoebox and write a story about the backyard using the geometric properties.
- Calculate volume of 3-dimensional shapes by filling shapes with cubes or another manipulative tool
-Draw the 6 types of triangles on dot paper and name their properties
- Construct various polygons on dot paper and have their partner name and describe them
- Have students make index cards with the names of special quadrilaterals on one side and their diagrams on the other side.
- Draw models for point, line, plane, segment, and ray and ask students to give the geometric names for each.

B. Transforming Shapes
1. Use a translation, a reflection, or a rotation to map one figure on to another congruent figure.
2. Recognize, identify, and describe geometric relationships and properties as they exist in nature, art, and other real-world settings.

Suggested Activities That Address These Standards May Include But Are Not Limited To:

-Create designs translating, reflecting, rotating, and tessalating two geometric templates onto a sheet of paper. Trace the outcome.
-Collect real-life objects and describe the geometric properties that apply to each.

C. Coordinate Geometry
1. Create geometric shapes with specified properties in the first quadrant on a coordinate grid.

Suggested Activities That Address These Standards May Include But Are Not Limited To:

- Graph ordered pairs
- Create geometric shapes by identifying appropriate ordered pairs for vertices
-Create pictures by identifying appropriate ordered pairs
-Locate ordered pairs

D. Units of Measurement
1. Select and use appropriate units to measure angles and area.
2. Convert measurement units within a system (e.g., 3 feet = _____ inches).
3. Know approximate equivalents between the standard and metric systems (e.g., one kilometer is approximately 6/10 of a mile).
4. Use measurements and estimates to describe and compare phenomena.

Suggested Activities That Address These Standards May Include But Are Not Limited To:

-Draw figures on grid paper and exchange with a partner to estimate the areas.
- Use a geoboard to find different rectangles with different dimensions and the same area.

E. Measuring Geometric Objects
1. Use a protractor to measure angles.
2. Develop and apply strategies and formulas for finding perimeter and area.
- Square
-Rectangle
3. Recognize that rectangles with the same perimeter do not necessarily have the same area and vice versa.
4. Develop informal ways of approximating the measures of familiar objects (e.g., use a grid to approximate the area of the bottom of one's foot).

Suggested Activities That Address These Standards May Include But Are Not Limited To:
- Apply formulas to measure and determine area and perimeter of geometric shapes
- Apply formulas to measure and determine volume of three dimensional geometric shapes

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.

Building upon knowledge and skills gained in preceding grades, by the end of Grade 5, students
will:

A. Patterns
1. Recognize, describe, extend, and create patterns involving whole numbers.
- Descriptions using tables, verbal rules, simple equations, and graphs

Suggested Activities That Address These Standards May Include But Are Not Limited To:

-*Ask the students for examples of patterns in their lives (traffic lights, wearing a winter coat, etc.)*

B. Functions and Relationships
1. Describe arithmetic operations as functions, including combining operations and reversing them.
2. Graph points satisfying a function from T-charts, from verbal rules, and from simple equations.

Suggested Activities That Address These Standards May Include But Are Not Limited To:

- *Draw function graphs of input and output tables provided by the teacher.*

C. Modeling
1. Use number sentences to model situations.
_ Using variables to represent unknown quantities.
_ Using concrete materials, tables, graphs, verbal rules, algebraic expressions/equations
-Students will create word problems for a partner to create an expression or equation.
2. Draw freehand sketches of graphs that model real phenomena and use such graphs to predict and interpret events.
- Changes over time
-Rates of change (e.g., when is plant growing slowly/rapidly, when is temperature dropping most rapidly/slowly)

Suggested Activities That Address These Standards May Include But Are Not Limited To:

- Create concrete materials to aid in solving of problems, i.e. graphs, charts, etc.
- Represent numbers with base-10 blocks
- Model a problem using manipulatives

D. Procedures
1. Solve simple linear equations with manipulatives and informally
- Whole-number coefficients only, answers also whole numbers
- Variables on one side of equation

Suggested Activities That Address These Standards May Include But Are Not Limited To:

-Solve for variables by balancing equations.
-Use base-10 blocks to represent numbers in equations

. **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.

Building upon knowledge and skills gained in preceding grades, by the end of Grade 5, students
will:

A. Data Analysis
1. Collect, generate, organize, and display data.
-Data generated from surveys
2. Read, interpret, select, construct, analyze, generate questions about, and draw inferences from displays of data.
-Bar graph, line graph, circle graph, table
-Range, median, and mean
3. Respond to questions about data and generate their own questions and hypotheses.

Suggested Activities That Address These Standards May Include But Are Not Limited To:

- Find a newspaper article that includes a survey. Send a letter to the editor asking about the sample, population and survey methods.
- Collect data about favorite colors and organize it in a frequency table and line plot.
- Find the range, mean, median and mode of the letters in student's names in their class.
- Describe 2 situations that would best be displayed by a line, bar, and circle graph.
- Use the population of the 5 most populated states to construct a bar and line graph.

