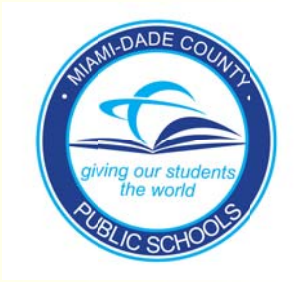
It Takes...

Comprehensive

MATHEMATICS

PLAN

Miami-Dade County Public Schools
Department of Mathematics



COMPREHENSIVE MATHEMATICS PLAN

2013-2014

THE SCHOOL BOARD OF MIAMI-DADE COUNTY, FLORIDA

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A Vision and Mission for Mathematics

A VISION AND MISSION FOR MATHEMATICS

Vision

We are committed to improving mathematics teaching and learning for all.

Mission

Provide leadership to empower teachers to deliver instruction that develops mathematical competence and confidence in students, and provide effective strategies for improving mathematical literacy for all.

Goals

- Empower teachers to deliver high-quality instruction utilizing standards-based curriculum.
- Provide District-wide mathematics curriculum leadership.
- Ensure mathematical competence and confidence in students.
- Provide effective strategies for improving mathematical literacy.
- Encourage mathematics' rich classroom environments.
- Build school-site mathematics leadership capacity.
- Promote rigor, relevance, and relationships in mathematics' classrooms.
- Involve the community, businesses, universities, and parents in supporting mathematics throughout the District.

Underlying Principles

- Instructional programs and teaching strategies must accommodate diverse learning styles and needs
- Excellence in mathematics teaching and learning grows from a commitment shared by teachers, students, parents, administrators, and the community at large
- Learning is a lifelong process. Successful learners are lifelong learners.

Chapter 2

OVERVIEW OF THE COMPREHENSIVE MATHEMATICS PLAN

OVERVIEW

Overview

In a rapidly changing world, reform in mathematics education is ongoing and essential. For many years the mathematics curriculum was designed to provide a background for the study of calculus. This would prepare the student for further study in math. A great deal of the 20th century has been spent applying mathematics to various fields of study such as engineering and science. The need to enlarge the scope of mathematics began to emerge as the social sciences began to use math to describe and analyze large amounts of data, draw inferences from this data and make predictions based on those inferences. With the application of mathematics to real-world problems becoming more complex, traditional mathematics tools became limiting. Finding solutions to complex problems such as making decisions about oil production or designing a transportation system required numeric methods of approximation or more complex equations. Technology began to provide capabilities that known mathematical methods could not.

American society has long believed that the study of mathematics is suitable for only the most academically talented. Now, mathematical competence is needed for a student to be successful in today's global economy. Every area of life requires an ability to use mathematical procedures to make informed decisions on issues, act as a wise consumer, and make personal and business decisions. Today, the fastest-growing jobs are in professional, technical, and sales fields, all of which require education and high skill levels. Students need to be able to sift through arguments, interpret quantitative information, and make critical judgments. The ability to reason, think, and act independently are skills for the wise consumer, the stewards of our environments, and citizens capable of appreciating cultural differences.

Every student must be equipped with the knowledge and skills to make sense of data, interpret technical materials, understand linear and nonlinear growth, manipulate formulas, distinguish logical arguments, and apply geometric principles. The discipline of math enhances pattern recognition which is transferable not only to other subject areas but also to real-world problem solving. The *Comprehensive Mathematics Plan* provides our students the opportunity to nurture their mathematical growth in both computational skills and conceptual mathematical thinking.

The Miami-Dade County Public Schools *Comprehensive Mathematics Plan* is designed to provide a guide for teaching and learning mathematics. This mathematics framework encourages students to understand and use

mathematics to reason, communicate, and solve problems in an ever changing global and technological society. Development of these skills will help students become numerically literate, that is, have the mathematical knowledge, problem solving ability, and communication skills required by all persons to compete successfully in our ever changing world.

The initial *Comprehensive Mathematics Plan* for improving student achievement in mathematics and reducing the achievement gap was developed in 1999 and revised in 2007. Since that time, student achievement in mathematics has shown increasing trends in several grade levels as referenced in Tables 2.1 and 2.2 below. The 2013 *Comprehensive Mathematics Plan* is designed to continue to reduce the achievement gap and empower students to become mathematically powerful and compete globally.

Table 2.1: Miami-Dade County Percentage Scoring Satisfactory and Above FCAT 2.0

Grade Level	2011	2012	2013
3	58	60	62
4	61	62	64
5	54	58	56
6	47	50	51
7	51	52	51
8	54	56	35

Table 2.2 Miami-Dade Percentage Passing (Level 3 or Above)- First Time Takers

Grade Level	Algebra 1 EOC Assessment						
	2010-2011	2011-2012			2012-2013		
	Spring	Winter	Spring	Summer	Winter	Spring	Summer
08	80	*	89	*	*	89	*
09	33	28	44	37	71	54	53
10	20	16	21	24	32	30	33

The *Comprehensive Mathematics Plan* incorporates the use of District Pacing Guides. These guides ensure instruction throughout the district is provided in a sequential, consistent, and challenging format. A standards-based instructional model provides students with a deeper understanding of content rather than a broad base of knowledge. Both literature and technology are integrated throughout the mathematics pacing guides. The *Comprehensive Mathematics Plan* assists the teacher with designing and implementing lessons that teach to the student's natural learning cycle. Additionally, teachers are guided to develop activities that address diverse cultures and learning styles.

The professional learning activities incorporated in this Plan include infusing technology in the mathematics classroom, strategies for improving instruction, strategies for connecting mathematics and science learning, collaborative inquiry, project-based learning and aligning instruction with assessment. To foster sharing, communication, and common practice, mathematics learning communities are developed and capacity at each school site is built via the mathematics learning community.

The M-DCPS *Comprehensive Mathematics Plan* reflects the principles endorsed by the National Council of Teachers of Mathematics (NCTM), including 1) Equity: Excellence in mathematics education requires equity, high expectations and strong support for all students; 2) Curriculum: A curriculum is more than a collection of activities: it must be coherent, focused on important mathematics, and well-articulated across the grades; 3) Teaching: Effective mathematics teaching requires understanding what students know and need to learn and then challenging and supporting them to learn it well; 4) Learning: Students must learn mathematics with understanding, actively building new knowledge from experience and profit knowledge; 5) Assessment should support the learning of important mathematics and furnish useful information to both teachers and students, and 6) Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students' learning.

The *Comprehensive Mathematics Plan* is also linked to the District's One goal, Student Achievement: *Preparing for Success in the Third Millennium* as stated in the *District Strategic Framework, 2009-2014.* This goal states:

> Each student succeeds academically, personally, and civically as measured by:
>
> 1. Demonstrating age/grade level appropriate knowledge mastery
> 2. Having a post-secondary plan
> 3. Graduating
> 4. Successfully entering higher education arena and/or workforce.

COMPREHENSIVE MATHEMATICS PLAN

Chapter 3

CURRICULUM

CURRICULUM

The M-DCPS mathematics curriculum is designed to enrich the mathematical experiences of both teachers and students. It builds on fundamental mathematical concepts and integrates mathematics into other subject areas. The curriculum is based on an extensive body of research on how students learn mathematics and provides opportunities for all students to develop mathematical proficiency. The Florida Next Generation Sunshine State Standards (NGSSS), the curriculum for 3-12 mathematics, delineates what mathematics students need to know and be able to do. In addition, the Common Core State Standards (CCSS) are being fully implemented in grades K-2 with a blended instruction for grades 3-12.

The Next Generation Sunshine State Standards (NGSSS)

The Department of Education recognized the need for a systematic approach to review and revise all of the academic standards, and on January 17, 2006, the State Board of Education adopted a six-year cycle that set forth a schedule of the regular review and revision of all K-12 content standards. http://www.floridastandards.org/Standards/FLStandardSearch.aspx. This move went far beyond increasing the rigor of the standards; however, it included this alignment of the new standards with assessments, instructional materials, professional development, and teacher licensure exams. This way, the new standards and their higher levels of rigor will be fully integrated into the entire culture of K-12 instruction. This move sets the stage for higher levels of rigor and higher academic achievement for years to come" (Next Generation Sunshine State Standards, 2007, p. 2).

Common Core State Standards (CCSS)

Building on the excellent foundation of standards states have laid, the Common Core State Standards are the first step in providing our young people with a high-quality education. It should be clear to every student, parent, and teacher what the standards of success are in every school.

Teachers, parents and community leaders have all weighed in to help create the Common Core State Standards. The standards clearly communicate what is expected of students at each grade level. This will allow our teachers to be better equipped to know exactly what they need to help students learn and establish individualized benchmarks for them. The Common Core State Standards focus on core conceptual understandings and procedures starting in the early grades,

thus enabling teachers to take the time needed to teach core concepts and procedures well—and to give students the opportunity to master them.

CCSS Standards for Mathematical Practice

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. The first of these are the NCTM process standards of problem solving, reasoning and proof, communication, representation, and connections. The second are the strands of mathematical proficiency specified in the National Research Council's report *Adding It Up*: adaptive reasoning, strategic competence, conceptual understanding (comprehension of mathematical concepts, operations and relations), procedural fluency (skill in carrying out procedures flexibly, accurately, efficiently and appropriately), and productive disposition (habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one's own efficacy).

Course Descriptions

Course specific information for students in grades 6-12 is available in *The Florida Course Descriptions* at http://www.floridastandards.org/Courses/CourseDescriptionSearch.aspx. Select *Basic Education: Grades 6-12* followed by, *Basic Education, Grades 6 to 8* or *Basic Education, Grades 9 to 12 and Adult* and then *Mathematics*.

Curriculum Framework

The *Florida Mathematics Curriculum Framework* provides a guide to teachers, administrators, and districts about mathematics education by illustrating how to implement the mathematics standards, and provides information and guidance on issues concerning areas of content, instruction, and assessment.

District Developed Pacing Guides

To positively impact student achievement across all schools, the consistent implementation of the core curriculum within the context of the Florida Continuous Improvement Model (FCIM) is critical. To this end, the District has developed Pacing Guides, Instructional Focus Calendars, and lesson plans which are aligned to the district-wide administration of the interim assessments

and the Florida Comprehensive Assessment Test 2.0 and End of Course Exams. The consistent implementation of the core curriculum will maximize the impact of professional development provided and deployment of support personnel to schools. The pacing guides can be found at the following URL: https://village.dadeschools.net/PageLib/default.aspx

Early Childhood Mathematics

Throughout the early years of life, children notice and explore mathematical dimensions of their world. The *Comprehensive Mathematics Plan* supports the Early Childhood Program that provides activities for young children to compare quantities, find patterns, navigate in space, and struggle with real problems such as balancing a tall block building or sharing a bowl of crackers fairly with a playmate. The foundation for future mathematics learning is developed in the Pre-K classroom using hands-on, make-and-take activities, and real-world application strategies.

Elementary Mathematics Course Offerings

The required program of study for elementary school grades in M-DCPS reflects state and district requirements, including the Next Generation Sunshine State Standards and Common Core State Standards, for elementary education. In grades K-5/6, one hour (60 minutes) of consecutive, uninterrupted, daily instruction in mathematics is **required.**

Middle School Mathematics Course Offerings

Students in grades 6, 7, and 8 are required to enroll in three annual courses in mathematics. Students in grades 6, 7, and 8 may enroll in selected senior high school courses for the purposes of pursuing a more challenging program of study. Credit may be earned in the following courses: Algebra I Honors and Geometry Honors. Students should be encouraged to enroll in advanced/honors mathematics courses whenever appropriate. Students should begin this sequence early in order to follow a path leading to the successful completion of four credits of high school mathematics. Students who encounter difficulties in mathematics courses may take an intensive mathematics course. A recommended sequence is outlined in Table 3.1 below.

TABLE 3.1 Suggested Course Sequence for Middle School Mathematics				
Mathematical Ability	**Grade 6**	**Grade 7**	**Grade 8**	**Student Selection**
Regular	M/J Mathematics 1	M/J Mathematics 2	M/J Pre-Algebra	• Regular Mathematical Ability
Advanced/ Accelerated	M/J Mathematics 1 Advanced	M/J Mathematics 2 Advanced	Algebra I Honors	• Strong-Average to Above Average Mathematical Ability

Senior High School Mathematics Course Offerings

Students in grades 10 – 12 are required to complete 4 credits of mathematics (Algebra I completed in grade 9, Geometry completed in grade 10, and two higher level mathematics courses). A series of courses equivalent to Algebra I or a higher level mathematics course will also meet the Algebra I graduation requirement. A four year recommended sequence includes Algebra I, Geometry, Algebra II, and Advanced Topics in Mathematics. A recommended sequence is outlined in Table 3.1 below.

TABLE 3.1: SUGGESTED COURSE SEQUENCE FOR HIGH SCHOOL CREDIT MATHEMATICS					
Programs	**Grade 9**	**Grade 10**	**Grade 11**	**Grade 12**	**Student Selection**
Regular	Algebra I	Geometry	Algebra II	Advanced Topics in Math	• Students achieving an A, B, and/or C's in their mathematics courses
	Algebra I	Geometry	Algebra II	Mathematics for College Readiness	• College bound students whose test scores on the PERT/ACT/SAT are at or below the established cut scores for mathematics
	Algebra I	Geometry	Algebra II	Advanced Algebra with Financial Applications	• Students who struggled (D's) in Algebra I, Geometry, and Algebra II
Advanced	Honors/ Honors Gifted Algebra I	Honors/ Honors Gifted Geometry	Honors/ Honors Gifted Algebra II	PreCalc, AP Stat, and/or DE	• Honors and Gifted Students
Accelerated (Algebra I in	Honors Geometry	Honors Algebra II	PreCalc	AP Calc AB, AP Stat, and/or	• Students

TABLE 3.1: SUGGESTED COURSE SEQUENCE FOR HIGH SCHOOL CREDIT MATHEMATICS					
Programs	**Grade 9**	**Grade 10**	**Grade 11**	**Grade 12**	**Student Selection**
8th grade)				DE	accelerated in 8th grade
Accelerated (Algebra I in 7th grade)	Honors Algebra II	Pre-Calculus	AP Calculus AB, AP Statistics, and/or DE	AP Calculus BC, AP Statistics, and/or DE	• Students accelerated in 7th grade
Struggling Learners	Algebra I	Geometry	Liberal Arts Math*	Advanced Algebra with Financial Applications	• Students with low scores in Algebra I and Geometry and needing further intervention

This course cannot be used to meet Florida Academic Scholars and Florida Medallion Scholars academic core requirements. The course counts as ELECTIVE credit for college admissions,

Advanced Academic Mathematics Programs and Course Offerings

Many programs and courses are offered to address the needs of advanced learners at all grade levels. These programs and courses are rigorous, relevant, and offered to students, who by virtue of outstanding abilities, are capable of high performance and require differentiated educational programs beyond those normally provided by the regular school program in order to realize their contributions to self and society (see Table 3.2).

TABLE 3.2: ADVANCED ACADEMICS PROGRAMS AND COURSES	
Grade Level	**Available Programs/Courses**
Elementary School	• Teaching Enrichment Activities to Minorities (TEAM) • Gifted Program
Middle School	• Advanced Courses • Honors Courses • Gifted Program
Senior High School	• Honors Courses • Gifted Program • Advanced Placement Program • Dual Enrollment Program • International Baccalaureate (IB) Program • Cambridge Academy (AICE)

MATHEMATICS CURRICULUM PACING GUIDES

The ***Mathematics Curriculum Pacing Guides*** were formulated for the purpose of providing teachers with a "road map" for the year. These *Pacing Guides* group the information from the Next Generation Sunshine State Standards' Benchmarks, FCAT 2.0 content limits, and Common Core State Standards into nine-week clusters so that teachers may plan mathematics instruction that meets the standards. These guides have been designed for elementary grades (K-5), middle school grades (6-8), Algebra I, Geometry, Algebra II, Advanced Topics in Mathematics, Mathematics for College Readiness, Mathematics for College Success and Pre-Calculus.

The curriculum pacing guides are available to teachers, school-site administrators, and regional center personnel at https://village.dadeschools.net/PageLib/default.aspx. The hard copies have not been included in this document due to their size. However, a sample of each *Curriculum Pacing Guides* document has been included for review.

ELEMENTARY AND MIDDLE SCHOOL MATHEMATICS *CURRICULUM PACING GUIDES*

Sample Elementary and Middle pacing guides are outlined in Tables 3.3a and 3.3b. The complete pacing guides for each grade can be found on the mathematics website: https://village.dadeschools.net/PageLib/default.aspx.

Each column of the elementary and middle school pacing guides contains the following information:

- a list of Next Generation Sunshine State Standards and/or Common Core State Standards, essential content, student learning goals/objectives, suggesting pacing, aligned core textbook sections, and Instructional Tools for each topic in the nine week period
- a list of student learning goals/objectives for each nine week period
- a list of assessments and technology resources

TABLE 3.3a: SAMPLE 4TH GRADE MATHEMATICS CURRICULUM PACING GUIDE

MIAMI-DADE COUNTY PUBLIC SCHOOLS
District Pacing Guide

Grade 4 **Course Code: 5012060F1**

DOMAIN: Numbers and Operations in Base Ten (4.NBT)

TOPIC I: **Place Value, Addition and Subtraction to One Million**

Pacing	Dates
13 Days	08-19-13 to 09-06-13

COMMON CORE STATE STANDARD(S) & MATHEMATICAL PRACTICES (MP)	NEXT GENERATION SUNSHINE STATE STANDARD(S)	ESSENTIAL CONTENT	OBJECTIVES
MACC.4.NBT.1: Generalize place value understanding for multi-digit whole numbers. • **MACC.4.NBT. 1.1:**Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right. *For example, recognize that 700 ÷ 70 = 10 by applying concepts of place value and division.*(MP 2, 6 & 7) • **MACC.4.NBT.1.2:** Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons. **(MP 2, 4, 6 & 7)** • **MACC.4.NBT.1.3:** Use place value understanding to round multi-digit whole numbers to any place. **(MP 2 & 6)** MACC.4.NBT.2: Use place value understanding and properties of operations to perform multi-digit arithmetic. • **MACC.4.NBT. 2.4:** Fluently add and subtract multi-digit whole numbers using the standard algorithm. **(MP 2, 5, 7 & 8)**	Supporting Idea 6: Number and Operations • **MA.4.A.6.1:** Use and represent numbers through millions in various context, including estimation of relative sizes of amounts or distances.	A. Reading and Writing Numbers 1. Standard Form 2. Expanded Form 3. Written Form B. Place Value, Value of Digit and Face Value 1. Ones 2. Tens 3. Hundred 4. Thousand 5. Ten Thousand 6. Hundred Thousand 7. Million C. Estimate 1. Rounding a. ones b. tens c. hundred d. thousand e. ten thousand f. hundred thousand g. million 2. Compatible Numbers D. Problem Solving 1. Adding numbers through millions 2. Subtracting numbers through millions	• Model the 10 to 1 relationship among place-value positions in the base-ten number system. • Read and write whole numbers in standard form, word form, and expanded form. • Compare and order whole numbers based on the values of the digits in each number. • Round a whole number to any place. • Use and represent numbers through millions • Use and represent numbers through ten millions • Build numbers through hundred millions by using patterns • Estimate and understand the relative size of amounts and distances through millions • Rename whole numbers by regrouping. • Add whole numbers and determine whether solutions to addition problems are reasonable. • Subtract whole numbers and determine whether solutions to subtraction problems are reasonable. • Use the strategy *draw a diagram* to solve comparison problems with addition and subtraction.

