TOWNSHIP OF FRANKLIN PUBLIC SCHOOLS
MATHEMATICS CURRICULUM
SEPTEMBER 2005

INTRODUCTION AND OVERVIEW

We live in a mathematical world and we rely daily on mathematical understanding. The level of mathematical thinking and problem solving in the workplace has increased dramatically. In such a world, those who understand and can do mathematics will have opportunities that others do not. Students have different abilities, needs, and interests. Yet, everyone needs to be able to use mathematics in his or her personal life, in the workplace, and in further study. Students need to learn a set of mathematics basics that enable them to compute fluently and to solve problems creatively and resourcefully.

This curriculum guide lists the skills and objectives that are considered to be crucial for each student to master at each grade level and the Core Curriculum Content Standards which correspond with these skills. Progress Indicators are also listed at each grade level. These indicators assure that students are taught the appropriate skills as determined by the New Jersey Core Curriculum Content Standards. Activities, materials and assessment techniques are also listed. As the material in the curriculum is presented, teachers are encouraged to use this guide along with the Teacher's Guide. In addition, teachers in grades K to 4 should become familiar with information presented in the *Directory of Test Specifications and Sample Items for the ASK 3 and 4*. Teachers in grades 5 and 6 should refer to the *Directory of Test Specifications and Sample Items for the Grade Eight Proficiency Assessment*. These directories reiterate the knowledge and skills that students are expected to master by grades 4 and 8. This information, along with the sample questions provided, will be helpful as the mathematics program is instituted. In addition, standards based activities for each grade level are available *at www.njpep.org* under Classroom Resources.

As an introduction to each grade level, grade level proficiencies are identified. These proficiencies delineate the specific concepts and skills that should be attained by at least 80% of the students at an 80% level of mastery at the end of that grade level.

It is, of course, not realistic to expect all students to achieve mastery of all these skills at the recommended grade level in this guide, but it is recommended that all students shall at least be exposed to these skills. In fact, teachers may will take some of their students beyond these objectives, but these are intended to be basic expectations toward which all students would be making progress.

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PHILOSOPHY

In a technological society, a good mathematics program must teach the essentials of mathematical skills and concepts while helping students to apply those skills practically. A good mathematics program helps students to gain mathematical power; it enables students to explore, conjecture, and reason logically, as well as to use a variety of mathematical methods effectively to solve routine and non-routine problems.

The opportunity for all students to experience these components of mathematics is central to a quality mathematics program. Our mathematics curriculum must be flexible enough to encompass individual differences and individual goals.

In a good mathematics program, classrooms are places where interesting problems are regularly explored using important mathematical ideas. Activities should grow out of problem situations, with learning occurring through active involvement with mathematics. In this way, students experience a variety of instructional approaches.

The following principles are vital to the mathematics curriculum of the Township of Franklin Public Schools:

The Equity Principle

Excellence in mathematics requires equity - high expectations and strong support for all students.

The Curriculum Principle

A curriculum is more than a collection of activities; it must be coherent, focused on important mathematics, and well articulated across the grades.

The Teaching Principle

Effective mathematics teaching requires understanding what students know and need to learn, and challenging and supporting them to learn it well.

The Learning Principle

Students must learn mathematics with understanding, actively building new knowledge from experience and prior knowledge.

The Assessment Principle

Assessment should support the learning of important mathematics and furnish useful information to both teachers and students.

The Technology Principle

Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students' learning.

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STATEMENT OF PURPOSE

The purpose of the Mathematics Curriculum in the Township of Franklin Public Schools is to develop individuals who have proficiencies which will enable them to:

1) surpass the District MLP established;

2) meet or exceed proficiency levels on state assessments;

3) learn to communicate effectively in the area of mathematics;

4) become productive members of society as an adult.

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DISTRICT GOAL

Through the teaching of Mathematics, the Township of Franklin Public Schools shall give to every pupil the opportunity to:

1) acquire basic skills in obtaining information, solving problems, thinking critically, and communicating effectively;

2) develop intellectual curiosity and eagerness for learning;

3) learn to enjoy the process of learning and to acquire the skills necessary for a lifetime of continuous learning and adaptation to change;

4) develop the ability to pose and solve mathematical problems in mathematics, other disciplines, and everyday experiences.

5) communicate mathematically through written, oral, symbolic, and visual forms of expression.

6) connect mathematics to other learning by understanding the interrelationships of mathematical ideas and the roles that mathematics
and mathematical modeling play in other disciplines and in life.

7) develop reasoning ability and will become self-reliant, independent mathematical thinkers.

8) regularly and routinely use calculators, computers, manipulatives, and other mathematical tools to enhance mathematical thinking, understanding, and power.

9) develop number sense and an ability to represent numbers in a variety of forms and use numbers in diverse situations.

10) develop spatial sense and an ability to use geometric properties and relationships to solve problems in mathematics and in everyday life.

11) understand, select, and apply various methods of performing numerical operations.

12) develop an understanding of and will use measurement to describe and analyze phenomena.

13) use a variety of estimation strategies and recognize situations in which estimation is appropriate.