B. Probability

1. Determine probabilities of events.
- Event, probability of an event
- Probability of certain event is 1 and of impossible event is 0

2. Determine probability of using intuitive, experimental, and theoretical methods (e.g., using model of picking items of different colors from a bag).
- Given numbers of various types of items in a bag, what is the probability that an item of one type will be picked
- Given data obtained experimentally, what is the likely distribution of items in the bag

3. Model situations involving probability using simulations (with spinners, dice) and theoretical models.

Suggested Activities That Address These Standards May Include But Are Not Limited To:

- *Be challenged to change unfair games into fair games.*
- *Choose a method to find the experimental probability for choosing 1 of 3 different movies.*

C. Discrete Mathematics – Systematic Listing and Counting

1. Solve counting problems and justify that all possibilities have been enumerated without duplication.
_ Organized lists, charts, tree diagrams, tables

2. Explore the multiplication principle of counting in simple situations by representing all possibilities in an organized way (e.g., you can make 3 x 4 = 12 outfits by using 3 shirts and 4 skirts).

Suggested Activities That Address These Standards May Include But Are Not Limited To:

-*Construct tree diagrams for more than one event.*
-*Create a tree diagram to display the possibilities if they roll a number cube twice.*

D. Discrete Mathematics – Vertex-Edge Graphs and Algorithms

1. Devise strategies for winning simple games (e.g., start with two piles of objects, each of two players in turn removes any number of objects from a single pile, and the person to take the last group of objects wins) and express those strategies as sets of directions

Suggested Activities That Address These Standards May Include But Are Not Limited To:

- *Understand and be able to use different algorithms for different mathematical operations*
- *Create their own algorithms, or instructions to solve a problem*
- *Represent and solve problems using dot and line graphs*

STANDARD 4.5 (MATHEMATICAL PROCESSES)
ALL STUDENTS WILL USE MATHEMATICAL PROCESSES OF PROBLEM SOLVING, COMMUNICATIONS, CONNECTIONS, REASONING, REPRESENTATIONS, AND TECHNOLOGY TO SOLVE PROBLEMS AND COMMUNICATE MATHEMATICAL IDEAS.

With respect to content appropriate for grade 5, students will:

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.

Suggested Activities That Address These Standards May Include But Are Not Limited To:

-Review various strategies that have been presented previously to solve word problems.
- In their journals, write which problem solving strategies they have found most useful and give examples to explain.
-Solve a Problem of the Day in journals daily.

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.

Suggested Activities That Address These Standards May Include But Are Not Limited To:

- *Write out in words, steps to solving problems*
- *Actively listen to mathematics*
- *Speak with appropriate mathematics language*
- *Write regularly in a mathematics journal*

- Communicate mathematical thinking orally in discussion with peers and teachers
- Discuss thinking strategies with partners or cooperative groups
- Respond to an open-ended question
- Listen to a problem to complete mental math
- Follow directions or steps in a problem
- List characteristics of a math concept

Connections

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 (cf. world languages and social studies standards).
6. Understand how mathematical ideas interconnect and build on one another to produce a coherent whole.

Suggested Activities That Address These Standards May Include But Are Not Limited To:

- Apply mathematics to everyday situations, such as shopping, paying bills, measuring a floor for carpet, etc.
- Apply mathematics in other content areas such as science
-Research the development of math concepts over time
-Demonstrate understanding of how mathematical concepts build upon one another

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.

Suggested Activities That Address These Standards May Include But Are Not Limited To:

-Be able to justify their answers to problems

- *Be able to describe their procedures*
-*Check their answers through reasoning and practical application*

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.

Suggested Activities That Address These Standards May Include But Are Not Limited To:

-*Use base-10 blocks to represent place value*
-*Use pattern blocks to demonstrate and create patterns*
- *Create graphical representations of data in the form of charts, tables, or graphs*
-*Create a formula to represent a generic computation*

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.

Suggested Activities That Address These Standards May Include But Are Not Limited To:

- *Use the Internet to gather information*
-*Use spreadsheet programs to sort and analyze data*
- *Use computer graphing programs to illustrate data*
- *Use calculators to solve problems, not computations (i.e., to find patterns, to check answers)*
-*Use computer applications to gather and organize information and to solve problems.*

INSTRUCTIONAL STRATEGIES:

-□Textbook
- Math journals
-□Teacher made quizzes and tests
-□Book made quizzes and tests
-□Manipulative activities
-□Performance assessment
-□Projects
-□Cooperative learning groups
-□Problem of the day
-□Skill Buiders
-Weekly computer-based assessment program (YPP)

EVALUATION/ASSESSMENT OF STUDENTS:

-□Formal standardized tests
-Cooperative group projects
-Teacher observation
-□Teacher made tests
-□Quizzes
-□Projects
-□Portfolios
-□Cooperative activities
-□Journals
-□Packets
-□Oral presentations
-□Student work
-□Observation
-□Performance activities
-Weekly computer-based assessment program (YPP)

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/BIBLIOGRAPHY
Carlsson, G., & Cohen, R.L. (2002). *Mathematics*. McGraw Hill: New York.

State of New Jersey Department of Education. (n.d.). Retrieved August 13, 2008 from www.state.nj.us/education/cccs/