MIAMI-DADE COUNTY PUBLIC SCHOOLS
District Pacing Guide

Grade 4 **Course Code: 5012060F1**

INSTRUCTIONAL TOOLS

Core Text Book: **Houghton Mifflin Harcourt *GO Math! Florida* Common Core edition, CHAPTER 1**

The following are suggestions and can be altered to ensure instructional time is maximized.
Please review each section during your instructional planning and supplement or modify components as needed to best differentiate instruction.
Use ***FCAT 2.0 Mathematics Test Item Specifications*** as a resource document to help define grade-level content.

HMH *GO Math! Florida*	Textbook	Teacher Notes
Lesson 1.1– Represent Millions **Lesson 1.2** –Place Value Through Ten Millions	NGSSS ed.	
Lesson 1.1 – Model Place Value Relationships	CCSS ed.	
Lesson 1.2 – Read and Write Numbers	CCSS ed.	
Lesson 1.4 –Relative Size	NGSSS ed.	
Lesson 1.3 – Compare and Order Numbers	CCSS ed.	
Lesson 1.5 –Estimate Through Millions	NGSSS ed.	
Lesson 1.4 – Round Numbers	CCSS ed.	
* **Mid-Chapter Checkpoint** **Lesson 1.5** – Rename Numbers	CCSS ed.	
* **Lesson 1.6** – Add Whole Numbers **Lesson 1.7** – Subtract Whole Numbers	CCSS ed.	**Focus on Lesson 1.7**
Lesson 1.8– Comparison Problems with Addition and Subtraction	CCSS ed.	
Topic Assessment: • *Go Math! Florida* **Assessment Guide**	CCSS ed.	

* **Note: These lessons may be combined.**

Vocabulary:
period, standard form, expanded form, word form, place value, greater than sign, less than sign, equal to, sum, compare, equal sign, estimate, round, regroup, addend, addition, difference

Strategies:
literature connection, foldable, vocabulary/word walls

TABLE 3.3b: SAMPLE 8TH GRADE MATHEMATICS CURRICULUM PACING GUIDE

MIAMI-DADE COUNTY PUBLIC SCHOOLS
District Pacing Guide

M/J Pre-Algebra — **Course Code: 120507001**

DOMAIN: Expressions and Equations (8.EE)
The Number System (8.NS)

Pacing		Date(s)
Traditional	32 days	08-19-13 to 10-03-13
Block	16 days	08-19-13 to 10-03-13

TOPIC I: Number and Operations

COMMON CORE STATE STANDARDS & MATHEMATICAL PRACTICES (MP)	NEXT GENERATION SUNSHINE STATE STANDARDS	ESSENTIAL CONTENT	OBJECTIVES
DOMAIN: The Number System (8.NS) **MACC.8.NS.1.1:** Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number. ***(MP.7, MP.8)*** **MACC.8.NS.1.2:** Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π^2). *For example, by truncating the decimal expansion of √2, show that √2 is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.* ***(MP.5, MP.7, MP.8)*** ***DOMAIN: Expressions and Equations (8.EE)*** **MACC.8.EE.1.1:** Know and apply the properties of integer exponents to generate equivalent numerical expressions. *For example,* $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$. ***(MP.7)*** **MACC.8.EE.1.2:** Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational. ***(MP.6)***	*Supporting Idea 6 – Number and Operations* **MA.8.A.6.1** Use exponents and scientific notation to write large and small numbers and vice versa and to solve problems. **MA.8.A.6.2** Make reasonable approximations of square roots and mathematical expressions that include square roots, and use them to estimate solutions to problems and to compare mathematical expressions involving real numbers and radical expressions. **MA.8.A.6.3*** Simplify real number expressions using the laws of exponents. **MA.8.A.6.4** Perform operations on real numbers (including integer exponents, radicals, percents, scientific notation, absolute value, rational numbers, and irrational numbers) using multi-step and real world problems.	A. Percents 1. Percent of Change 2. Application of Percents 3. Simple Interest B. Integer Exponents 1. Positive Integer Exponents 2. Negative Integer Exponents 3. Laws of Exponents C. Scientific Notation 1. Convert from Standard Form to Scientific Notation with both positive and negative exponents 2. Add and Subtract Numbers in Scientific Notation 3. Multiply and Divide Numbers in Scientific Notation D. Squares, Square and Cube Roots 1. Define Square and Cube Roots 2. Radical Expressions 3. Rational and Irrational Numbers E. Real World Problems 1. Solve real-world problems that involve fractions, decimals, irrational numbers, numbers expressed as radicals, percents, absolute, values, or scientific notation.	***NGSSS*** • Calculate discounts, simple interest, taxes, tips, and percents of increase or decrease. • Evaluate and manipulate expressions of rational numbers in exponential notation, including negative exponents, and/or numerical or algebraic expressions that contain exponential notation. • Solve standard scientific notation problems with negative exponents. • Solve problems with fractions represented in standard scientific notation greater than one-billionth. • Write numbers in scientific notation to hundred billions through hundred-billionths. • Determine the effects of operations on real numbers, including addition, subtraction, multiplication, division, exponents, and finding square roots. • Analyze the effects of the four basic operations on real numbers including integer exponents, radicals, percents, scientific notation, absolute value, rational numbers, and irrational numbers to solve problems. ***CCSSM*** • Identify rational and irrational numbers • Identify repeating and terminating decimals • Classify numbers in the real number system • Estimate irrational numbers • Locate irrational numbers on a number line • Estimate the value of expressions with irrational numbers • Evaluate cube roots of small perfect cubes • Solve equations of the form x^2=p and x^3 =p where p is a positive rational number

MIAMI-DADE COUNTY PUBLIC SCHOOLS
District Pacing Guide

M/J Pre-Algebra — **Course Code: 120507001**

INSTRUCTIONAL TOOLS

Use *FCAT 2.0 Mathematics Test Item Specifications* as a resource document to help define grade-level content. **Note: Item Specs are hyperlinked.**

Core Text Book: Holt McDougal Florida Mathematics Course 3 Worktext
SW =Student Worktext (Chapter-Section), TD= Traditional Day/ BD= Block Day

The following are suggestions and can be modified to ensure instructional time is maximized.
Please review each section during your instructional planning and supplement or discard portions as needed.

TD	BD	SW	Benchmark	Section Title	Teacher Notes
2	1	6-5	MA.8.A.6.4	Percent of Increase and Decrease	
2	1	6-6	MA.8.A.6.4	Applications of Percents	
2	1	6-7	MA.8.A.6.4	Simple Interest	
2	1	4-2	MA.8.A.6.3	Integer Exponents	
3	1.5	4-3	MA.8.A.6.1	Scientific Notation	
2	1	4-4	MA.8.A.6.3	Laws of Exponents	
2	1	4-5	MA.8.A.6.2	Squares and Square Roots	
2	1	4-6	MA.8.A.6.2	Estimating Square Roots	
1	.5	4-8	MA.8.A.6.3	The Real Numbers	
2	1	2-3	MA.8.A.6.4	Adding and Subtracting Rational Numbers	
2	1	2-4	MA.8.A.6.4	Multiplying Rational Numbers	
2	1	2-5	MA.8.A.6.4	Dividing Rational Numbers	
3	1.5	2-6	MA.8.A.6.4	Solving Equations with Rational Numbers	
Common Core Resources and Activities to Supplement with Worktext:					
**Adjustments can be made to days in order to accommodate the CCSS activities*			MACC.8.EE.1.3 MACC.8.EE.1.4	100 People	http://map.mathshell.org/materials/download.php?fileid=1046
			MACC.8.EE.1.4	Multiplying in Scientific Notation	http://www.khanacademy.org/math/arithmetic/exponents-radicals/scientific-notation/v/multiplying-in-scientific-notation?exid=multiplying_and_dividing_scientific_notation
			MACC.8.EE.1.2	Square Roots: Sides of squares and the square root symbol	http://www.cpalms.org/Resources/PublicPreviewResource8805.aspx

SENIOR HIGH SCHOOL MATHEMATICS
CURRICULUM PACING GUIDES

TABLE 3.4: SAMPLE ALGEBRA 1 CURRICULUM PACING GUIDE

MIAMI-DADE COUNTY PUBLIC SCHOOLS
District Pacing Guide

Algebra I — **Course Code: 120031001**

Conceptual Category: A: Algebra

Topic II: Algebraic Expressions

Pacing		Date(s)
Traditional	6 days	08/28/13-09/06/13
Block	3 days	08/28/13-09/06/13

COMMON CORE STATE STANDARD(S) & MATHEMATICAL PRACTICE (MP)	NEXT GENERATION SUNSHINE STATE STANDARD(S)	ESSENTIAL CONTENT	OBJECTIVES
MACC.912.A-SSE.1.1: Interpret expressions that represent a quantity in terms of its context. (MP.1, MP.2, MP.4, MP.7) **MACC.912.A-SSE.1.1a**: Interpret parts of an expression, such as terms, factors, and coefficients. . (MP.1, MP.2, MP.4, MP.7) **MACC.912.A-SSE.2.3**: Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. . (MP.2, MP.7)	MA.912.A.1.1: Know equivalent forms of real numbers (including integer exponents and radicals, percents, scientific notation, absolute value, rational numbers, irrational numbers) MA.912.A.1.4: Perform operations on real numbers (including integer exponents, radicals, percents, scientific notation, absolute value, rational numbers, and irrational numbers) using multi-step and real-world problems. MA.912.A.3.2: Identify and apply the distributive, associative, and commutative properties of real numbers and the properties of equality. *(FI)* MA.912.A.4.2: Add, subtract, and multiply polynomials. *(FI, EOC)*	*ALGEBRAIC EXPRESSIONS* A. Properties of Real Numbers 1. Associative 2. Commutative 3. Identity for Addition 4. Identity for Multiplication 5. Zero Property for Multiplication B. Evaluate/Simplify Algebraic Expressions 1. Distributive Property 2. Simplify Polynomial Expressions a. Add polynomials b. Subtract polynomials 3. Evaluate algebraic expression for a given value	*NGSSS* • Identify and apply properties of the real numbers • Write and evaluate expressions using the rules for the order of operations • Add polynomial expressions • Subtract polynomial expressions • Write and evaluate expressions using the rules for the order of operations • Translate words to numbers and symbols • Define variable, expressions, and equation • Compare real number expressions • Describe the process and property used to evaluate an expression • Apply the associative and commutative properties and properties of real numbers • Identify the properties of equality • Determine if two equations have equivalent solutions • Use the commutative, associative, and/or distributive properties to determine if two equations are equivalent

KEY: EOC: End Of Course FI: Fall Interim WI: Winter Interim

Office of Academics and Transformation
Topic II_First Nine Weeks

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The senior high schools *Mathematics Curriculum Pacing Guides* include the following:

- a nine week overview of essential content to be covered
- a nine week overview of the essential Next Generation Sunshine State Standards benchmarks and Common Core State Standards
- a list of student learning goals/objectives for each nine week period
- a list of Next Generation Sunshine State Standards and Common Core State Standards, essential content, aligned core textbook sections, student learning goals/objectives, suggesting pacing, and Instructional Tools for each topic in the nine week period

The role of the teacher in implementing the *Mathematics Curriculum Pacing Guides* is to:

- teach students the state's NGSSS/CCSS essential content matter within a specific mathematics course.

- provide classroom activities that address the essential content assessed by the NGSSS/CCSS.
- enhance the curriculum by using textbooks, manipulatives, technology, and other instructional materials.
- use varying methods of instruction to address diverse learning styles.
- administer assessments aligned with the NGSSS/CCSS.

In addition to using the *Mathematics Curriculum Pacing Guides,* teachers should:

- consider intra-school collaborative planning and spiraling of the curriculum to ensure efficient and effective pacing and delivery of instruction.
- adjust pacing and discuss progress with peers.
- align and connect mathematics literature to support reading.
- visit the Department's website at for additional resources.

FCAT 2.0 Item Specifications

In order to measure student achievement on the NGSSS in Mathematics (Grades 3-8), The Florida Comprehensive Assessment Test (FCAT 2.0) was created. It assesses student progress on benchmarks identified in the Mathematics Next Generation Sunshine State Standards.

Specifications for the FCAT 2.0 Mathematics NGSSS (Grades 3-8) were created to determine which of the benchmarks contained in the Florida Mathematics NGSSS would be assessed on FCAT 2.0 and which item types for these benchmarks would be appropriate. The Florida Department of Education (FLDOE), in cooperation with the FCAT 2.0 Mathematics Content Advisory Committee, developed the *Specifications* and produced a document, **FCAT 2.0 *Mathematics Test Item Specifications,*** to describe the item and design features of the mathematics portion of the FCAT 2.0. The **FCAT 2.0 *Mathematics Test Item Specifications*** can be found at http://fcat.fldoe.org/fcat2/itemspecs.asp

EOC Item Specifications

The Florida Department of Education and committees of experienced Florida educators developed and approved the specifications documents. Each *Specifications* document defines the content and format of the assessment and the assessment's items for item writers and reviewers, and indicates the alignment of items with the Next Generation Sunshine State Standards. They also serve as a source of information for educators and the general public.

The Florida End of Course Exam Item Specifications can be found at: http://fcat.fldoe.org/eoc/itemspecs.asp

Chapter 4

INSTRUCTION

An effective mathematics program provides quality instruction, high expectations, and consistent standards for all students. The content must be challenging and stimulating for all students and based on the assumption that all students can achieve high standards if given adequate opportunities to learn. Curriculum and Instruction shares NCTM's belief that in order for students to receive a high-quality mathematics education, they must understand the need for mathematics in everyday life. In addition, teachers must make the connection between the **mathematics content** (numbers and operations, algebra, geometry, measurement, and data analysis and probability) and **process standards** (problem solving, reasoning and proof, communication, connections, and representations) within the curriculum. Moreover, proper delivery of instruction drives academic success when teachers know the learners, know their resources, and are aware of the strategies needed to improve student learning. Therefore, the delivery of instruction must include determining students' current mathematical skills, matching instructional strategies and assessments to the objectives, and planning instruction that is appropriate and challenging to students at all levels.

The following principles guide Curriculum and Instruction's instructional design for teaching and learning Mathematics:

- Learning requires the active participation of the student.
- People learn in a variety of ways and at different rates.
- Learning is both an individual and a group process.

Research has shown that students learn with greater depth, understanding, and retention when they are actively engaged in the process of discovering concepts for themselves. Quality classrooms actively involve our students. Students speak the language of mathematics when they pose questions, explore solutions to their questions, conjecture, reason, think, connect their mathematics to real life and, most importantly, have fun.

Teachers focus instruction on the meaningful development of the important mathematical ideas. New concepts and skills are developed through real world problem solving opportunities. Small groups of students discussing, exploring, conjecturing, and using appropriate technology as they develop the meaning for the concept they are studying is followed by a whole group discussion of the specific concepts, connections, and predictions. As students develop their numeracy skills and concepts, they become more confident and motivated in their mathematical ability. They learn to enjoy and value mathematics, think analytically, and understand the role of mathematics in everyday life.

LESSON DESIGN

One of the primary roles that teachers perform is that of designer and implementer of instruction. Teachers at every level prepare plans that aid in the organization and delivery of their daily lessons. These plans vary widely in the style and degree of specificity. Quality lesson design balances content understanding and process expectations. Each lesson may contain one or more learning episodes. These learning episodes must be designed so that students will be able to move their learning from their working memory to their long term memory, i.e., students must be exposed to activities that allow their brain to find the pattern in the activity before they are told what to do or how to do something. The following steps provide a natural learning sequence to assist when designing a lesson: Preparation, Meaning, Content, Practice, and Performance.

Preparation

Begin by focusing on the preparation for the learning. Determine the specific student learning outcomes that are desired. Student learning goals are a checklist of concepts and skills used by the student to help them determine if they have mastered the required goals. Determine and write the daily topic and agenda. An agenda is a specific list of the activities that the student will be involved in during the learning episode. Sit in the student's seat and ask yourself the following question: Does this room make me feel at home? Is it warm, decorated, and comfortable? Utilizing ambient light, displaying student work, and providing visuals that relate to the learning invite the student to participate in the learning.

Meaning

Designing meaning requires careful reflection to gain insight into connecting to the student's world. This connection is the "hinge" that subsequent learning depends on. This beginning activity helps the student develop personal meaning for what is to be learned and connect with diverse ideas. This opening activity requires the student to imagine, reflect, and discuss with other students in a small group setting, a past or real-life experience that relates to the concept of the lesson. Discovery activities help the students develop the meaning for their learning through hands-on activities. Incorporating the use of technology greatly enhances the experience for the students.

Content

Students return to the whole class setting to recap what they discovered in the previous activities. After the students have shared their discoveries and conversations, the teacher will directly recap what was learned and present any information that requires more focus. This activity presents the concept directly

through demonstrations, readings, and lecture. Time for student written reflections is provided every five to ten minutes. A mathematical journal prompt asks the student to describe the thinking process used.

Practice

These activities assist the students in practicing the skills learned. Utilization of think-pair-share, numbered heads, and jigsaw cooperative structures assists in actively engaging the students in the initial practice. The students practice with their learning teams, and the learning teams present solutions to the work they are practicing. Practice does **not** make perfect; practice makes permanent. The feedback and quality of a problem solving practice episode is more important than the quantity of problems. During this time in the lesson, students work in teams on practice problems while the teacher moves around the classroom and assists, bringing the whole group back together as needed to clarify a concept, discuss a solution process, or seize a teachable moment.

Performance

This is a creative real-world application of the concepts learned. The student will demonstrate his/her understanding by selecting a real-world problem and apply the knowledge learned by investigating, presenting, and using the concepts learned. Projects such as “create a mobile consisting of polygons with the same area” or “develop a sprinkler system” (which addresses a community need) provide an opportunity for the student to demonstrate the concepts learned.

The performance activity provides personal meaning and long term retention. It sets up the next learning episode so that connections are easily and readily made. Designing a lesson takes time and practice.

Lesson Plan Templates

The following steps provide a natural learning sequence to assist when designing a lesson: Preparation, Meaning, Content, Practice, and Performance. The following lesson plan templates provide assistance in design lessons that actively engage students.

Daily Plan Format Description

GRADE ____ **Day____**

TEACHER OBJECTIVES:

The teacher will provide the student an opportunity to:

- *Teacher objectives describe what the student will do to develop the concepts to be learned through specific skills.*
- *Ex: Discover the formula for the surface area of a cylinder.*

STUDENT LEARNING GOALS: (given to student)

After this lesson you will:

- *Student learning goals can be used by the student as a check list of concepts and skills to determine if they have mastered the required goals.*

  Ex: -Explain the meaning of each term of the formula for surface area of a cylinder, and

  -Calculate the surface areas of a cylinder given the measures of its dimensions.

NEXT GENERATION SUNSHINE STATE STANDARDS:

List the benchmarks that will be addressed during the lesson.