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DISTRICT GOAL

14) develop an understanding of patterns, relationships, and functions and will use them to represent and explain real-world phenomena.

15) develop an understanding of statistics and probability and will use them to describe sets of data, model situations, and support appropriate inferences and arguments.

16) develop an understanding of algebraic concepts and processes and will use them to represent and analyze relationships among variable quantities and to solve problems.

17) apply the concepts and methods of discrete mathematics to model and explore a variety of practical situations.

18) develop an understanding of the conceptual building blocks of calculus and will use them to model and analyze natural phenomena.

19) demonstrate high levels of mathematical thought through experiences which extend beyond traditional computation, algebra, and geometry.

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INSTRUCTIONAL PRIORITIES

While teachers will, of course, use different methods for accomplishing each of the outcome goals listed in this curriculum, there are several guiding principles:

- Teaching should be conceptually oriented. The development of mathematical understandings and relationships should be emphasized. A conceptual approach enables children to acquire clear and stable concepts by constructing meanings in the context of physical situations and allows mathematical abstractions to emerge from empirical experience. A strong conceptual framework also provides anchoring for skill acquisition. Skills should be acquired in ways that make sense to students and in ways that result in more effective learning.

- Students should be actively involved in doing mathematics. Students should explore, justify, represent, solve, construct, discuss, use, investigate, describe, develop, and predict by interacting with the physical world. Students should have substantial experience in working with a wide variety of concrete mathematical models and manipulatives.

- Activities should emphasize the development of mathematical thinking and reasoning abilities. Instructional approaches should engage students in the process of learning rather than transmit information for them to receive. Activities should provide opportunities for students to work both individually and in small and large group settings.

- Instruction should make appropriate and ongoing use of mathematical tools and techniques, including manipulatives, calculators and computers. Calculators enable students to explore number ideas and patterns, to have valuable concept-development experiences, to focus on problem-solving processes, and to investigate realistic applications. Computers can provide interesting problem-solving situations and applications as well as simulate mathematical ideas.

    1. Use pictures, tables, graphs, blocks, algebraic formulas, or spreadsheet software to see patterns and relationships.
    2. Use drawings, compasses, computer graphing and modeling software and other concrete materials to create models.
    3. Use counters, algorithms, computers, calculators, rulers, scales, etc. to determine how much or how many.

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INSTRUCTIONAL PRIORITIES

- Communication with and about mathematics and mathematical reasoning should be emphasized. Communication plays an important role in helping children construct links between their informal, intuitive notions and the abstract language and symbolism of mathematics; it also plays a key role in helping children make important connections among physical, pictorial, graphic, symbolic, verbal, and mental representations of mathematical ideas. Students should be regularly asked to talk and write about their mathematics activities, perhaps in journals. Opportunities to explain, conjecture, and defend one's ideas orally and in writing can stimulate deeper understandings of concepts and procedures.

- Activities should stimulate students to make connections. Teachers should help students to learn mathematics in a connected way, building upon previously-learned concepts. It is important that children connect ideas both among and within areas of mathematics. Without such connections, children must learn and remember too many isolated concepts and skills rather than recognizing general principles relevant to several areas. When mathematical ideas are also connected to everyday experiences, both in and out of school, children become aware of the usefulness of mathematics.

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EVALUATION COMPONENT

Students are evaluated regularly through a variety of procedures. During instruction, teachers use varied questioning techniques to monitor student behavior and check for understanding. Classwork, homework, group and individual participation are assessed through the use of teacher observation, checklists, and numerical/letter grades. Teacher-made tests and textbook recommended tests are given at regular intervals. Standardized achievement tests are given annually, providing norm-referenced data which us used as a basis for planning remedial instruction needs.

Evaluation and assessment are integral parts of a mathematics curriculum. We believe that:

1) student assessment is integral to instruction;
2) multiple means of assessment must be used;
3) all aspects of mathematics and its connections should be assessed.

Student assessment refers to the process of trying to understand and quantify the students' progress toward achieving the objectives set forth in the curriculum. Periodic assessment provides the teacher with a basis for deciding what questions should be asked and what examples and illustrations should be used.

Assessment must be more than testing; it must be a continuous, dynamic, and often informal process. Assessment should focus on the following areas:

- Mathematical Power
- Problem Solving
- Communication
- Reasoning
- Mathematical Concepts
- Mathematical Procedures
- Mathematical Disposition (attitudes and beliefs)

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EVALUATION COMPONENT

Appropriate methods for assessment include the following:

- Observations
- Oral questions that ask students to explain their thinking processes
- Focused written tasks
- Class presentations
- Extended problem-solving projects
- Take-home tests
- Homework
- Journals
- Group work and projects
- Papers or written arguments that demand thoughtful inquiry
- Portfolios

Students will show satisfactory achievement of outcomes by:

1) participation in mathematics activities;
2) receiving satisfactory grades on tests and other assessment tools;
3) showing satisfactory progress on report cards;
4) scoring at or above the state minimum level of proficiency on the Mathematics Subtest of the Statewide Assessments;
5) attaining at or above the district standard.