Body of Knowledge	Geometry
Big Idea 2	Develop an understanding of and use formulas to determine surface areas and volumes of three-dimensional shapes.
MA.7.G.2.1	Justify and apply formulas for surface area and volume of pyramids, prisms, cylinders, and cones.
Assessed	Multiple Choice, Gridded Response
Content Limits	*Dimensions of given figures will be whole numbers. *Problems related to surface area will not include cones, but problems related to volume can include cones.

COMMON CORE STATE STANDARDS:

Domain	Geometry
Cluster	*Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.*

MACC.7.G.2.6	Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.
Math Practices	MP.1 Making sense of problems and persevere in solving them. MP.5 Use appropriate tools strategically.

PREPARATION

MATERIALS

List the materials that will be needed

Essential Question

Identify the essential questions

Key Vocabulary

List all vocabulary associated with the concepts to be studied.

CLASS OPENING

Describe what the student will do as he/she enters the classroom. The student should record the daily agenda in their learning journal (notebook) upon entering. This agenda helps the child's brain begin looking for patterns in order to develop a program for leaning. Additionally, this agenda provides the child's parent an overview of what work the child participated in during the class time.

AGENDA

Topic

Provide a creative name/puzzle for the topic that relates to the concept.

Activities

Bullet the activities that the student will participate in during the learning episode.

Home Learning Assignment

Identify the specific after class responsibilities of the student.

MEANING DEVELOPMENT

- *Designing meaning requires a high degree of teaching skill to gain insight into connecting to the student's world.*
- *This is the "hinge" that subsequent learning depends on.*
- *This beginning activity helps the student develop personal meaning for what is to be learned and helps the student make connections with others.*
- *This opening activity requires the student to imagine, reflect, and discuss with other students a past or real-life experience that relates to the concept of the lesson.*
- *Discovery activities help the students develop the meaning for their learning through hands-on activities.*
- *Describe the grouping that will be used with the students.*

CLASS ACTIVITIES

CONCEPT Development

- *Students return to the whole class setting to recap what they discovered in the previous activities.*
- *After the students have shared their discoveries and conversations, the teacher will directly recap what was learned and present any information that requires more focus.*
- *This activity presents the concept directly through demonstrations, readings, and lecture.*

PRACTICE Development

- *These activities assist the students in practicing the skills learned.*
- *Utilization of think-pair-share and numbered heads cooperative structures assists in actively engaging the students in the initial practice.*
- *The students practice with their teams and the teams present solutions to the work they are practicing.*
- *Individual accountability can be fostered by using a spinner to determine the team presenter/speaker when asking for a response from each team.*
- *Practice does **not** make perfect; practice make permanent. The quality and feedback of a problem solving practice episode is more important than the quantity of problems.*

The Team Process

- *This is description of the cooperative strategy that students will use when working as a team.*

CLOSURE

This is a reflective activity asking the student to express the key points learned. Each section is a written description of what will happen during the class. Once the class has been held, teacher reflections will appear on the left side of each activity.

PERFORMANCE (a culminating activity)

- *This is a creative real-world application of the concepts learned.*
- *The student will demonstrate his/her understanding by selecting a real-world problem and apply the knowledge learned by investigating, presenting, and using the concepts learned.*
- *Projects such as "create a mobile consisting of polygons with the same area" provide an opportunity for the student to demonstrate the concepts learned.*

ACTIVITY I Activity Sheets (if necessary)

ACTIVITY II

ACTIVITY III

K-8 Daily Plan Template

GRADE ____ **Day ____**

TEACHER OBJECTIVES:

The teacher will provide the student an opportunity to:

STUDENT LEARNING GOALS: (given to student)

After this lesson you will:

NEXT GENERATION SUNSHINE STATE STANDARDS:

Body of Knowledge	
Big Idea/ Supporting Idea	
MA.	
Assessed	
Content Limits	

COMMON CORE STATE STANDARDS:

Domain	
Cluster	
MACC.	
Math Practices	

PREPARATION

MATERIALS

Essential Question

Key Vocabulary

AGENDA

Topic

Activities

Home Learning Assignment

MEANING DEVELOPMENT

CONCEPT Development

PRACTICE Development

PERFORMANCE (a culminating activity)

ACTIVITY I **Activity Sheets (if necessary)**

ACTIVITY II

ACTIVITY III

High School Daily Plan Template

Subject: _____ **Day #:** _____

Teacher: _____

TEACHER OBJECTIVES:

The teacher will provide the student an opportunity to:

STUDENT LEARNING GOALS: (given to student)

After this lesson you will:

NEXT GENERATION SUNSHINE STATE STANDARDS:

Body of Knowledge	
Big Idea/ Supporting Idea	
MA.	
Assessed	
Content Limits	

COMMON CORE STATE STANDARDS:

Domain	
Cluster	
MACC.	
Math Practices	

PREPARATION

MATERIALS

Essential Question

Key Vocabulary

AGENDA

Topic

Activities

Home Learning Assignment

MEANING DEVELOPMENT

CONCEPT Development

PRACTICE Development

The Team Process

PERFORMANCE (a culminating activity)

ACTIVITY I **Activity Sheets (attach when necessary)**

ACTIVITY II

ACTIVITY III

INSTRUCTIONAL BLOCK

Research indicates a primacy-recency effect that shows that the learner learns best what takes place in the first ten minutes and the last five minutes of a learning episode. The time in between is referred to as down time. The implications of this research are that the first ten minutes of class should not engage the student in trivial banter or administrative tasks. Also, closure and reflection are critical at the end of the learning episode (Sousa, 2003).

TABLE 4.3: SAMPLE OF ELEMENTARY MATHEMATICS INSTRUCTIONAL BLOCK

Learning Sequence: **Class Routine** - suggested time	**Description** * Strategies
Meaning Development: **Engage** - 5 *minutes*	Help the student develop personal meaning for what is to be learned and connect with diverse ideas. * Connection to prior learning/knowledge * Essential Question
Concept Development: **Teach and Talk** - *25 minutes*	Exploration/Direct Instruction/Guided Practice ✔ Listen and Draw (Grades K-2) ✔ Unlock the Problem (Grades 3-5)
Practice: **Practice** - *10-15 minutes*	Guide Practice/Independent Practice/Evaluation ✔ Share and Show (Guided Practice) ✔ On Your Own (Independent Practice) * Quick Check Intervention * Differentiation * Problem Solving * H.O.T. Problems * Test Prep
Performance: **Summarize** *-5 minutes or* - *time needed to complete assessment*	Students answer the essential question and assess student understanding of the concepts taught * Have students **communicate** mathematical ideas by discussing, drawing, or writing the answer to the essential question. * administer assessment; use various types of measures

TABLE 4.4: RECOMMENDED SECONDARY MATHEMATICS INSTRUCTIONAL BLOCK: 50 - 60 MINUTE CLASS		
Class Routine	**Strategies**	**Description**
Preparation *- Daily Agenda* *- Materials*	Learning Goals Student Work Displayed Manipulatives/Technology Classroom Environment	The instructor welcomes the students. The day's agenda and learning goals are displayed. The students are seated, open their learning journal (notebook), and copy the daily agenda and learning goals.
Lesson Lead-In /Opening *- Meaning* *-10 minutes*	Sensory Experience Discovery Activity Cooperative Learning Cues, Question, Advance Organizers Real-World Examples	The student attaches personal meaning to the content and makes connection with other's ideas. The student imagines, reflects, and discusses with other students in a small group setting a past or real-life experience that relates to the concept of the lesson.
Steps To Deliver Lesson **-** *Content* *- 10 – 15 minutes*	Note Taking/Summarizing Discovery Activity Journal Writing Similarities & Differences Non-linguistic References Modeling	Students return to the whole-class setting to recap what they discovered. After sharing their discoveries, the teacher recaps what was learned and presents any information that requires more focus. Concepts are presented directly through demonstrations, readings, and lecture.
Guided Practice *- Practice* *- 10 – 15 minutes*	Collaboration "Math Talk" Learning Team Problem Solving Teacher Circulation with Feedback	Think-pair-share or numbered heads cooperative structures assist in actively engaging the students in the initial practice. Students practice with their learning teams and present solutions to the whole class. The teacher circulates and assists, bringing the full class together as needed to clarify a concept, discuss a solution, or seize the teachable moment.
Independent Practice *- Practice* *- 5 - 10 minutes (plus home learning)*	Focused Practice/ Homework	Practice does **not** make perfect; practice makes permanent. The quality of feedback during guided practice is more important than the quantity of problems. Assuring students have mastered the concept, independent practice may begin in class and continue at home.
Lesson Closure *- 5 minutes*	Journal Writing	Students write a summary of what was discussed during class or explain an approach used to solve a specific problem.
Assessment *- Performance* *-10 – 15 minutes*	Real Life Problem Solving Hands-on Group/Individual Projects Research/Technology Community-based Application Concept Extension	This is a creative real-world application of the concepts learned. Preparation for student performance begins within the classroom with feedback from the instructor and peers, and is completed outside of the regular class period. The student selects a real-world problem to apply the concepts learned.

TABLE 4.5: RECOMMENDED SECONDARY MATHEMATICS INSTRUCTIONAL BLOCK: 90-100 MINUTE CLASS		
Class Routine	**Strategies**	**Description**
Preparation *- Daily Agenda* *- Materials*	Learning Goals Student Work Displayed Manipulatives/Technology Classroom Environment	The instructor welcomes the students. The day's agenda and learning goals are displayed. The students are seated, open their learning journal (notebook), and copy the daily agenda and learning goals.
Lesson Lead-In /Opening *- Meaning* *-10 minutes*	Sensory Experience Discovery Activity Cooperative Learning Cues, Question, Advance Organizers Real-World Examples	The student attaches personal meaning to the content and makes connection with other's ideas. The student imagines, reflects, and discusses with other students in a small group setting a past or real-life experience that relates to the concept of the lesson.
Steps To Deliver Lesson **-** *Content* *- 15 - 20 minutes*	Note Taking/Summarizing Discovery Activity Journal Writing Similarities & Differences Non-linguistic References Modeling	Students return to the whole class setting to recap what they discovered. After sharing their discoveries, the teacher recaps what was learned and presents any information that requires more focus. Concepts are presented directly through demonstrations, readings, and lecture.
Guided Practice *- Practice* *-15 - 20 minutes*	Collaboration "Math Talk" Learning Team Problem Solving Teacher Circulation with Feedback	Think-pair-share or numbered heads cooperative structures assist in actively engaging the students in the initial practice. Students practice with their learning teams and present solutions to the whole class. The teacher circulates and assists, bringing the full class together as needed to clarify a concept, discuss a solution, or seize the teachable moment.
Independent Practice *- Practice* *-10 - 15 minutes (plus home learning)*	Focused Practice/ Homework	Practice does **not** make perfect; practice makes permanent. The quality of feedback during guided practice is more important than the quantity of problems. Assuring students have mastered the concept, independent practice may begin in class and continue at home.
Lesson Closure *- 5 minutes*	Journal Writing	Students write a summary of what was discussed during class or explain an approach used to solve a specific problem.
Assessment *- Performance* *-15 – 20 minutes*	Real Life Problem Solving Hands-on Group/Individual Projects Research/Technology Community-based Application Concept Extension	This is a creative real-world application of the concepts learned. Preparation for student performance begins within the classroom with feedback from the instructor and peers, and is completed outside of the regular class period. The student selects a real-world problem to apply the concepts learned.

During a block schedule of class time, the teacher may want to structure two or three learning episodes. The content and the practice components, which typically occur during down time, should actively engage the learner (Sousa, 2003).

LITERACY INFUSION

Research has indicated that children better internalize new information when it is meaningful and useful to them. Utilizing literature in mathematics offers the necessary meaning for children to successfully grasp mathematics concepts and allows students to make connections with real-world situations. “As students engage in solving literature-based mathematics lessons, they are applying mathematics in different contexts and making connections among mathematical ideas, which are expectations outlined in the Connections Standard in *Principles and Standards for School Mathematics* NCTM 2000” (Jennifer M. Bay Williams, 2005). In addition, making mathematical connections in context with other subjects builds a strong comprehension of mathematical concepts. “Children’s literature is a powerful tool that can be used to entice and motivate students to actively explore mathematics.” (David E. Murphy and Laura L. Gulley, 2005)

What Does Literacy Infusion in Mathematics Look Like?

- Mathematics terminology infused throughout each lesson by the teacher and students
- Interactive “Word Walls” created by the teacher and students in conjunction with each lesson
- Trade books or mathematics vignettes utilized during the *Lesson Lead-in, Guided Practice or Closure* of the lesson, as appropriate
- Journals written by students reflecting mathematical conclusions
- Daily news headlines involving mathematics concepts.

TECHNOLOGY INTEGRATION

Integrating technology in the mathematics classroom enables the students to explore, visualize, solve, and describe the concepts they are learning. Technology is a rich tool that excites and advances student performance. Moreover, technology is an essential tool that facilitates the teaching and learning of mathematics and allows students to organize and visualize mathematics concepts. Graphing software, calculators, computers, and interactive white-boards are some critical tools that can be used as part of an effective mathematics program. In addition, there are many software tools available to all schools that support the teaching and learning of mathematics, including (but not limited to):

Carnegie Learning's Cognitive Tutor Programs

A secondary software curriculum that engages students directly in problem solving. Students receive online individualized instruction, practice, immediate feedback and coaching with the Cognitive Tutor software.

Riverdeep *Destination Success*

A comprehensive, Pre K- 12 educational software program that students can use to learn mathematics. The Riverdeep software enables teachers to provide students with extra practice in areas of weakness or extra challenge to extend learning. This software is web based and can be accessed in school, at home, or in the library.

FCAT Explorer

An interactive program for students that offers practice on the FCAT-tested benchmarks in math and reading. The program monitors the student's progress by automatically adjusting readability levels and instructional support levels based on student's success with practice questions.

Florida Achieves! Focus

An online resource designed to support Florida's Continuous Improvement Model. It offers online mini-assessments for each assessed math benchmark on the FCAT 2.0 (grades 3 through 8) and the Algebra I and Geometry EOC.

Edgenuity

Edgenuity features online activities and highly qualified teachers delivering content rich lessons. Content is aligned to the District's pacing guides. Edgenuity is used for recovery of middle and high school courses/credits and acceleration of high school courses. It can also be used for whole group instruction, intervention and end-of-course learning gap analysis.

Gizmos

Gizmos is a library of interactive online simulations for math and science. It contains fun and easy to use interactive simulations which help students develop a deep understanding of challenging concepts through inquiry and exploration.

Discovery Education

Discovery Education provides engaging rich media across all curriculum areas, designed to support multiple learning modalities. The collection of dynamic videos, rich content, and variety of resources spark student curiosity, support educators through the transition to Common Core and ultimately drive achievement.

NBC Learn

NBC Learn, the educational arm of NBC News, has digitized over 12,000 stories from the NBC archives and makes them available, on-demand, to teachers, students, and parents. Digital content, comprised of historic stories, images, primary source documents, and suggested lesson plans has been aligned to the district pacing guides.

Algebra Nation

This is a powerful computer-based Algebra End-of-Course Prep Tool created by the University of Florida and Study Edge will provide teachers EOC preparation resources aligned with New Generation Sunshine Standards. Teachers can use these aligned videos in their class as a meaning development for a lesson, as part of a unit or exam review, or for differentiated instruction. In addition, Algebra Nation 2.0 supports learning 24 hours a day, 7 days a week and builds 21 century study skills.

Edusoft

Assessment Management System is a standards-based assessment solution that makes it easy for districts to collect, analyze and act on student performance data to improve classroom instruction and student performance. Edusoft helps schools administer district benchmarks and classroom tests quickly and easily; delivers rapid results; improves the reliability of assessment programs; and connects assessment to instructional decisions.

Compass Learning Odyssey

Compass Learning Odyssey® delivers NGSSS aligned middle grades curricula that provide interactive, self-paced, challenging, engaging activities. Activities promote exploration, individual and cooperative learning, problem solving, reflection, and real-world connections. Odyssey applies current and confirmed research about how students think and learn.

INSTRUCTIONAL STRATEGIES

Student achievement is affected by both school level and teacher level factors. Three teacher-level factors contribute to student success: Instructional strategies, classroom management and classroom curriculum design. Selecting appropriate instructional strategies is critical to the design of an effective lesson. While no instructional strategy works equally well in all situations, the following table (Table 4.6) lists strategies that have been shown to have a positive impact on improving student achievement (Marzano, 2001).

TABLE 4.6: RESEARCH-BASED INSTRUCTIONAL STRATEGIES

Instructional Strategy	Examples
Identify Similarities and Differences	• Comparison and classification tasks • Graphic Organizers (Venn Diagrams, Comparison Matrix) • Organizing ideas into groups based on their similarities • Use analogies and metaphors
Note Taking and Summarizing	• Create verbal and written summaries • Organize and take daily notes in a learning journal/notebook • Revise and edit notes taken in class • Include diagrams and graphic organizers to help illustrate notes
Reinforce Effort and Provide Recognition	• Recognize and reinforce the importance of effort and the effect on the student's achievement • Recognize and celebrate progress during the study of a concept/unit • Recognize and celebrate that the student has achieved his/her learning goals
Homework and Practice	• Design practice assignments that focus on specific elements of a complex skill or process • Design homework that clearly articulates the purpose and outcome • Provide high quality, specific feedback
Cooperative Learning	• Provide opportunities for teams of students to collect data, find a pattern in the data and make conjecture
Nonlinguistic Representations	• Create graphic representations • Make physical models • Generate mental pictures • Draw diagrams, table, and graphs • Engage in kinesthetic activity
Setting Objectives and Providing Feedback	• Provide a daily class agenda on the board or the overhead • Identify and publish the specific student learning goals for a unit of study • Provide feedback on the learning goals during the unit • Have the students self-assess their progress on attainment of their learning goals • Provide summative feedback at the end of a unit of study
Generate and Test Hypotheses	• Develop exploration and inquiry activities for students that allow them to explore a concept and develop meaning prior to direct instruction • Engage students in generating and testing hypotheses though real-world problem solving, investigation, and invention tasks
Question, Cues, and Advance Organizers	• Prior to presenting a new concept, provide the student teams with questions to discuss that allow the students to identify their prior knowledge of a new concept • Prior to presenting a new concept, provide time for the students to discuss, organize, and think about the concept with their student team.

DIFFERENTIATING INSTRUCTION

In today's society there are many types of diversity – ethnic, cultural, learning styles, and intelligences. This diversity should guide a teacher's choice of instructional strategies. Differentiating instruction is based on the belief that students learn differently and involves lesson design that recognizes the diverse needs and learning styles of students. This does not mean the teacher needs to individualize lessons for every student every day. Rather, differentiation can be accomplished by a lesson design that takes all learners through a lesson cycle utilizing diverse learning strategies that encompass all learning styles as well as offer opportunities for student choice and creativity. Differentiation can be naturally folded into teachers' instructional design by a lesson design sequence that focuses on preparation, meaning, content, practice, and performance.

The following strategies are additional strategies that teachers can use to actively involve their students:

Preparing Students for Learning and Prior-Knowledge Assessment

Teachers inquire about students' understandings of concepts before sharing their own understanding about the topic. The technique of "frontloading" to elicit prior knowledge related to real-life experiences and applications can create a direct connection to the content for students.

Examples: Graphic organizer (e.g., concept mapping, KWL); Video Clips; Demonstration; Literature Springboard

Developing Active Learners

Students become active learners through opportunities to construct their own understanding. These learning episodes require students to explore, discover, organize, classify, interpret, and draw conclusions about real-life mathematical and scientific problems. Students communicate their ability to think mathematically and problem-solve graphically, algebraically, numerically, and verbally.

Examples: Investigations; Open-ended questions; Real-life scenarios to solve; Simulations requiring higher order thinking skills

Teaching for Diversity

Teachers, as the facilitators of the learning, provide a variety of activities that address learning, language, and cultural differences. Activities within the classroom reflect a variety of cultures, learning styles, and multiple intelligences. Students learn that there are different ways of knowing and learning.

Examples: Graphic organizers (e.g. Concept mapping, KWL), Incorporating linguistic, logical-mathematical, bodily-kinesthetic, spatial, musical, interpersonal (small and large group interaction), intrapersonal (reflective journaling), and naturalist activities; Opportunities to work individually, in small learning groups, and in large groups

Collaborative Mathematical Discourse

Encourage student discourse within the classroom through student dialogue with the teacher and with other students. Teachers encourage and accept student autonomy and initiative by allowing student responses to drive lessons, shift instructional strategies, and alter the lesson plans.

Examples: *Posing questions and tasks that elicit, engage, and challenge thinking; asking students to clarify and justify issues; encouraging elaboration during discussions*

Varied Instructional Format

A variety of instructional formats allow students to make sense of the content and construct meaning from new concepts.

Examples: *Inquiry-based instruction provides opportunities for small-group work, individual exploration, peer instruction, and whole class discussion; hands-on activities; technology-based activities*

Critical Thinking and Higher-Order Questioning

Use open-ended questioning techniques that encourage student inquiry. Encourage students to pose their own questions, evaluate the information presented, and make informed decisions about the information.

Examples: *Elaborating; analyzing; Hypothesizing; Evaluating*

Continuous Assessment of the Learning

The purpose of assessment is to gather evidence of student achievement to inform instructional decisions and to motivate learning. Formative assessment is embedded at various points in the lesson to guide the instructional planning and pacing. Maintain a clear alignment between curriculum, instruction, and assessment.

Examples: *Formative- Questioning/discussion, Monitoring/Observation, Quizzes, Self-assessment, Note taking; Summative- Performance tasks, Notebooks, Essays, Portfolios, Video presentations, Demonstrations, Tests*

Strategies to Support English Language Learners

The strategies listed in Table 4.7 will provide mathematics teachers with effective practices for incorporating mathematics learning standards and the English for Speakers of Other Languages (ESOL) learning standards in daily instruction.

TABLE 4.7: SUGGESTED EFFECTIVE STRATEGIES FOR DIFFERENTIATING INSTRUCTION FOR LIMITED ENGLISH PROFICIENT (LEP) STUDENTS:		
A. Methodologies/Approaches		
• Total Physical Response (TPR) • Frequent checking of comprehension • Thematic approach • Build background information • Utilization of Language acquisition stages	• Choral/Chant echo approach • Language Experience Approach • Sheltered Instruction • Reciprocal Teaching • Brainstorming	• Cognitive Academic Language Learning Approach (CALLA) • Previewing • Assess Prior Knowledge
B. Visuals (Graphic Organizers and Other Audio/Visuals)		
• Flow charts • Maps • Charts • Graphs • Pictures • Semantic Webbing/ Mapping • T-Charts • Venn Diagrams	• Timelines • Computer/ Software • Videos/Films • Realia (Real life artifacts for demonstration purposes) • Demonstrations	• Captioning • Labeling • Music/Songs • Jazz Chants/ Raps • Cassettes-Music / Books • Language Master
C. Interactive Strategies (Cooperative Learning Activities)		
• Peer Buddy • Small Group Activities • Pairs and Threes • Jigsaw • “Corners” • Think/Pair/Share	• Cooperative Learning Groups (Group Reports/ Projects) • Panel Discussions/ Debates	• Choral Reading/Read Around Groups (RAG) • Echo Reading
D. Other Interactive Strategies		
• K.W.L (Know, Want to Know, Learned) • Role Play	• Games • Dialogue Journals	• Language Experience Approach • Think Alouds
E. Modified Class Work/Alternative Strategies (Based on Level of English Proficiency)		
• Vary the Complexity of the Assignment and Assessment • One-on-One Instruction with Teacher or Aide • Modify Nature of Assignment • Substitute a Graphic	• Use Simple, Direct Language, Limit use of Idioms • Use all Learning Styles and Modalities • Provide Meaningful Language Practice • Substitution/Expansion/Pa	• SQ3R (Survey/Question/Read/Recite/Review) • Summarizing • Note-Taking • Word Banks • Repetition • QAR –

TABLE 4.7: SUGGESTED EFFECTIVE STRATEGIES FOR DIFFERENTIATING INSTRUCTION FOR LIMITED ENGLISH PROFICIENT (LEP) STUDENTS:		
Organizer • Use Home Language for Directions • Explain Key Concepts • Repeat/ Paraphrase/ Slow Down Rate • Vocabulary with Context Clues • Reading with a Specific Purpose	raphrase Repetition • Matching with Visuals • Unscramble: Sentences/Words • Categorize Vocabulary • Use Context Clues • Use Outline Notes • Directed Reading/Thinking Activity (DRTA) • Semantic Feature Analysis	Question/Answer/Relationships • Develop and Maintain Routines • Eliminate Nonessential Information • Double Grade Narratives/Essays for Content And Grammar • Focus on Student Motivation • Categorize Vocabulary/Word Sorts
F. Multicultural Resources		
• Cultural Sharing • Varied Holiday Activities	• Validation of student cultural contributions	• Culture Studies
G. Alternative Assessment Instruments		
• Interviewing • Content Retelling • Content Dictation • Cloze Procedures • Graphic Representations	• Student Self-rating and Evaluations • Teacher Checklist • Smaller writing sample/test sample	• Student Self-rating and Evaluations • Teacher Checklist • Smaller writing sample/test sample

The strategies to support ESOL students can be accessed through the Bilingual Education and World languages web site at the following link: http://bilingual.dadeschools.net/.

SPECIAL EDUCATION STUDENTS

The strategies listed in Table 4.8 will provide mathematics teachers with information and effective practices for addressing the individual needs of Special Education Students.

TABLE 4.8: STRATEGIES TO SUPPORT SPECIAL EDUCATION STUDENTS

Characteristics of Students with Learning Disabilities Related to Mathematics

- Difficulty processing information which results in problems learning to read and problem solve
- Difficulty with distinguishing relevant information in story problems
- Low motivation, self-esteem, or self-efficacy to learn due to repeated academic failure
- Problems with higher-level mathematics that require reasoning and problem solving skills
- Difficulty with self-monitoring and self-regulation during problem
- Difficulty with arithmetic, computational deficits

Source: From best practices teaching mathematics top secondary students with special needs: Implications from teaching perceptions and the review of the literature by Maccini, P., Gagnon, J.C., 2000, *Focus on Exceptional Children,* 32(5), 1-22.

Effective Teaching Strategies for Mathematics Instruction

- Teaching prerequisites skills, definitions, and strategies
- Providing direct instruction in problem representation and problem solution
- Providing direct instruction in self-monitoring procedures
- Using organizers
- Incorporating manipulatives
- Teaching conceptual knowledge
- Providing effective instruction

Instructional Strategy Steps

- Step 1: Provide an advanced organizer, using KWL strategy
- Step 2: Provide teacher modeling
  - Two methods:
    - "Think-aloud" while introducing a new strategy
    - "Fade" (or reduce) teacher prompts while involving students in application of the strategy

TABLE 4.8: STRATEGIES TO SUPPORT SPECIAL EDUCATION STUDENTS

- Step 3: Provide guided practice
  - Provide opportunities for students to practice the new strategy with teacher assistance
  - Fade teacher assistance until students can perform the task independently
- Step 4: Provide student independent practice
  - Assess student mastery of the skills by providing problems without teacher prompts/assistance
- Step 5: Provide feedback
  - Provide positive and corrective feedback throughout the lesson in five steps-
    - Document student performance
    - Target error patterns/incorrect answers
    - Reteach, if necessary
    - Provide student practice with similar problems and monitor student performance
    - Close with positive feedback
- Step 6: Provide for generalization
  - Provide prompts or questions to promote generalization to other
    - Problem solving situations
    - Content areas
    - Real-world situations

Source: Adapted from Maccini & Hughes, 2000; Maccini & Ruhl, 2000; Mercer & Miller, 1992.

For more information and resources about intervention strategies to address the needs of student with disabilities, go to http://www.k8accesscenter.org/index.php.

LEARNING SUPPORT SYSTEM

Successful schools fulfill the promise of education – that each student may develop his or her ability to the fullest. These schools communicate a clear message to all students: “What you are doing here is important,” “You can do it,” and “We are not going to give up on you, nor will you give up on yourself. “ These schools provide a “safety net” for their students by providing a learning support plan.

A school’s learning support plan provides extra help to students who need to make greater progress in their learning. A well designed support system is a benefit to the struggling student. In addition, it benefits teachers by increasing instructional momentum and focusing their energy on all learners. A well designed learning support system is rooted in the belief that all humans are natural learners and all learners can be successful.

Success at learning requires persistence and promotes confidence. Struggling students need to receive additional time and support. Rather than providing remediation, a learning support system intervenes by providing a systematic, timely, and directive program for struggling students. In a learning support system the teachers quickly identify students who are in need of additional time and support and these students are provided with help as soon as they experience difficulty rather than utilizing summer school, retention, or a remedial course to address their needs. An effective learning support system reflects the school goals for student learning and the school’s commitment to the successful learning of all students. In addition, a learning support system may include the following intervention strategies:

Cooperative Groups of Mixed Ability

Classroom teachers place students in cooperative groups of mixed abilities to complete a daily activity. Students who are struggling can benefit and learn from students with a greater mastery of the skill or better grasp of the subject matter. When students explain their learning to peers, they engage in a brain based rehearsal strategy that increases retention.

Weekly Progress Reports

Weekly progress reports for the student and the student’s parents are provided. When a student or the parent discovers that the student is not doing well in a class, a talk with the teacher, parent, and guidance counselor or faculty advisor will help the student begin to resolve the problem. At this meeting, the student, parent, counselor, and classroom teacher can sign a contract that clarifies what each party will do to help the student meet the standards for the course.

Math Centers

Math centers within the classroom provide extra assistance and activities for struggling students.

After School Study Time

After school study time is required for struggling students. This dedicated "quiet time" is provided for the student to complete class assignments, complete homework assignments, work on long term projects, and prepare for tests. A classroom teacher moderates the after school study time assisting the student as needed. The after school study time teacher communicates with the student's classroom teacher to learn exactly what homework each student needs to complete, monitors the completion of that work, and notifies the classroom teacher of the student's efforts.

Coordinated Intervention among School Staff

Utilize the school staff to plan intervention strategies for individual students. The counselor will check on struggling students on a weekly basis and communicate with the parent and teacher. Communication between teachers of struggling students, the counselor, and the student provides a safety net for the student.

Small Group Guided Instruction

Identify groups of students (5 or less) who need additional assistance with a concept and work with them in a small group while the rest of the class is working on independent practice. Small group instruction addresses individual needs effectively and efficiently and increases student understanding and grasp of course content. This strategy also motivates students and generates greater student involvement in learning.

Interventions

If a student scores at Level 1 or Level 2 on FCAT 2.0 or EOC, the student must receive remediation the following year. Remediation may be integrated into the student's required mathematics course, offered as a pull-out, or in the case of secondary, offered as Intensive Mathematics, an elective course, in addition to the regular mathematics courses (Student Progression Plan).

Interventions are designed to assist students in strengthening their ability in areas of identified need. The classroom teacher examines the student's data, determines the student's areas of strength and areas for improvement, and designs a plan to assist the student in improving mathematically. When appropriate, the classroom teacher and the supplemental support provided coordinate the activities with the student's primary mathematics class. Intervention classes utilize technology, peer tutors, classroom aides, and school

volunteers to assist struggling students. Cooperative groups, one-to-one tutoring, and guided instruction are used to help strengthen student's area of weakness. Mastery of the Sunshine State Standards benchmarks is continually monitored. Immediate feedback is provided and appropriate interventions applied for the individual student's success. The following tables (Table 4.9 and Table 4.10) identify various resources that may be used for interventions.

TABLE 4.9: ELEMENTARY MATHEMATICS INTERVENTIONS

	INTERVENTION RESOURCES
TIER 1	**Florida Online Intervention:** Animated Math Interactive, voiced instruction and practice providing alternative approaches for the concepts and skills taught in the each Student Edition lesson and a built-in management system for teachers.
	Florida Destination Math: Incorporated into the online Student eBooks and online Teacher Editions, provides engaging, interactive animations for standards instruction and practice for modeling with the class or assigning to students.
	HMH Mega Math: Provides additional practice of the Florida benchmarks with engaging activities correlated to the Student Edition. Includes audio and animation.
TIER 2	**Florida Soar to Success Math (Grades 1 – 5):** Online system of diagnostic, prescriptive assessments and targeted instruction providing individual diagnosis and intervention by automatically prescribing individual learning plans to help student achieve grade-level mastery. Includes built-in teacher management tools that allow teachers to monitor student progress and print reports. A special assessment in the Student Edition, Show What You Know, identifies students who would benefit from Intensive Intervention.
	Strategic Intervention Skills: Target at students who are performing up to 2 years below grade level. By focusing on essential prerequisites and concepts for each chapter, the tiered intervention skills prescribe instruction to prepare students to work successfully on grade-level content. This resource helps the teacher accommodate the diverse skill levels of the students. Student performance on the Show What You Know page will allow to diagnose weaknesses and prescribe appropriate intervention. The *Strategic Intervention* is tied to each skill after the first skill.

TABLE 4.9: ELEMENTARY MATHEMATICS INTERVENTIONS	
INTERVENTION RESOURCES	
TIER 3	**Florida Soar to Success Math (Grades 1 – 5):** Online system of diagnostic, prescriptive assessments and targeted instruction providing individual diagnosis and intervention by automatically prescribing individual learning plans to help student achieve grade-level mastery. Includes built-in teacher management tools that allow teachers to monitor student progress and print reports. A special assessment in the Student Edition, Show What You Know, identifies students who would benefit from Intensive Intervention.
	Intensive Intervention Skills: Targeted at students who are performing 2 or more years below grade level. By focusing on essential prerequisites and concepts for each chapter, the tiered intervention skills prescribe instruction to prepare students to work successfully on grade-level content. This resource helps the teacher accommodate the diverse skill levels of the students. Student performance on the Show What You Know page will allow to diagnose weaknesses and prescribe appropriate intervention. The *Intensive Intervention* is tied directly to the first skill.
ENRICHMENT	**GO Math! Florida Enrich Book with Enrich Teacher Edition (with answers):** Activities are designed to extend learning of high achievers. Enrich Teacher Edition contains answers.
MONITORING PROGRESS	**The following assessments monitor student progress on mathematics:** • District's Baseline Assessment • District's Interim Assessments, Fall and Winter (Grades 3-5) • *GO Math! Florida* Assessments o Prerequisite Skills Assessment o Beginning-of-Year Test o Middle-of-Year Test o End-of-Year Test o Benchmark Mini Assessments o Chapter Tests (Form A and B) o Big Idea Assessments
REFERENCE BOOKS	*Principles and Standards for School Mathematics* *National Council of Teachers of Mathematics* (NCTM)
TEACHER REFERENCE BOOKS	**ASSOCIATION FOR SUPERVISION AND CURRICULUM DEVELOPMENT** • Robert Marzano, Debra Pickering, and Jane Pollock, *Classroom Instruction That Works* **NATIONAL COUNCIL OF TEACHERS OF MATHEMATICS** • *Principles and Standards for School Mathematics* • *A Research Companion to Principles and Standards for School Mathematics*

TABLE 4.10: SECONDARY MATHEMATICS INTERVENTIONS

SECONDARY MATHEMATICS INTERVENTION PROGRAMS		Instructor Lead (I) Technology Based (T)	Number Sense, Concepts, & Operations	Measurement	Geometry and Spatial Sense	Algebraic Thinking	Data Analysis & Probability
Grade 6-12	Explore Learning Gizmos (www.explorelearning.com)	I/T	√	√	√	√	√
	FCAT Explorer (http://www.fcatexplorer.com)	I/T	√	√	√	√	√
	Florida Focus (http://focus.florida-achieves.com)						
	Riverdeep (Destination Math or Tangible Math)	I/T	√	√	√	√	√
	Virtual Manipulative (http://matti.usu.edu/nlvm/nav/vlibrary.html)	I/T	√	√	√	√	√
Grades 6-8	Compass Learning Odyssey	I/T	√	√	√	√	√
	Edgenuity For Course Recovery	I/T	√	√	√	√	√
Algebra 1	Edgenuity	I/T	√	√	√	√	√
	Cognitive Tutor – Algebra I	I/T	√	√	√	√	√
	Florida Focus (http://focus.florida-achieves.com)						
Geometry	Cognitive Tutor – Geometry	I/T	√	√	√	√	

Course Recovery

Occasionally, students may not master a particular course's content, even after interventions are implemented. At the secondary level, students who are not successful in a course may elect to repeat the course in order to increase their knowledge of the subject matter studied. For students in grades 9-12 the policy for retaking required courses allows a student to replace the grade of "D" or "F" with a grade of "C" or higher earned subsequently in the same or comparable course. The policy for elective courses allows a student to replace a grade of "D" or "F" with a grade of "C" or higher earned subsequently in another course. In either situation, only the new grade will be used to compute the student's GPA, but the lower grade will remain on the student's transcript and in the student's permanent record. Any course not replaced according to this policy shall be included in the calculation of the cumulative grade point average required for graduation.

The only exception to these policies shall be made for a student in the middle grades who takes a high school course for high school credit beginning in the 2007-2008 school year and earns a grade of "C," "D," or "F." In such case, the policy will allow the replacement of the grade with a grade of "C" or higher, earned subsequently in the same course or comparable course.