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A SAMPLER OF ASSESSMENT TECHNIQUES

A series of questions should be reviewed before assessment. As an example, when assessing the understanding of whole number multiplication, the following questions could be asked:

What do we want to know? What kinds of information would be most helpful?
What is most important?
How can we judge success?
Do we need a number rating or grade? For what purposes?
Specifically, what can we have the students do?
What are we going to look for?

Are some of the following questions more important than others?

Do students estimate before computing?
Can students use a standard algorithm? Do they have a choice of several algorithms?
Do they know when to multiply? Can they identify a situation that uses multiplication?
Can they explain the process or thinking involved?
Do they understand the relationship between multiplication and division?

A Typical Multiple-Choice Test Item:

59 x 12 =

○ 608
○ 698
○ 708
○ 798

A Multiple-Choice Item to check understanding of the Algorithm:
In the following multiplication problem, what number goes in the [ ]?

```
  59
x 12
[   ]
 590
 708
```

○ 708
○ 128
○ 118
○ 108

Observation and Interview:

Draw as many diagrams as you can that represent the multiplication fact 12 x 59 = 708.
Explain to me what each means.

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A SAMPLER OF ASSESSMENT TECHNIQUES

To include in a Student Portfolio:

Write a word problem that would probably involve multiplying 59 x 12 for its solution.

A Performance Task:

(with blocks, beans, balance scales, tiles, graph paper, calculator, etc. available) You are going to teach a second grader what multiplication is all about. How would you go about this? What materials would you like to use? Show me what you would do.

An Investigation:

Here is a multiplication fact: 59 x 12 = 708
Create a presentation for the class about other mathematical ideas this relates to in some way. You may work alone or with others and you may consult with other adults or any book in the library.

A Word Problem:

Which operation would be used to solve this word problem? Explain how you know.
Jenny has 4 different skirts and 6 different blouses. How many possible combinations does she have?

An Open-Ended Item:

Name two numbers larger than 10 that you think can be multiplied together to give the answer of 708. Explain how you decided on those numbers.

Student Self-Assessment:

How well do you think you understand multiplication? Is there one part or idea you think you may need to work on more?

A Problem for a Group:

Design a test to find out whether the class understands the relationship between multiplication and division.

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BASIC SKILLS MODIFICATIONS

Basic Skills instruction is provided for those students identified either through test results or teacher recommendation as being in need of additional academic support. This instruction is supplemental to the regular classroom.

Basic Skills Teachers are able to utilize small group and or one-to-one instruction by program design and scheduling. These teachers provide visual, auditory, kinesthetic and tactile approaches to present their lessons. They follow along with the regular curriculum guide giving special attention to areas identified by either testing, teacher recommendation, or computer printout as being weak or in need.

Students are evaluated for program release each marking period based on:

1) Course Reports
2) Report Card Grade
3) Teacher Input

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SPECIAL EDUCATION MODIFICATIONS

The special education program in the Township of Franklin services the needs of the elementary school disabled population, ages three through twelve, or grades preschool through six. Programs within the district meet the needs of those students classified as Eligible for Special Education and Related Services due to learning, language, behavioral,
or multiple disabilities. Students whose disabilities are so severe that their needs cannot be met within the district are placed into appropriate programs outside of the district.

The Township of Franklin is committed to providing a free and appropriate public education to all disabled children in the least restrictive environment. In an effort to insure that each student reaches his/her potential, an educational plan is designed specifically for that child. The special education program is structured to provide resource center, self-contained, and supported regular education instruction based on the educational need of the student. The curriculum parallels that of the regular classroom with exceptions made for the individuality of the student.

Student progress in meeting the specific goals and objectives of his/her Individual Education Plan is monitored on an on-going basis by both the teacher and the student's case manager. An annual review is held each year to discuss both academic progress and objectives for the following year. Evaluation of progress may include, but is not limited to, teacher-made and standardized tests, informal observation, homework, classwork, and three-year re-evaluation.

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MATHEMATICS CURRICULUM COMMITTEE

GRADE	TEACHER	SCHOOL
K	Ann Fisch	Mary F. Janvier
K	Andrea Watson	Mary F. Janvier
K	Marilyn Webb	Mary F. Janvier
K	Bonnie Zuccarini	Mary F. Janvier
1	Margery Walsh	Mary F. Janvier
2	Colleen Sharkey	Mary F. Janvier
Special Education	Christine Rowan	Mary F. Janvier
3	Angela Colucci	C.L. Reutter
4	Michele McKissick	C.L. Reutter
5	Jennifer Cockerill	C.L. Reutter
5	Christine Rambone	Main Road
6	Barbara Freund	C.L. Reutter
6	John Stagliano	C.L. Reutter
6	Andrea Foster	Main Road
6	Andrew Moskowitz	Main Road
6	Lisa Stefano	Main Road
Resource Center	Jacquelyn Reilly	C.L. Reutter
Special Education, 5-6	David MacDonald	Main Road

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MATHEMATICS CURRICULUM WRITERS

Grade K	Terri Griffin
Grade 1	RoseMarie Herman
Grade 2	Terri Griffin
Grade 3	Mary Gauer
Grade 4	Mary Gauer
Grade 5	Barbara Freund
Grade 6	Barbara Freund