TABLE 4.11 THINGS TO LOOK FOR IN A MATHEMATICS CLASSROOM

CURRICULUM

- ❒ Next Generation Sunshine State Standards (NGSSS)
- ❒ Common Core State Standards (CCSS)
- ❒ Course Description- middle and senior high school
- ❒ Mathematics Pacing Guides

INSTRUCTION

CLASSROOM ENVIRONMENT

- ❒ Classroom is arranged to enable active engagement by all students-
  - whole-group instruction
  - teacher-led small groups instruction
  - cooperative learning groups
  - independent student centers
    - o mathematics center
- ❒ Daily mathematics objectives are displayed
- ❒ Focus Calendar is posted
- ❒ Student work is displayed and reflects current mathematics topics or themes
- ❒ Daily Class Schedule is posted
- ❒ Grading Scale is posted
- ❒ A mathematics "print rich environment" is evident
  - math word walls and bulletin boards, and mathematic content-rich classroom libraries

MATERIALS

- ❒ Current district-adopted textbooks are used
- ❒ Supplemental materials are used
- ❒ Math tools are readily available
  - Calculators
    - o four-function, scientific and/or graphing calculators
  - Computers
    - o software allows students to work on teacher selected module or based on student needs
  - Grade-level appropriate manipulatives
    - o algebra tiles, geoboards, counters, rulers, protractors
  - Math reference sheet
  - A/V equipment is readily available
    - o overhead projector, LCD panel
  - FCAT 2.0 / EOC Resources

TEACHER INSTRUCTION (WHOLE CLASS)

- ❒ Instruction follows the pacing guide and is standards-based

TABLE 4.11 THINGS TO LOOK FOR IN A MATHEMATICS CLASSROOM

- ❒ The classroom behavior management system is effective
- ❒ There is evidence that math routines and procedures were previously taught
- ❒ Teacher utilizes a variety of instructional strategies
  - Inquiry, guided instruction, direct instruction
- ❒ Teacher provides appropriate and clear instructions for ALL children (At-risk, LEP, and ESE)
- ❒ Teacher poses questions and tasks that elicit, engage, and challenge each student's thinking; uses of higher-ordered thinking skills are evident
- ❒ Opportunities are provided for students to reason, make connections, solve problems, and communicate about math
  - Journals, logs, open discussions
- ❒ Transitions are smooth and quick
- ❒ Pacing is appropriate
- ❒ Teacher fosters active student engagement and motivation to learn
- ❒ Teacher uses a variety of resources during instruction
- ❒ Literacy infusion is evident

DIFFERENTIATED INSTRUCTION

- ❒ Small group instruction is provided at different levels **based on data** and **depending on student need**
- ❒ Differentiated, small group instruction or time for direct work with individuals is a regular daily activity, and is evident within the classroom period
- ❒ A well-defined behavior management system is in place to guide student movement between groups and centers (if applicable for the unit/lesson)

ASSESSMENT

- ❒ Teacher monitors student progress throughout the lesson
- ❒ Students are evaluated utilizing a variety of assessment methods (formal and informal)
- ❒ Meaningful homework is assigned
- ❒ Portfolios are kept that include math logs, sample pages, informal assessments, and projects
- ❒ Portfolios reflect student's growth in mathematics.

COMPREHENSIVE MATHEMATICS PLAN

Chapter 5

INSTRUCTIONAL MATERIALS

DISTRICT APPROVED TEXTBOOKS

Textbooks and supplemental instructional materials are a critical element in assuring the effectiveness of instructional programs. Students must have access to appropriate textbooks for use in school and at home in all subjects. Table 5.1 outlines the District Approved Textbooks for mathematics for all grade levels. The current adoption period ends June 2016.

TABLE 5.1: DISTRICT APPROVED TEXTBOOKS

COURSE/GRADE LEVEL	PUBLISHER	TITLE
ELEMENTARY SCHOOL		
Mathematics, Grades K-5	Houghton Mifflin Harcourt School Publishers	GO Math! Florida CCSS

COURSE CODES	COURSE	LEVELS	PUBLISHER	TITLE
MIDDLE SCHOOL				
120501001 **120502001** **120502002**	M/J 1	Regular Advanced Advanced/Gifted	Holt McDougal iMath – Carnegie Learning	Mathematics Course1, Florida Carnegie Learning Math Series Course 1
120504001 **120505001** **120505002**	M/J 2	Regular Advanced Advanced/Gifted	Holt McDougal iMath – Carnegie Learning	Mathematics Course 2, Florida Carnegie Learning Math Series Course 2
120507001	M/J Pre-Algebra	Regular	Holt McDougal iMath – Carnegie Learning	Mathematics Course 3, Florida Carnegie Learning Math Series Course 3
SENIOR HIGH				
120031001 **120032001** **120032002**	Algebra I	Regular Honors Honors/Gifted	Prentice Hall	Algebra I Honors Gold Series
120033001 **120034001** **120034002**	Algebra II	Regular Honors Honors/Gifted	Prentice Hall	Algebra II Honors Gold Series
120631001 **120632001** **120632002**	Geometry	Regular Honors Honors/Gifted	Key Curriculum Press	*Discovering Geometry: An Investigative Approach* 978-1-55953-882-4
129831001	Advanced Topics in Math	Regular	Prentice Hall	Algebra and Trigonometry, Blitzer, 83-785-0
120830001	Liberal Arts Math	Regular	Prentice Hall	Thinking Mathematically 83-780-1
120234002 **120234003**	PreCalculus	Honors Gifted	Prentice Hall	PreCalculus, Blitzer, 83-816-0
120230001 **120230002**	Calculus	Honors Gifted	Bedford Freeman,	Single Variable Calculus– Early

TABLE 5.1: DISTRICT APPROVED TEXTBOOKS

				Transcendentals
COURSE CODES	**COURSE**	**LEVELS**	**PUBLISHER**	**TITLE**
120231001 **120231002**	AP Calculus AB	AP AP Gifted	Holt McDougal	Calculus of a Single Variable, Larson, 83-857-1
120232001 **120232002**	AP Calculus BC	AP AP Gifted	Prentice Hall	Calculus: Graphical, Numerical, Algebraic, Finney, 83-863-0
121030003	Probability & Stat w/ Applications	Honors	Prentice Hall	Elementary Statistics: Picturing the World, Larson 83-959-0
121032001	AP Statistics	AP	Bedford Freeman	The Practice of Statistics, Yates, 83-990-0
120050002	Advanced Algebra with Financial Applications	Regular	Southwestern	Financial Algebra
120070001	Mathematics for College Readiness	Regular	Pearson/Addison-Wesley	Beginning Algebra w/ MyMathLab, Lial & Hornsby ISBN# 978032143726-10th edition

SUPPLEMENTAL INSTRUCTIONAL MATERIALS

Tables 5.2, 5.3 and 5.4 list materials that schools may utilize to supplement the curriculum.

TABLE 5.2 ELEMENTARY SUPPLEMENTAL MATERIALS

Materials	Focus	Type of Materials	Vendor/ Contact Info
FCAT Explorer	With resources for parents and teachers, the FCAT Explorer helps students learn about and practice the skills tested on the Florida Comprehensive Assessment Test (FCAT). The *Math Station* provides comprehensive practice with the math benchmarks tested on the 5th grade FCAT. With a colorful, interface, the *Math Station* includes over 150 context-rich practice problems and five benchmark-based math games. The *Math Station* also offers hints for incorrect answer choices and detailed answer explanations. This program can be accessed from home by teachers, parents, and students.	Computer-based	http://www.fcatexplorer.com/
National Library of Virtual Manipulatives	National Library of Virtual Manipulatives (NLVM) has transported powerful teaching tools into the virtual dimension of the computer. The NLVM collection of over 100 interactive software programs, called "applets," is an effective means for accelerating and deepening students' understanding of math. This enables teachers to develop meaningful lesson presentations, prepare customized math problems for students ahead of time, and enable students to continue working on a problem during a later class session. These free virtual manipulatives can be accessed by the teacher, parent or student in the classroom or at home.	Web-based technology	http://nlvm.usu.edu/en/nav/vlibrary.html
NCTM Navigation Series	The NCTM Navigation Series focus on the NCTM standards which correlate to the Florida	Text-based; Utilizes manipulatives	NCTM 1-800-235-7566

TABLE 5.2 ELEMENTARY SUPPLEMENTAL MATERIALS			
Materials	**Focus**	**Type of Materials**	**Vendor/ Contact Info**
	Sunshine State Standards. These activities follow a sequential methodology regarding "how to teach" the subject matter for conceptual understanding through the use of manipulatives. The NCTM Navigation Series available are: • Navigating through Algebra in Prekindergarten- Grade 2 • Navigating through Algebra in Grades 3-5 • Navigating through Measurement Prekindergarten-Grade 2 • Navigating through Geometry in Prekindergarten- Grade 2 • Navigating through Geometry in Grades 3-5 • Navigating through Data Analysis and Probability in Prekindergarten- Grade 2 • Navigating through Data Analysis and Probability in Grades 3-5		Fax: 1-703-476-2970
Riverdeep® Mathematics	Riverdeep® Mathematics is a technology-based, student-friendly curriculum that includes tutorials and a teacher management system. This system is available to all schools through the Miami-Dade County portal and can be accessed from home by teachers, parents, and students.	Computer-based	Riverdeep Inc., A Limited Liability Company 1-800-242-6747 Fax: 800.567.2714

TABLE 5.3 MIDDLE SCHOOL MATERIALS			
Materials	**Focus**	**Type of Materials**	**Vendor/ Contact Info**
Compass Learning*:* *Odyssey Math*	Compass Learning Odyssey® delivers standards aligned PreK-12 curricula that provide interactive, self-paced, challenging, engaging activities. Activities promote exploration, individual and cooperative learning, problem solving, reflection, and real-world connections. Odyssey applies current and confirmed research about how student think and learn. The Compass Learning Odyssey® Middle School Math Curriculum includes: Odyssey Math - Levels 6-8	Computer Based	Linda Ganz Implementation Manager 954-483-9907
FCAT Explorer – *Math Navigator*	The *Math Navigator* provides comprehensive practice with the math benchmarks tested on the 8th grade FCAT 2.0. With hints for incorrect answer choices and detailed correct answer explanations, *Math Navigator* offers 139 context-rich math problems in a visually interesting format. This program is available to all schools through the mathematics portal and can be accessed from home by teachers, parents, and students.	Computer-based	http://www.fcatexplorer.com/
Gizmos™	Gizmos™ are for grades 6 –12 are software programs (applets) that allow students to explore mathematics and science concepts in an interactive simulation format. Gizmos are designed as supplemental curriculum materials that support state and national curriculum standards. Gizmos™ utilize research-based instructional strategies and assist the teacher in the use of visual imagery and interactive manipulatives.	Computer-based	Explore Learning 1-866-882-4141
National Library of Virtual Manipulatives	The National Library of Virtual Manipulatives (NLVM) has transported powerful teaching tools into the virtual dimension of the computer. The NLVM collection of over 100 interactive software programs, called	Web-based technology	http://nlvm.usu.edu/en/nav/vlibrary.html

TABLE 5.3 MIDDLE SCHOOL MATERIALS			
Materials	**Focus**	**Type of Materials**	**Vendor/ Contact Info**
	"applets," is an effective means for accelerating and deepening students' understanding of math. This enables teachers to develop meaningful lesson presentations, prepare customized math problems for students ahead of time, and enable students to continue working on a problem during a later class session. These free virtual manipulatives can be accessed by the teacher, parent or student in the classroom or at home.		
NCTM Navigation Series	The NCTM Navigation Series focus on the NCTM standards which correlate to the Florida Sunshine State Standards. These activities follow a sequential methodology as to "how to teach" the subject matter for conceptual understanding through the use of manipulatives. The NCTM Navigation Series available are: • Navigating through Algebra in Grades 6-8 • Navigating through Geometry in Grades 6-8 • Navigating through Data Analysis in Grades 6-8	Text-based; Utilizes manipulatives	NCTM 1-800-235-7566 Fax: 1-703-476-2970
Riverdeep® Destination Math K-8	The Destination Math™ Series is a carefully sequenced, comprehensive curriculum that demonstrates how mathematics issues arise out of real-life situations. The program begins with assessments based on state standards and then delivers sequenced, prescriptive instruction, targeting each student's individual needs. Seven progressive courses offer a balance of abstract and applied math principles. Delivering a rich blend of assessment materials, coursework, and educator support tools, the comprehensive Destination Math™ Series is adaptable to any educational environment.	Web-based	Riverdeep 1-800-242-6747

TABLE 5.4 SENIOR HIGH SCHOOL MATERIALS			
Materials	**Focus**	**Type of Materials**	**Vendor/ Contact Info**
Carnegie Learning's Cognitive Tutor	The Cognitive Tutor mathematics series utilizes a cognitive model that simulates the way in which students think about and attack mathematics problem solving. The Cognitive Tutor programs engage students in real-world problem-solving activities. This approach helps students connect prior knowledge with the new skills and concepts they learn. Each curriculum combines software-based, individualized computer lessons with collaborative, real-world problem-solving activities. Students spend 40% of their class time using the software and the balance of their time engaged in classroom problem-solving activities. Programs available are: • Algebra I • Algebra II • Geometry • Integrated Mathematics I, II, III • Test Prep	Computer-based activities (40%) Hands-on, hand-held technology and classroom activities (60%)	Carnegie Learning 1-888-851-7094
FCAT Explorer – *Math Timeline*	The *Math Timeline* provides comprehensive practice with the math benchmarks tested on the 10th grade FCAT. Using a timeline-based navigation, the *Math Timeline* includes problems that focus on history, science, culture, and career. In addition, the *Math Timeline* allows students to freely navigate through the program or work on problems related to a specific benchmark. In addition, the Math Timeline offers instructional lessons on Strand C: Geometry and Spatial Sense benchmarks. This program is available to all schools through the mathematics portal and can be accessed from home by teachers, parents, and students.	Computer-based	http://www.fcatexplorer.com/
Florida Achieves! Focus	A website offering online mini-assessments for mathematics.	Computer-based	http://focus.florida-achieves.com/(S(ko

TABLE 5.4 SENIOR HIGH SCHOOL MATERIALS			
Materials	**Focus**	**Type of Materials**	**Vendor/ Contact Info**
	For each benchmark in math, Focus offers a 5-item test and a 5-item retest.		m4pbv5w1eapqzkh3triffp))/login.aspx
Gizmos™	Gizmos™ are a grade 6 – grade 12 software program that allows students to explore mathematics and science concepts in an interactive simulation format. Gizmos™ are designed as supplemental curriculum materials that support state and national curriculum standards. Gizmos™ utilize research-based instructional strategies and assist the teacher in the use of visual imagery and interactive manipulatives.	Computer-based	Explore Learning 1-866-882-4141
National Library of Virtual Manipulatives	National Library of Virtual Manipulatives (NLVM) has transported powerful teaching tools into the virtual dimension of the computer. The NLVM collection of over 100 interactive software programs, called "applets," is an effective means for accelerating and deepening students' understanding of math. This enables teachers to develop meaningful lesson presentations, prepare customized math problems for students ahead of time, and enable students to continue working on a problem during a later class session. These free virtual manipulatives can be accessed by the teacher, parent or student in the classroom or at home.	Web-based technology	http://nlvm.usu.edu/en/nav/vlibrary.html
NCTM Navigation Series	The NCTM Navigation Series focus on the NCTM standards which correlate to the Florida Sunshine State Standards. These activities follow a sequential methodology as to "how to teach" the subject matter for conceptual understanding through the use of manipulatives. The NCTM Navigation Series available are: • Navigating through Algebra in Grades 9-12 • Navigating through Geometry	Text-based ; Utilizes manipulatives	NCTM 1-800-235-7566 Fax: 1-703-476-2970

TABLE 5.4 SENIOR HIGH SCHOOL MATERIALS			
Materials	**Focus**	**Type of Materials**	**Vendor/ Contact Info**
	in Grades 9-12		
Riverdeep® Algebra I	The Destination Math™ Series is a carefully sequenced, comprehensive curriculum that demonstrates how mathematical issues arise out of real-life situations. In Mastering Algebra I, Course 2, students continue to enhance their algebra skills by learning polynomial expressions and operations, by graphing parabolas, and by identifying relationships between graphs and equations. Students apply the quadratic formula to solve quadratic equations in one variable, and they investigate radical and relational functions.	Web-based technology	Riverdeep 1-800-242-6747
Hand-Held Technology by Texas Instruments	This hand-held technology is used in the mathematics classroom to encourage mathematical exploration, discussion, and develop meaning for the concepts the students are learning. Utilizing the graphing calculators and navigation system, students contribute real-time data to a shared workspace that can be projected to the class, generating discussion and encouraging collaborative inquiry. The types of available hand-held technology include: • Graphing Calculators • CBR (Calculator-Base Ranger) • CBL (Calculator-Based Laboratory) • TI Interactive software • TI Navigator System • TI Nspire System • Smartview software	Hand-held technology	D&H 1-800-340-1006 http://buycalcs.com Texas Instruments 1-972-917-1663 1-800-TI-CARES (1-800-842-2737))

INTERNET RESOURCES

The following mathematics titles are web links for teachers, students, and parents that include lesson plans, activities, and/or multimedia resources.

TABLE 5.5: INTERNET RESOURCES

Mathematics Web Sites	Description	URL
Allmath.com: Glossary	A site for online worksheets, games, references, dictionaries, and other math related resources.	http://www.allmath.com/
The Ancients - Mathematicians of the African Diaspora	This site gives the history of mathematics in Africa south of the Sahara.	http://www.math.buffalo.edu/mad/Ancient-Africa/index.html
Aplusmath.com	This web site was developed to help students improve their math skills interactively	http://www.aplusmath.com/
Atomic Learning	A web-based software training for more than 100 applications students and educators use every day.	http://www.atomiclearning.com/
Coolmath.com - An amusement park of mathematics… and more!	A site filled with math lessons, games, problems, and other mathematics resources.	http://www.coolmath.com/
Connected Mathematics Project	The website of the Connected Mathematics Project (CMP) at Michigan State University	http://connectedmath.msu.edu/
Educational Java Programs	This Web site contains Java™ applets whose purpose is to be used as manipulatives to help and enhance the education of children.	http://ejad.best.vwh.net/java/java.shtml
Education Place Mathematics Center	A searchable site for Textbook Support Materials.	http://www.eduplace.com/math/
FCAT Explorer	FLDOE online resource for FCAT math and reading.	http://www.fcatexplorer.com/
Free Worksheets	Free worksheets for K-12 education.	http://www.freeworksheets.com/
Figure This! Math Challenges for Families	A site to help families enjoy mathematics outside school through a series of fun and engaging, high-quality challenges.	http://www.figurethis.org/index.html
Illustrative Mathematics Project	Illustrate the range and types of mathematical work that students will experience in a faithful implementation of the Common Core standards	http://www.illustrativemathematics.org/
Improving Mathematics in Middle School: Lessons from TIMSS and Related Research	TIMSS is a particularly rich data source about the middle grades because it includes not only achievement data and a curriculum analysis but also a classroom instruction videotape study.	http://www.ed.gov/inits/Math/silver.html

TABLE 5.5: INTERNET RESOURCES		
Mathematics Web Sites	**Description**	**URL**
Inside Mathematics	A professional resource for educators that features classroom examples of innovative teaching methods and insights into student learning, tools for mathematics instruction that teachers can use immediately, and video tours of the ideas and materials on the website. Inside Mathematics will be aligning its tools and examples to the Common Core.	www.insidemathematics.org/
K-12 Mathematics Curriculum Center	The K–12 Mathematics Curriculum Center aims to help teachers and administrators make thoughtful, informed decisions about mathematics curriculum and instructional materials	http://www2.edc.org/mcc/
Learning First Alliance	The Learning First Alliance is a partnership of 18 leading education associations dedicated to improving student learning in America's public schools.	http://www.learningfirst.org/
Khan Academy	Students can practice math at their own pace through an adaptive assessment environment. Each problem is randomly generated, so you never run out of practice material. If you need a hint, every single problem can be broken down, step-by-step, with one click. If you need more help, you can always watch a related video.	http://www.khanacademy.org/commoncore
Math Counts	A National middle school math competition.	https://mathcounts.org/
Mathematics Assessment Project	The Mathematics Assessment Program (MAP) aims to bring to life the Common Core State Standards (CCSSM) in a way that will help teachers and their students turn their aspirations for achieving them into classroom realities. MAP is a collaboration between the University of California, Berkeley and the Shell Center team at the University of Nottingham, with support from the Bill & Melinda Gates Foundation.	http://www.map.mathshell.org/materials/index.php
Mathematics Glossary - Middle Years	A site with definitions that are designed to be meaningful to middle level mathematics teachers.	http://mathcentral.uregina.ca/RR/glossary/middle/glossaryab.html
MathDrill	Math problems are organized into 86 levels (and increasing), ranging from simple ordering of numbers to addition and subtraction fractions, time, algebra and geometry,	http://www.mathdrill.com/

TABLE 5.5: INTERNET RESOURCES		
Mathematics Web Sites	**Description**	**URL**
Math in Daily Life	The site explores how math can help us in our daily lives.	http://www.learner.org/exhibits/dailymath/
MathLine (PBS)	Over 100 professional development courses in Mathematics, Reading, Technology Integration and more—delivered online.	http://www.pbs.org/teachers/
Math Mania	An Amazing Mathematical Object Factory produces lists of mathematical objects in response to users' input.	http://theory.cs.uvic.ca/~cos/amof/
Math N Stuff	A site for online worksheets, games, references, dictionaries, and other math related resources.	http://www.mathnstuff.com/
Math Stories	The goal of this math website is to help elementary school (Grade 1st through 6th) children boost their math problem solving and critical-thinking skills.	http://www.mathstories.com/
Math Forum Home Page	Is a leading online resource for improving math learning, teaching, and communication since 1992.	http://mathforum.org/
Mega Mathematics	The MegaMath project is intended to bring unusual and important mathematical ideas to elementary school classrooms so that young people and their teachers can think about them together.	http://www.c3.lanl.gov/mega-math/menu.html
MOTIVATE	MOTIVATE is a real-time videoconferencing project for schools, providing math, science and cross-curricular videoconferences and linked projects for students of all ages (5-19) both in the UK and internationally.	http://motivate.maths.org/
National Assessment of Educational Progress Home	The National Assessment of Educational Progress (NAEP) is the only nationally representative and continuing assessment of what America's students know and can do in various subject areas.	http://nces.ed.gov/nationsreportcard/
National Library of Virtual Manipulates	The National Library of Virtual Manipulatives (NLVM) is an NSF supported project that began in 1999 to develop a library of uniquely interactive, web-based virtual manipulatives or concept tutorials, mostly in the form of Java applets, for mathematics instruction (K-12 emphasis).	http://nlvm.usu.edu/en/nav/index.html
NCTM's Principles and Standards	The site for the national standards for mathematics.	http://standards.nctm.org/
NBPTS - The National Board For Professional Teaching Standards	The National Board for Professional Teaching Standards	http://www.nbpts.org/

TABLE 5.5: INTERNET RESOURCES		
Mathematics Web Sites	**Description**	**URL**
NRICH	A site filled with math lessons, games, problems, and cool resources.	http://nrich.maths.org/public/
Plus	Plus magazine opens a door to the world of math, with all its beauty and applications, by providing articles from the top mathematicians and science writers on topics as diverse as art, medicine, cosmology and sport.	http://www.plus.maths.org/
Project 2061 Home	Project 2061 is a long-term initiative of AAAS to help all Americans become literate in science, mathematics, and technology.	http://www.project2061.org/
Riverdeep	The District's free online interactive math resource for students.	http://riverdeep.dadeschools.net/lms
ShowMe Center Home	A National Science Foundation project supporting implementation of standards-based middle grades mathematics curricula.	http://www.showmecenter.missouri.edu/
Sloan Career Cornerstone Center *NEW* added 08/17/06	The Sloan Career Cornerstone Center is an ever-expanding resource center for anyone interested in exploring career opportunities in science, technology, engineering, mathematics, computing, and medicine.	http://www.careercornerstone.org/
Teacher net by teachers for teachers	A site to empower, recognizes, and connect teachers to improve student learning, and to advocate for teacher leadership, all for the public good.	http://www.teachernet.org/
Third International Mathematics and Science Study	The Trends in International Mathematics and Science Study (TIMSS) provides reliable and timely data on the mathematics and science achievement of U.S. students compared to that of students in other countries.	http://nces.ed.gov/timss/
TI Calculator Link	Texas Instrument's graphing calculator resources.	http://education.ti.com/educationportal/sites/US/homePage/index.html

COMPREHENSIVE MATHEMATICS PLAN

Chapter 6

LITERATURE GUIDE

PURPOSE OF MATHEMATICS LITERATURE CONNECTIONS IN THE CLASSROOM

Research has shown that children assimilate new information best when it has meaning and usefulness for them. Literature is a way to give math meaning and provides an avenue for children to personalize mathematics learning.

The National Council of Teachers of Mathematics (NCTM) has reported that reading, writing, discussing, representing, and listening to mathematics are essential to students' comprehension of mathematical concepts. Using literature as a springboard to spark student interest in mathematical concepts:

- gives mathematics meaning.
- engages students in authentic, "real world" experiences in which people use mathematics for real purposes.
- teaches problem solving skills.
- offers opportunities for students to think and to reason.

Curriculum and Instruction, Mathematics, recognizes the many benefits to using the identified literature connections:

- Class discussion of the literature piece provides an informal means of identifying students' prior knowledge.
- Students' reading/language art skills are further developed and enhanced.
- Students' awareness of mathematics topics through indirect mathematics instruction is intensified.
- Students are more open to content instruction due to an increased interest level (curiosity is heightened by the use of stories and poems).
- Stories and poems are often real world-based.
- Students can better relate to and retain information in story form as opposed to isolated facts.

Infusing mathematics literature in the classroom will encourage the teaching of mathematical processes (problem solving, reasoning and proof, communication, connections, and representations) as proposed by NCTM in *Principles and Standards for School Mathematics*.

Description of the Mathematics Literature Guide

This literature guide contains suggested titles of books aligned by strand and concept to the Florida Sunshine State Standards to better prepare students in the curriculum area of mathematics. The literature guide was created to assist teachers in the development of mathematical concepts via the use of literature as a bridge.

Suggestions for How to Use Mathematics Literature in the Classroom Effectively

- Read the story/book as an opener to a unit for motivation and comprehension for content retention.
- Engage students in sticky-note discussions to promote small group discussion dealing with challenging mathematics concepts and generalizations.
- Revisit text often to explore concepts.
- Incorporate in learning stations based on the current objective to be mastered.
- Use with small groups to generate conversation and discussion about the content.
- Model fluency and phrasing in reading for understanding while helping students acquire mathematical language.
- Read the story/book again to promote questioning for quality thinking by asking questions that require more than a "yes" or "no" answer.
- Engage students in creating a name for a chapter, section, or passage to note main ideas of text.
- Brainstorm thoughts with Think-Pair-Share to teach students how to make and investigate mathematics conjectures and communicate about mathematics.

Some of these ideas have been adapted from a presentation conducted by Judy Chambers--National Math Consultant and 1995 Presidential winner for Excellence in Math Teaching-- for Newbridge's *All About Math* and Authentic Math literature during the 2006 Mathematics Summer Heat Literacy elementary mathematics facilitators' inservice.

Table 6.1 below provides a list of identified titles of books aligned by mathematics content to serve as a resource for teachers. The detailed alignment by concept to the Florida Sunshine State Standards can be found in the original *Mathematics Literature Guide* at http://math.dadeschools.net. Additional titles have been added to the list addressing secondary mathematics. This is by no means an exhaustive list, but a reference to guide teachers.

TABLE 6.1: MATHEMATICS LITERATURE ALIGNED TO MATHEMATICS CONTENT

NAME OF BOOK	AUTHOR	LEVEL*	MATH CONTENT
* E= ELEMENTARY M= MIDDLE S= SENIOR HIGH			
10 for Dinner	Jo Ellen Boggart	E	• Number Sense
100 Days of Cool	Stuart J. Murphy	E	• Number Sense
100th Day Worries	Margery Cuyler	E	• Number Sense
12 Ways to Get to 11	Eve Miriam	E	• Number Sense • Geometry • Math Process Skills
17 Kings and 42 Elephants	Margaret Mahy	E	• Number Sense
A Dollar for Penny	Julie Glass	E	• Number Sense • Measurement
A Fair Bear Share	Stuart J. Murphy	E	• Number Sense

TABLE 6.1: MATHEMATICS LITERATURE ALIGNED TO MATHEMATICS CONTENT			
NAME OF BOOK	**AUTHOR**	**LEVEL***	**MATH CONTENT**
*** E= ELEMENTARY M= MIDDLE S= SENIOR HIGH**			
A Million Fish More or Less	Patricia C. McKissack	E	• Number Sense
A Quarter from the Tooth Fairy	Caren Holtzman	E	• Number Sense • Measurement
A Remainder of One	Elinor Pinczes	E	• Number Sense
Alexander, Who Used to Be Rich Last Sunday	Judith Viorst	E	• Number Sense • Measurement
Alice in Pasta Land: A Math Adventure	Alexander Wright	E	• Number Sense
Amanda Bean's Amazing Dream	Marilyn Burns	E	• Number Sense
Arthur's Funny Money	Lillian Hoban	E	• Measurement
Bad Luck Brad	Barbara deRubertis	E	• Data Analysis and Probability
Bear's New Year Party	Paul P. Lewis	E	• Number Sense • Measurement
Benny's Pennies	Pat Brisson	E	• Measurement
Betcha	Stuart J. Murphy	E	• Number Sense • Geometry
Bigger, Better, BEST!	Stuart J. Murphy	E	• Measurement
Captain Invincible and the Space Shapes	Stuart J. Murphy	E	• Geometry
Carrie Measures Up	Linda Williams Abner	E	• Measurement
Chickens on the Move	P. Pollack/M. Belviso	E	• Measurement
Clean Sweep Campers	Lucille Recht Penner	E	• Number Sense
Count on Pablo	Barbara deRubertis	E	• Number Sense • Geometry
Dave's Down to Earth Rock Shop	Stuart J. Murphy	E	• Number Sense
Deena's Lucky Penny	Barbara deRubertis	E	• Measurement
Dinosaur Deals	Stuart J. Murphy	E	• Number Sense
Divide and Ride	Stuart J. Murphy	E	• Number Sense
Domino Addition	Lynette Long	E	• Number Sense
Each Orange Had 8 Slices	Paul Giganti	E	• Number Sense
Esio Triot	Roald Dahl	E	• Number Sense • Math Process Skills
Even Steven and Odd Todd	Kathyrn Cristaldi	E	• Number Sense • Algebraic Thinking
Everybody Wins	Sheila Bruce	E	• Number Sense
Henry's Important Date	Robert Quackenbush	E	• Data Analysis
Hershey's Fractions Book	Jerry Pallotta	E	• Number Sense
Hershey's Subtraction Book	Jerry Pallotta	E	• Number Sense
How Big Is a Foot?	Rolf Myller	E	• Measurement
How Many Feet? How Many Tails?	Marilyn Burns	E	• Number Sense • Algebraic Thinking
How Many Snails? A Counting Book	Paul Giganti	E	• Number Sense

TABLE 6.1: MATHEMATICS LITERATURE ALIGNED TO MATHEMATICS CONTENT			
NAME OF BOOK	**AUTHOR**	**LEVEL***	**MATH CONTENT**
*** E= ELEMENTARY M= MIDDLE S= SENIOR HIGH**			
How Tall How Short How Far Away	David A. Adler	E	• Measurement • Data Analysis and Probability
Inch by Inch	Leo Lionni	E	• Measurement
Inchworm and a Half	Elinor J. Pinczes	E	• Measurement
Insectopedia	Douglas Forian	E	• Geometry
Is a Blue Whale the Biggest Thing There Is?	Robert E. Well	E	• Measurement
It Was Halloween Night	Grace Maccorone	E	• Geometry • Math Process Skills
It's About Time, Max	Kitty Richards	E	• Measurement
Jelly Beans for Sale	Bruce McMillan	E	• Number Sense • Measurement
Keep Your Distance	Gail Herman	E	• Measurement
Kitten Castle	M. Friedman/E. Weiss	E	• Measurement • Geometry
Lemonade for Sale	Stuart J. Murphy	E	• Data Analysis
Less Than Zero	Stuart J. Murphy	E	• Number Sense
Let's Fly a Kite	Stuart J. Murphy	E	• Geometry
Lights Out!	Lucille Recht Penner	E	• Number Sense
Lulu's Lemonade	Barbara deRubertis	E	• Measurement
Make Four Million Dollars by Next Thursday	Stephen Manes	E	• Measurement
Math Fair Blues	Sue Kassirer	E	• Measurement
Me and the Measure of Things	Joan Sweeney	E	• Measurement
Mental Math Challenges	Michael Lobosco	E	• Math Process Skills
Midnight Math	Peter Ledwon	E	• Math Process Skills
Moira's Birthday	Robert Munsch	E	• Number Sense • Measurement
More M&M's Math	Barbara B. McGrath	E	• Number Sense
Mrs. Fitz's Flamingos	Kevin McCloskey	E	• Number Sense
My Full Moon is Square	Elinor J. Pinczes	E	• Geometry
My Rows and Piles of Coins	Tololwa M. Mollel	E	• Measurement
No Fair	Caren Holtzman	E	• Data Analysis
Not Enough Room	Joanne Rocklin	E	• Geometry
One Hundred Hungry Ants	Elinor Pinczes	E	• Number Sense
One Moose, Twenty Mice	Clare Beaton	E	• Number Sense
Only One	Marc Harshman	E	• Number Sense
Picking Peas for Penny	Angela Shelf Madearis	E	• Measurement • Math Process Skills
Pigs Will Be Pigs	Amy Axelrod	E	• Measurement • Math Process Skills
Pizza Pizzazz	Carol A. Losi	E	• Number Sense
Play Date	Rosa Santos	E	• Measurement

TABLE 6.1: MATHEMATICS LITERATURE ALIGNED TO MATHEMATICS CONTENT			
NAME OF BOOK	AUTHOR	LEVEL*	MATH CONTENT
* E= ELEMENTARY M= MIDDLE S= SENIOR HIGH			
Probably Pistachio	Stuart J. Murphy	E	• Data Analysis
Ready, Set, HOP!	Stuart J. Murphy	E	• Number Sense
Room for Ripley	Stuart J. Murphy	E	• Measurement
Sea Squares	Joy N. Hulme	E	• Number Sense • Algebraic Thinking
Seven Blind Mice	Ed Young	E	• Algebraic Thinking
Shape Up! Fun with Triangles and Other Polygons	David A. Adler	E	• Measurement • Geometry
Six Dinner Sid	Inga Moore	E	• Number Sense • Math Process Skills
Skittles Riddles Math	Barbara B. McGrath	E	• Number Sense
Spiders Spin Webs	Yvonne Winer	E	• Geometry
Stacks of Trouble	Martha F. Brenner	E	• Number Sense • Data Analysis
Stay in Line	Teddy Slatter	E	• Number Sense • Algebraic Thinking
Super Sand Castle Saturday	Stuart J. Murphy	E	• Measurement
Super, Super, Superwords	Bruce McMillan	E	• Math Process Skills
Ten Black Dots	Donald Crews	E	• Number Sense
Ten Sly Piranhas	William Wise	E	• Number Sense • Measurement
The 100-Pound Problem	Jennifer Dussling	E	• Measurement • Math Process Skills
The 12 Circus Rings	Seymour Chwast	E	• Number Sense
The 500 Hats of Bartholomew Cubbins	Dr. Seuss	E	• Number Sense • Measurement • Algebraic Thinking • Math Process Skills
The Bedspread	Sylvia Fair	E	• Geometry
The Biggest Fish	Sheila Keenan	E	• Number Sense • Measurement
The Blast Off Kid	Laura Driscoll	E	• Number Sense
The Button Box	Margarette Reid	E	• Algebraic Thinking
The Case of the Missing Birthday Cake	Joanne Rocklin	E	• Number Sense • Algebraic Thinking • Math Process Skills
The Case of the Shrunken Allowance	Joanne Rocklin	E	• Number Sense • Measurement • Math Process Skills
The Coin Counting Book	Rozanne L. Williams	E	• Measurement
The Fraction Family Heads West	Marti Dryk	E	• Number Sense • Measurement
The Great Divide	Dayle Ann Dodds	E	• Number Sense
The Hershey's Fraction Book	J. Pallotta/R. Bolster	E	• Number Sense
The Hershey's Multiplication Book	Jerry Pallotta	E	• Number Sense

TABLE 6.1: MATHEMATICS LITERATURE ALIGNED TO MATHEMATICS CONTENT			
NAME OF BOOK	**AUTHOR**	**LEVEL***	**MATH CONTENT**
*** E= ELEMENTARY M= MIDDLE S= SENIOR HIGH**			
The Icky Bug Counting Book	Jerry Pallotto	E	• Number Sense • Measurement
The Long Wait	Annie Cobb	E	• Number Sense • Algebraic Thinking
The M&M's Chocolate Candies Counting Books	Barbara B. McGrath	E	• Number Sense
The M&M's Color Pattern Book	Barbara B. McGrath	E	• Algebraic Thinking
The Napping House	Audrey Wood	E	• Measurement
The Penny Pot	Stuart J. Murphy	E	• Number Sense
The Silly Story of Goldilocks and the Three Squares	Grace Maccarone	E	• Geometry
The Sundae Scoop	Stuart J. Murphy	E	• Combinations
The Village of Round and Square Houses	Ann Grifalcono	E	• Measurement • Geometry
Three Pigs, One Wolf, Seven Magic Shapes	Grace Maccorone	E	• Geometry
Tiger Math: Learning to Graph from a Baby Tiger	Anne Whitehead Nagda	E	• Data Analysis • Math Process Skills
Tightwad Tod	Daphne Skinner	E	• Measurement
Too Many Kangaroo Things to Do!	Stuart J. Murphy	E	• Number Sense
Two of Everything	Lily Toy Hong	E	• Number Sense • Measurement
Two Ways to Count to Ten	Ruby Dee	E	• Number Sense • Math Process Skills
What Time Is It?	Sheila Keenan	E	• Measurement
What's a Pair? What's a Dozen?	Stephen R. Swinburne	E	• Number Sense • Algebraic Thinking
Who Sank the Boat?	Pamela Allen	E	• Measurement
Who's Got Spots?	Linda Aber	E	• Data Analysis
A Cloak for the Dreamer	Aileen Friedman	EM	• Number Sense • Geometry and Measurement
A Collection for Kate	Barbara deRubertis	EM	• Number Sense • Math Process Skills
A Day with No Math	Marilyn Kaye	EM	• Number Sense • Math Process Skills
A Place for Zero	Angeline S. LoPresti	EM	• Number Sense
Ben Franklin and the Magic Squares	Frank Murphy	EM	• Number Sense
Casey at the Bat	Patricia Polacco	EM	• Number Sense • Geometry and Measurement
Cloudy with a Chance of Meatballs	J. Barrett/R. Barrett	M	• Data Analysis and probability
Counting on Frank	Rod Clement	EM	• Number Sense

TABLE 6.1: MATHEMATICS LITERATURE ALIGNED TO MATHEMATICS CONTENT			
NAME OF BOOK	AUTHOR	LEVEL*	MATH CONTENT
* E= ELEMENTARY M= MIDDLE S= SENIOR HIGH			
Cut Down to Size at High Noon	Scott Sundbt	EM	• Number Sense
Flat Stanley	Jeff Brown	EM	• Geometry • Math Process Skills
Jim and the Beanstalk	Raymond Briggs	EM	• Number Sense • Measurement
Millions to Measure	David Schwartz	EM	• Number Sense • Geometry and Measurement
Once Upon a Dime	Nancy Kelly Allen	EM	• Number Sense • Geometry and Measurement • Math Process Skills
Quilt of Dreams	Mindy Dwyer	EM	• Geometry and Measurement
Sam Johnson and the Blue Ribbon Quilt	Lisa Campbell Ernst	EM	• Geometry and Measurement
Sideways Stories from Wayside School	Louis Sachar	EM	• Number Sense • Geometry and Measurement • Math Process Skills
Spaghetti and Meatballs for All	Marilyn Burns	EM	• Measurement • Geometry • Math Process Skills
The Doorbell Rang	Pat Hutchins	EM	• Number Sense
The Dragon's Scales	Sarah Albee	EM	• Geometry and Measurement
The Greedy Triangle	Marilyn Burns	EM	• Geometry • Algebraic Thinking
The Hundred Penny Box	Sharon Bell Mathis	EM	• Geometry and Measurement • Math Process Skills
The King's Chessboard	David Birch	EM	• Geometry and Measurement
The King's Commissioners	Aileen Friedman	EM	• Number Sense
Twizzlers Percentages Book	Jerry Pallotta	EM	• Number Sense
Twizzlers Shapes and Patterns	Jerry Pallotta	EM	• Geometry and Measurement
X Marks the Spot	Lucille Recht Penner	EM	• Geometry and Measurement • Data Analysis
A Gebra named Al	Wendy Isdell	MS	• Numbers Sense • Geometry and Measurement
A Higher Geometry	Sharelle Bryars	MS	• Geometry and Measurement • Math Process Skills
Chasing Vermeer	Blue Balliet	MS	• Geometry and Measurement • Math Process Skills

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NAME OF BOOK	AUTHOR	LEVEL*	MATH CONTENT
* E= ELEMENTARY M= MIDDLE S= SENIOR HIGH			
Conned Again, Watson!	Colin Bruce	MS	• Number Sense • Data Analysis and Probability • Math Process Skill
Different Kind of Darkness	David Langford	MS	• Number Sense • Geometry and Measurement
Hannah Divided	Adele Griffin	MS	• Number Sense
Jayden's Rescue	Vladimir Tumanov	MS	• Number Sense • Geometry and Measurement
Lunch Money	Andrew Clements	MS	• Number Sense • Math Process Skills
Midnighters: The Secret Hour	Scott Westerfeld	MS	• Number Sense • Math Process Skills
Millions	Frank Cottrelle Boyce	MS	• Number Sense • Math Process Skills
Mind Games	Jeanne Marie Grunwell	MS	• Data Analysis and Probability • Math Process Skills
The Number Devil	Hans Magnus Enzensberger	MS	• Number Sense • Geometry and Measurement • Algebraic Thinking • Data Analysis and Probability Math Process Skills
The Wright 3	Blue Balliett	MS	• Number Sense • Geometry and Measurement • Math Process Skills
A Grain of Rice	Helen Clara Pittman	EMS	• Number Sense • Algebraic Thinking • Math Process Skills
A Light in The Attic	Shel Silverstein	EMS	• Math Process Skills • Math Process Skills
Among the Odds and Evens	Priscilla Turner	EMS	• Number Sense
Anno's Counting House	Mitsumasa Anno	EMS	• Number Sense
Anno's Magic Seeds	Mitsumasa Anno	EMS	• Number Sense
Anno's Mysterious Multiplying Jar	Mitsumasa Anno	EMS	• Number Sense
Arrow to the Sun	Gerald McDermott	EMS	• Geometry and Measurement
Grandfather Tang's Story	Ann Tompert	EMS	• Geometry and Measurement
How Much, How Many, How Heavy, How Long, How Tall is 1,000?	Helen Nolan	EMS	• Number Sense • Geometry and Measurement

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NAME OF BOOK	**AUTHOR**	**LEVEL***	**MATH CONTENT**
*** E= ELEMENTARY M= MIDDLE S= SENIOR HIGH**			
If You Made A Million	David Schwartz	EMS	• Geometry and Measurement • Math Process Skills
Jumanji	Chris Van Allsburg	EMS	• Data Analysis and Probability
Marvelous Math	Lee Bennett Hopkins	EMS	• Math Process Skills
Math Curse	Jon Scieszka	EMS	• Math Process Skills
Math for All Seasons	Greg Tang	EMS	• Math Process Skills
Mr. Archimedes Bath	Pamela Allen	EMS	• Geometry and Measurement • Algebraic Thinking • Data Analysis and Probability
On Beyond a Million	David M. Schwartz	EMS	• Number Sense • Math Process Skills
One Grain of Rice	Demi	EMS	• Number Sense • Data Analysis and Probability
Short Stories from the History of Mathematics	Robert E. Knauff	EMS	• Math Process Skills
Sir Cumference and the Dragon of Pi	Cindy Neuschwander	EMS	• Measurement • Geometry
Sir Cumference and the First Round Table	Cindy Neuschwander	EMS	• Geometry and Measurement
Sir Cumference and the Great Knight of Angleland	Cindy Neuschwander	EMS	• Geometry and Measurement
Sir Cumference and the Sword in the Cone	Cindy Neuschwander	EMS	• Geometry and Measurement
The Fly on the Ceiling	Julie Glass	EMS	• Geometry and Measurement
The Grapes of Math	Greg Tang	EMS	• Number Sense • Math Process Skills
The Great Book of Optical Illusions	Gyles Brandreth	EMS	• Math Process Skills
The Librarian Who Measured the Earth	Kathyrn Lasky	EMS	• Geometry and Measurement • Math Process Skills
The Mathematical Magpie	Clifton Fadiman	EMS	• Math Process Skills
The Moon Quilt	Sunny Warner	EMS	• Geometry and Measurement
The Name Quilt	Farrar, Strauss, Giroux	EMS	• Geometry and Measurement
The Patchwork Quilt	Valerie Flournoy	EMS	• Geometry and Measurement
The Phantom Tollbooth	Norton Juster	EMS	• Number Sense • Geometry and Measurement • Math Process Skills
The Promise Quilt	Candice F. Ransom	EMS	• Geometry

TABLE 6.1: MATHEMATICS LITERATURE ALIGNED TO MATHEMATICS CONTENT			
NAME OF BOOK	**AUTHOR**	**LEVEL***	**MATH CONTENT**
*** E= ELEMENTARY M= MIDDLE S= SENIOR HIGH**			
The Toothpaste Millionaire	Jean Merrill	EMS	• Number Sense • Geometry and Measurement • Math Process Skills
What's Next Nina?	Sue Kassirer	EMS	• Algebraic Thinking
Where the Sidewalk Ends	Shel Silverstein	EMS	• Algebraic Thinking • Math Process Skills

Chapter 7

ASSESSMENT

INTRODUCTION

Teachers assess students for two reasons: (1) to gather evidence of student achievement to inform instructional decisions and (2) to motivate learning. Assessment helps answer the following questions: *"How can I communicate my expectations about my students' mathematical understanding and the quality of their work? What do I think my students understand and what do they think they understand? Does the task or activity I am using provide my students the opportunity to demonstrate what they know? Is the activity I am using addressing the mathematics I think it addresses? What activity should I use next?" and "How can I communicate to my students and their parents what I think they understand?"* With the challenges faced by teachers in today's classrooms, assessment supports the mathematical development of our students and provides the teacher with data about their students' mathematical learning, communicates information and expectations to students, parents, other teachers, and guides, improves, and provides further opportunities for instruction.

TOOLS FOR ASSESSMENT

The following assessment tools will assist teachers in assessing students' mathematical power.

Authentic Assessment

Authentic assessment is any type of assessment that requires students to demonstrate skills and competencies that realistically represent problems and situations likely to be encountered in daily life. Students are required to produce ideas, to integrate knowledge, and to complete tasks that have real-world applications. Such approaches require the person making the assessment to use human judgment in the application of criterion-referenced standards.

Authentic assessment not only measures what a student knows but also what a student can do in a real world context. In other words, students learn how to apply their skills to authentic tasks and projects. Authentic assessment does not encourage rote learning and passive test-taking. Instead, it focuses on students' analytical skills; ability to integrate what they learn; creativity; ability to work collaboratively; and written and oral expression skills. It values the learning process as much as the finished product. Authentic assessment is a contrast to traditional educational testing and evaluation, which focuses on reproducing information such as memorized definitions, terms, or formulas. There are five major types of *performance samples*—learning activities that encourage students to use higher-order thinking skills. These are: performance assessment, portfolios, self-assessment, short investigations and open-response questions.

Performance Assessment

A performance-based assessment system is an integrated approach to education that underpins the culture of a school. Performance-based assessment incorporates curriculum, instruction, high standards, a variety of student work over a period of time, continuous assessment and professional development. It focuses on the ability of teachers (a) to present new ideas so they connect to what students already know, (b) to provide tasks that actively engage students in critical thinking and solving problems, (c) to plan instruction based on knowledge of how students differ in their approaches to learning, and (d) to create a learning environment in which learning by all students is valued.

Tasks used in performance-based assessment include essays, oral presentations, open-ended problems, hands-on problems, real-world simulations and other authentic tasks. Such tasks are concerned with problem solving and understanding. Just like standardized achievement tests, some performance-based assessments also have norms, but the approach and philosophy are much different than traditional standardized tests. The underlying concept is that the student should produce evidence of accomplishment of curriculum goals which can be maintained for later use as a collection of evidence to demonstrate achievement, and perhaps also the teacher's efforts to educate the child.

Performance-based assessment is sometimes characterized as assessing real life, with students assuming responsibility for self-evaluation. Testing is "done" to a student, while performance assessment is done by the student as a form of self-reflection and self-assessment. The overriding philosophy of performance-based assessment is that teachers will have access to information that can provide ways to improve achievement, demonstrate exactly what a student does or does not understand, relate learning experiences to instruction, and combine assessment with teaching.

Performance assessments test students' ability to use skills in a variety of authentic contexts. They frequently require students to work collaboratively and to apply skills and concepts to solve complex problems. Short- and long-term tasks include such activities as:

- conducting a week-long science experiment and analyzing the results
- utilizing math skills to develop a cost estimate for groceries needed to feed a family of four for one week
- working with a team to prepare a position in a classroom debate
- writing, revising, and presenting a report to the class

Portfolios

A portfolio is a collection of student work done over a substantial period of time. This long-term perspective accounts for student improvement and teaches

students the value of self-assessment, editing, and revision. A student portfolio includes but is not limited to:

- student self-reflection and analysis of work completed
- journal entries and reflective writing
- group reports
- peer reviews
- artwork, diagrams, charts, and graphs
- student notes and outlines
- rough drafts and polished writing

Self-Assessment

Self-assessment requires students to evaluate their own participation, process, and products. Evaluative questions are the basic tools of self-assessment. Students give written or oral responses to questions such as:

- What was the most difficult part of this project for you
- What do you think you should do next?
- If you could do this task again, what would you do differently?
- What did you learn from this project?

Mathematical Investigations

Investigations ask students to experiment, hypothesize, measure, analyze, test, talk, write, explain, and justify their ideas. Investigations engage students in real mathematics.

Open-Response Questions

Open-response questions, like short investigations, present students with a stimulus and ask them to respond. Response includes:

- a brief written or oral answer
- a mathematical solution
- a drawing
- a diagram, chart, or graph

Many teachers find that authentic assessment is most successful when students know what teachers expect. For this reason, teachers should always clearly define standards and expectations. Educators often use rubrics, or established sets of criteria, to assess students' work.

DISTRICT AND STATE TESTING

District Interim Assessment

The District Interim Assessment Program is an integrated assessment system designed to help classroom teachers monitor their students' attainment of the curriculum benchmarks outlined in Florida's Next Generation Sunshine State Standards. The purpose of the Interim Assessment Program is to provide educators with meaningful and timely information about the academic achievement and needs of every student. The two components of the Interim Assessment Program are:

1. Interim Assessment tests - the tests will be administered two times a year (fall and winter) in grades 3 to 8, Algebra I and Geometry. The tests assess benchmarks within the Next Generation Sunshine State Standards and are aligned to the District's instructional pacing guides.
2. Benchmark Assessment Item Bank - The item bank provides high quality items that can be used by classroom teachers on an as-needed basis to monitor student progress after instruction or intervention has taken place.

Florida Comprehensive Assessment Test (FCAT 2.0) Mathematics and Florida End-of-Course (EOC) Assessments

The Florida Comprehensive Assessment Test® (FCAT), Florida Comprehensive Assessment Test® 2.0 (FCAT 2.0), and Florida End-of-Course (EOC) Assessments are components of Florida's effort to improve the teaching and learning of higher educational standards. The primary purpose of the FCAT and FCAT 2.0 criterion-referenced tests and EOC assessments is to assess student achievement of the high-order thinking skills represented in the Sunshine State Standards (SSS) and the Next Generation Sunshine State Standards (NGSSS) for Mathematics.

Assessment graduation requirements can be found in the tables on the following pages.

Florida High School Graduation Charts

Students Entering Grade Nine In 2010-11 School Year

Subject Area	Graduation Requirements	
	24-Credit Program	ACCEL Program/Diploma Designations
English/ Language Arts (ELA)	4 credits with major concentration in composition, reading for information, and literature (must pass the Grade 10 FCAT 2.0 Reading or earn a passing concordant score on the ACT or SAT)	**ACCEL Program (18 credits minimum)** • Physical education is not required • 3 elective credits • Online course is not required All other graduation requirements for a standard diploma must be met (per s. 1003.4282(3)(a)-(e), F.S.).
Mathematics	4 credits, one of which must be Algebra 1 or its equivalent and one of which must be geometry or its equivalent (Algebra 1 EOC results count 30% of the final course grade)	
Science	3 credits in science, two of which must have a laboratory component	**Scholar Designation** In addition to meeting the standard high school diploma requirements: • 1 credit in Algebra 2 • 1 credit in statistics or an equally rigorous mathematics course • Pass the Biology 1 EOC • 1 credit in chemistry or physics • 1 credit in a course equally rigorous to chemistry or physics • Pass the U.S. History EOC Assessment • 2 credits in the same world language • Earn at least one credit in AP, IB, AICE or a dual enrollment course.
Social Studies	• 1 credit in world history • 1 credit in U.S. history • .5 credit in U.S. government • .5 credit in economics (must include financial literacy)	
World Languages	Not required for high school graduation; required for admission into state universities	
Fine and Performing Arts, Speech and Debate, or Practical Arts	1 credit in fine or performing arts, speech and debate, or practical arts (eligible courses specified in the Florida Course Code Directory)	
Physical Education	1 credit in physical education to include the integration of health	
Industry Certification	Not required	**Merit Designation**
Electives	8 credits	In addition to meeting the standard high school diploma requirements: • Attain one or more industry certifications from the list established (per s. 1003.492, F.S.).
Grade Point Average (GPA)	Cumulative GPA of 2.0 on a 4.0 scale	

Special Notes: EOC, End-of-Course Assessment; AP, advanced placement; AICE, Advanced International Certificate of Education; IB, International Baccalaureate.

Students Entering Grade Nine In 2010-11 School Year

Section 1003.428, Florida Statutes (F.S.)

Students Entering Grade Nine In 2011-12 School Year

Subject Area	Graduation Requirements	
	24-Credit Program	ACCEL Program/Diploma Designations
English/ Language Arts (ELA)	4 credits with major concentration in composition, reading for information, and literature (must pass the Grade 10 FCAT 2.0 Reading or earn a passing concordant score on the ACT or SAT)	**ACCEL Program (18 credits minimum)** • Physical education is not required • 3 elective credits • Online course is not required All other graduation requirements for a standard diploma must be met (per s. 1003.4282(3)(a)-(e), F.S.).
Mathematics	4 credits, one of which must be Algebra 1 or its equivalent and one of which must be geometry or its equivalent (must pass Algebra 1 EOC to earn course credit; must take geometry EOC)	
Science	3 credits in science, two of which must have a laboratory component and one of which must be Biology 1 or an equivalent course or a series of courses (must take Biology 1 EOC)	**Scholar Designation** In addition to meeting the standard high school diploma requirements: • 1 credit in Algebra 2 • 1 credit in statistics or an equally rigorous mathematics course • Pass the Biology 1 EOC • 1 credit in chemistry or physics • 1 credit in a course equally rigorous to chemistry or physics • Pass the U.S. History EOC Assessment • 2 credits in the same world language • Earn at least one credit in AP, IB, AICE or a dual enrollment course.
Social Studies	• 1 credit in world history • 1 credit in U.S. history • .5 credit in U.S. government .5 credit in economics (must include financial literacy)	
World Languages	Not required for high school graduation, but required for admission into state universities	
Fine and Performing Arts, Speech and Debate, or Practical Arts	1 credit in fine or performing arts, speech and debate, or practical arts (eligible courses specified in the Florida Course Code Directory)	
Physical Education	1 credit in physical education to include the integration of health	
Industry Certification	Not required	**Merit Designation** In addition to meeting the standard high school diploma requirements: • Attain one or more industry certifications from the list established (per s. 1003.492, F.S.).
Electives	8 credits	
Grade Point Average (GPA)	Cumulative GPA of 2.0 on a 4.0 scale	
Online Course	1 course within the 24 credits	

Special Notes: EOC, End-of-Course Assessment; AP, advanced placement; AICE, Advanced International Certificate of Education; IB, International Baccalaureate.

Students Entering Grade Nine In 2011-12 School Year

Section 1003.428, Florida Statutes (F.S.)

Students Entering Grade Nine In 2012-13 School Year

Subject Area	Graduation Requirements	
	24-Credit Program	ACCEL Program/Diploma Designations
English/ Language Arts (ELA)	4 credits with major concentration in composition, reading for information, and literature (must pass the Grade 10 FCAT 2.0 Reading or earn a passing concordant score on the ACT or SAT)	**ACCEL Program (18 credits minimum)** • Physical education is not required • 3 elective credits • Online course is not required All other graduation requirements for a standard diploma must be met (per s. 1003.4282(3)(a)-(e), F.S.).
Mathematics	4 credits, one of which must be Algebra 1 or its equivalent and one of which must be geometry or its equivalent (must pass Algebra 1 EOC to earn course credit; must take geometry EOC)	
Science	3 credits in science, two of which must have a laboratory component and one of which must be Biology 1 or an equivalent course or a series of courses (must take Biology 1 EOC)	**Scholar Designation** In addition to meeting the standard high school diploma requirements: • Pass the ELA Grade 11 Common Core assessment once implemented • 1 credit in Algebra 2 • 1 credit in statistics or an equally rigorous mathematics course • Pass the Biology 1 EOC • 1 credit in chemistry or physics • 1 credit in a course equally rigorous to chemistry or physics • Pass the U.S. History EOC Assessment • 2 credits in the same world language • Earn at least one credit in AP, IB, AICE or a dual enrollment course.
Social Studies	• 1 credit in world history • 1 credit in U.S. history (U.S. history EOC results count 30 % of the final course grade) • .5 credit in U.S. government • .5 credit in economics (must include financial literacy)	
World Languages	Not required for high school graduation, but required for admission into state universities	
Fine and Performing Arts, Speech and Debate, or Practical Arts	1 credit in fine or performing arts, speech and debate, or practical arts (eligible courses specified in the Florida Course Code Directory)	
Physical Education	1 credit in physical education to include the integration of health	**Merit Designation** In addition to meeting the standard high school diploma requirements: • Attain one or more industry certifications from the list established (per s. 1003.492, F.S.).
Industry Certification	Not required	
Electives	8 credits	
Grade Point Average (GPA)	Cumulative GPA of 2.0 on a 4.0 scale	
Online Course	1 course within the 24 credits	

Special Notes: EOC, End-of-Course Assessment; AP, advanced placement; AICE, Advanced International Certificate of Education; IB, International Baccalaureate.

Students Entering Grade Nine In 2012-13 School Year

Section 1003.428, Florida Statutes (F.S.)

Students Entering Grade Nine In 2013-14 School Year

Subject Area	Graduation Requirements	
	24-Credit Program	ACCEL Program/Diploma Designations
English/ Language Arts (ELA)	• 4 credits in ELA 1, 2, 3, 4 • ELA honors, AP, AICE, IB, and dual enrollment courses may satisfy this requirement (must pass the Grade 10 ELA Common Core assessment; must take ELA Grade 11 Common Core assessment when implemented)	**ACCEL Program (18 credits minimum)** • Physical education is not required • 3 elective credits • Online course is not required • All other graduation requirements for a standard diploma must be met (per s. 1003.4282(3)(a)-(e), F.S.).
Mathematics	• 4 credits, one of which must be Algebra 1 and one of which must be geometry (Algebra 1 EOC results count 30% of the final course grade; must pass to earn a standard diploma; geometry EOC results count 30% of the final course grade) • If Algebra 2 is selected, Algebra 2 Common Core assessment results count 30% of the final course grade when implemented • Industry certification courses that lead to college credit may substitute for up to 2 mathematics credits	**Scholar Designation** In addition to meeting the standard high school diploma requirements: • Pass the ELA Grade 11 Common Core assessment once implemented • 1 credit in Algebra 2 (must pass Algebra 2 EOC) • 1 credit in statistics or an equally rigorous mathematics course • Pass the Biology 1 EOC • 1 credit in chemistry or physics • 1 credit in a course equally rigorous to chemistry or physics • Pass the U.S. History EOC Assessment • 2 credits in the same world language • Earn at least one credit in AP, IB, AICE or a dual enrollment course.
Science	• 1 credit in Biology 1 (Biology EOC results count 30% of the final course grade) • 2 credits in equally rigorous science courses • 2 of the 3 required science credits must have a laboratory component • Industry certification courses that lead to college credit may substitute for up to 1 science credit	
Social Studies	• 1 credit in world history • 1 credit in U.S. history (U.S. history EOC results count 30% of the final course grade) • .5 credit in U.S. government .5 credit in economics (must include financial literacy)	**Merit Designation** In addition to meeting the standard high school diploma requirements: • Attain one or more industry certifications from the list established (per s. 1003.492, F.S.).
World Languages	Not required for high school graduation, but required for admission into state universities	
Fine and Performing Arts, Speech and Debate, or Practical Arts	1 credit in fine or performing arts, speech and debate, or practical arts (eligible courses specified in the Florida Course Code Directory)	
Physical Education	1 credit in physical education to include the integration of health	
Industry Certification	Not required	
Electives	8 credits	
Grade Point Average (GPA)	Cumulative GPA of 2.0 on a 4.0 scale	
Online Course	1 course within the 24 credits, excluding a driver education course	

Special Notes: EOC, End-of-Course Assessment; AP, advanced placement; AICE, Advanced International Certificate of Education; IB, International Baccalaureate.

Students Entering Grade Nine In 2013-14 School Year

Chapter 8

FCAT RESOURCES

FCAT 2.0 RESOURCES

The best way to prepare students for success on the FCAT 2.0 and the End-of-Course assessments is to provide high quality, data-driven, standards-based instruction. To this end, structures and strategies for effective instruction students are delineated in Chapter 3 of this document. Professional learning, as described in Chapter 9, provides an additional avenue for teachers to increase their knowledge of content and pedagogy. In addition, the documents in this chapter, adapted from the Florida Department of Education website, provide specific information that will aide teachers in preparing students for the FCAT 2.0 and End-of-Course assessments.

Curriculum and Instruction (Mathematics) provides various resources to support schools in preparing for the FCAT 2.0 and End-of-Course assessments.

The documents contained in this chapter include student, teacher and parent tips, FCAT Glossaries and list of assessed benchmarks by grade span

WHAT EVERY TEACHER SHOULD KNOW ABOUT THE MATHEMATICS FCAT 2.0 AND END-OF-COURSE ASSESSMENTS

- Use questions that require students to explain their answers. Make sure when responding that the answer is concise and scientifically sound.
- Use open-ended question formats that are similar to the Math FCAT 2.0 and End-of-Course assessments format. Classroom-developed questions should be Cognitive Level II.
- Rate and grade students' work using the Math FCAT 2.0 and End-of-Course assessments Item Specifications. Using the FCAT 2.0 and End-of-Course assessments Item Specifications documents to guide you in scoring papers, reports, test questions, projects, etc., students will develop a clear understanding of the levels of performance expected of them on the FCAT 2.0 and End-of-Course assessments.
- Use and develop questions for class discussions and tests that are of the same cognitive rigor as those on FCAT 2.0 and End-of-Course assessments Item Specifications.
- Require students to collect, analyze and interpret data frequently and incorporate the Nature of Science in all activities.
- Whenever possible, include graphics on classroom-developed assessments, such as illustrations, flow charts, data tables, and graphs.

Source: Florida Department of Education

HINTS FOR STUDENTS TAKING THE FCAT 2.0 MATHEMATICS TEST

Here are some hints to help you do your best when you take the FCAT mathematics test. Keep these hints in mind when you answer the sample questions.

- Learn how to answer each kind of question. FCAT 2.0 and End-of-Course assessments have two types of questions: FCAT 2.0: multiple-choice and gridded-response; End-of-Course assessments multiple-choice and fill-in response.
- Read each problem carefully and think about ways to solve the problem before you try to answer the question.
- Answer the questions you are sure about first. If a question seems too difficult, skip it and go back to it later.
- Be sure to fill in the answer bubbles correctly. Do not make any stray marks around answer spaces.
- Think positively. Some problems may seem hard to you, but you may be able to figure out what to do if you read each question carefully.
- When you have finished each problem, reread it to make sure your answer is reasonable.
- Relax. Some people get nervous about tests. It's natural. Just do your best.

TABLE 8.3a: NGSSS BENCHMARK ASSESSESD AT GRADES 3-5 Source: Florida Department of Education FCAT 2.0 Item Specifications		
GRADE 3	**GRADE 4**	**GRADE 5**
MC: MULTIPLE-CHOICE; GR: GRIDDED-RESPONSE		
Big Idea 1: Develop understandings of multiplication and division and strategies for basic multiplication facts and related division facts.	**Big Idea 1:** Develop quick recall of multiplication facts and related division facts and fluency with whole number multiplication.	**Big Idea 1:** Develop an understanding of and fluency with division of whole numbers.
MA.3.A.1.1 Model multiplication and division including problems presented in context: repeated addition, multiplicative comparison, array, how many combinations, measurement, and partitioning. **MC**	**MA.4.A.1.1** Use and describe various models for multiplication in problem-solving situations, and demonstrate recall of basic multiplication and related division facts with ease. Assessed with MA.4.A.1.2	**MA.5.A.1.1** Describe the process of finding quotients involving multi-digit dividends using models, place value, properties and the relationship of division to multiplication. **MC, GR**
MA.3.A.1.2 Solve multiplication and division fact problems by using strategies that result from applying number properties. **MC**	**MA.4.A.1.2** Multiply multi-digit whole numbers through four digits fluently, demonstrating understanding of the standard algorithm, and checking for reasonableness of results, including solving real-world problems. (Also assesses MA.4.A.1.1.) **MC, GR**	**MA.5.A.1.2** Estimate quotients or calculate them mentally depending on the context and numbers involved. Assessed with MA.5.A.1.4
MA.3.A.1.3 Identify, describe, and apply division and multiplication as inverse operations. **MC**		**MA.5.A.1.3** Interpret solutions to division situations including those with remainders depending on the context of the problem. Assessed with MA.5.A.1.4
		MA.5.A.1.4 Divide multi-digit whole numbers fluently, including solving real-world problems, demonstrating understanding of the standard algorithm and checking the reasonableness of results. (Also assesses MA.5.A.1.2 and MA.5.A.1.3.) **MC, GR**

Prior Knowledge: Items may require the student to apply mathematical knowledge described in NGSSS benchmarks from lower grades; however, the benchmarks from lower grades will not be assessed in isolation.

TABLE 8.3a: NGSSS BENCHMARK ASSESSESD AT GRADES 3-5 Source: Florida Department of Education FCAT 2.0 Item Specifications		
GRADE 3	**GRADE 4**	**GRADE 5**
MC: MULTIPLE-CHOICE; GR: GRIDDED-RESPONSE		
Big Idea 2: Develop an understanding of fractions and fraction equivalence.	**Big Idea 2:** Develop an understanding of decimals, including the connection between fractions and decimals.	**Big Idea 2:** Develop an understanding of and fluency with addition and subtraction of fractions and decimals.
MA.3.A.2.1 Represent fractions, including fractions greater than 1, using area, set and linear models. **MC**	**MA.4.A.2.1** Use decimals through the thousandths place to name numbers between whole numbers. Assessed with MA.4.A.2.3 and MA.4.A.2.4	**MA.5.A.2.1** Represent addition and subtraction of decimals and fractions with like and unlike denominators using models, place value or properties. (Also assesses MA.5.A.6.1.) **MC, GR**
MA.3.A.2.2 Describe how the size of the fractional part is related to the number of equal sized pieces in the whole. Assessed with MA.3.A.2.3	**MA.4.A.2.2** Describe decimals as an extension of the base-ten number system. Assessed with MA.4.A.2.3 and MA.4.A.2.4	**MA.5.A.2.2** Add and subtract fractions and decimals fluently and verify the reasonableness of results, including in problem situations. (Also assesses MA.5.A.2.3 and MA.5.A.6.1.) **MC, GR**
MA.3.A.2.3 Compare and order fractions, including fractions greater than one, using models and strategies. (Also assesses MA.3.A.2.2.) **MC**	**MA.4.A.2.3** Relate equivalent fractions and decimals with and without models, including locations on a number line. (Also assesses MA.4.A.2.1 and MA.4.A.2.2.) **MC, GR**	**MA.5.A.2.3** Make reasonable estimates of fraction and decimal sums and differences, and use techniques for rounding. Assessed with MA.5.A.2.2
MA.3.A.2.4 Use models to represent equivalent fractions, including fractions greater than 1, and identify representations of equivalence. **MC**	**MA.4.A.2.4** Compare and order decimals, and estimate fraction and decimal amounts in real-world problems. (Also assesses MA.4.A.2.1 and MA.4.A.2.2.) **MC**	**MA.5.A.2.4** Determine the prime factorization of numbers. (Also assesses MA.5.A.6.1.) **MC**

Prior Knowledge: Items may require the student to apply mathematical knowledge described in NGSSS benchmarks from lower grades; however, the benchmarks from lower grades will not be assessed in isolation.

TABLE 8.3a: NGSSS BENCHMARK ASSESSESD AT GRADES 3-5 Source: Florida Department of Education FCAT 2.0 Item Specifications		
GRADE 3	**GRADE 4**	**GRADE 5**
MC: MULTIPLE-CHOICE; GR: GRIDDED-RESPONSE		
Big Idea 3: Describe and analyze properties of two-dimensional shapes.	**Big Idea 3:** Develop an understanding of area and determine the area of two-dimensional shapes.	**Big Idea 3:** Describe three-dimensional shapes and analyze their properties, including volume and surface area.
MA.3.G.3.1 Describe, analyze, compare and classify two-dimensional shapes using sides and angles–including acute, obtuse, and right angles–and connect these ideas to the definition of shapes. **MC**	**MA.4.G.3.1** Describe and determine area as the number of same-sized units that cover a region in the plane, recognizing that a unit square is the standard unit for measuring area. **MC**	**MA.5.G.3.1** Analyze and compare the properties of two-dimensional figures and three-dimensional solids (polyhedra), including the number of edges, faces, vertices, and types of faces. **MC**
MA.3.G.3.2 Compose, decompose, and transform polygons to make other polygons, including concave and convex polygons with three, four, five, six, eight, or ten sides. **MC**	**MA.4.G.3.2** Justify the formula for the area of the rectangle "area = base × height". **MC**	**MA.5.G.3.2** Describe, define and determine surface area and volume of prisms by using appropriate units and selecting strategies and tools. **MC, GR**
MA.3.G.3.3 Build, draw and analyze two-dimensional shapes from several orientations in order to examine and apply congruence and symmetry. **MC**	**MA.4.G.3.3** Select and use appropriate units, both customary and metric, strategies, and measuring tools to estimate and solve real-world area problems. **MC, GR**	
Supporting Idea: Algebra		
MA.3.A.4.1 Create, analyze, and represent patterns and relationships using words, variables, tables and graphs. **MC**	**MA.4.A.4.1** Generate algebraic rules and use all four operations to describe patterns, including nonnumeric growing or repeating patterns. **MC, GR**	**MA.5.A.4.1** Use the properties of equality to solve numerical and real world situations. **MC, GR**
	MA.4.A.4.2 Describe mathematics relationships using expressions, equations, and visual representations. **MC, GR**	**MA.5.A.4.2** Construct and describe a graph showing continuous data, such as a graph of a quantity that changes over time. Assessed with MA.5.S.7.1 and MA.5.S.7.2
	MA.4.A.4.3 Recognize and write algebraic expressions for functions with two operations. **MC**	

Prior Knowledge: Items may require the student to apply mathematical knowledge described in NGSSS benchmarks from lower grades; however, the benchmarks from lower grades will not be assessed in isolation.

TABLE 8.3a: NGSSS BENCHMARK ASSESSESD AT GRADES 3-5 Source: Florida Department of Education FCAT 2.0 Item Specifications		
GRADE 3	**GRADE 4**	**GRADE 5**
MC: MULTIPLE-CHOICE; GR: GRIDDED-RESPONSE		
Supporting Idea: Geometry and Measurement		
MA.3.G.5.1 Select appropriate units, strategies and tools to solve problems involving perimeter. **MC**	**MA.4.G.5.1** Classify angles of two-dimensional shapes using benchmark angles (i.e. 45°, 90°, 180°, and 360°. **MC**	**MA.5.G.5.1** Identify and plot ordered pairs on the first quadrant of the coordinate plane. **MC**
MA.3.G.5.2 Measure objects using fractional parts of linear units such as $\frac{1}{2}$, $\frac{1}{4}$, and $\frac{1}{10}$. **MC**	**MA.4.G.5.2** Identify and describe the results of translations, reflections, and rotations of 45, 90, 180, 270, and 360 degrees, including figures with line and rotational symmetry. **MC**	**MA.5.G.5.2** Compare, contrast, and convert units of measure within the same dimension (length, mass, or time) to solve problems. **MC, GR**
MA.3.G.5.3 Tell time to the nearest minute and to the nearest quarter hour, and determine the amount of time elapsed. **MC**	**MA.4.G.5.3** Identify and build a three-dimensional object from a two-dimensional representation of that object and vice versa. **MC**	**MA.5.G.5.3** Solve problems requiring attention to approximation, selection of appropriate measuring tools, and precision of measurement. **MC**
		MA.5.G.5.4 Derive and apply formulas for areas of parallelograms, triangles, and trapezoids from the area of a rectangle. **MC, GR**
Supporting Idea: Number and Operations		
MA.3.A.6.1 Represent, compute, estimate and solve problems using numbers through hundred thousands. **MC**	**MA.4.A.6.1** Use and represent numbers through millions in various contexts, including estimation of relative sizes of amounts or distances. **MC, GR**	**MA.5.A.6.1** Identify and relate prime and composite numbers, factors and multiples within the context of fractions. Assessed with MA.5.A.2.1, MA.5.A.2.2 and MA.5.A.2.4
MA.3.A.6.2 Solve non-routine problems by making a table, chart, or list and searching for patterns. **MC**	**MA.4.A.6.2** Use models to represent division as: • the inverse of multiplication • as partitioning • as successive subtraction **MC**	**MA.5.A.6.2** Use the order of operations to simplify expressions which include exponents and parentheses. **MC, GR**
	MA.4.A.6.3 Generate equivalent fractions and simplify fractions. **MC**	**MA.5.A.6.3** Describe real-world situations using positive and negative numbers. **MC**
	MA.4.A.6.4 Determine factors and multiples for specified whole numbers. **MC**	**MA.5.A.6.4** Compare, order, and graph integers, including integers shown on a number line. **MC**

Prior Knowledge: Items may require the student to apply mathematical knowledge described in NGSSS benchmarks from lower grades; however, the benchmarks from lower grades will not be assessed in isolation.

TABLE 8.3a: NGSSS BENCHMARK ASSESSESD AT GRADES 3-5 Source: Florida Department of Education FCAT 2.0 Item Specifications		
GRADE 3	**GRADE 4**	**GRADE 5**
MC: MULTIPLE-CHOICE; GR: GRIDDED-RESPONSE		
Supporting Idea: Number and Operations (Continued)		
	MA.4.A.6.5 Relate halves, fourths, tenths, and hundredths to decimals and percents. **MC, GR**	**MA.5.A.6.5** Solve non-routine problems using various strategies including "solving a simpler problem" and "guess, check, and revise." **MC, GR**
	MA.4.A.6.6 Estimate and describe reasonableness of estimates; determine the appropriateness of an estimate versus an exact answer. **MC**	
Supporting Idea: Data Analysis		
MA.3.S.7.1 Construct and analyze frequency tables, bar graphs, pictographs, and line plots from data, including data collected through observations, surveys, and experiments. **MC**		**MA.5.S.7.1** Construct and analyze line graphs and double bar graphs. (Also assesses MA.5.A.4.2.) **MC**
		MA.5.S.7.2 Differentiate between continuous and discrete data and determine ways to represent those using graphs and diagrams. (Also assesses MA.5.A.4.2.) **MC**

Prior Knowledge: Items may require the student to apply mathematical knowledge described in NGSSS benchmarks from lower grades; however, the benchmarks from lower grades will not be assessed in isolation.

Table 8.3b: FCAT 2.0 Reporting Categories for Grades 3-5		
Grade 3	**Grade 4**	**Grade 5**
Number: Operations, Problems, and Statistics (50%)	**Number: Operations and Problems (45%)**	**Number: Base Ten and Fractions (50%)**
• MA.3.A.1.1 • MA.3.A.1.2 • MA.3.A.1.3 • MA.3.A.4.1 • MA.3.A.6.1 • MA.3.A.6.2 • MA.3.S.7.1	• MA.4.A.1.2 (also assesses MA.4.A.1.1) • MA.4.A.4.1 • MA.4.A.4.2 • MA.4.A.4.3 • MA.4.A.6.1 • MA.4.A.6.2 • MA.4.A.6.4 • MA.4.A.6.6	• MA.5.A.1.1 • MA.5.A.1.4 (also assesses MA.5.A.1.2 and MA.5.A.1.3) • MA.5.A.2.1 (also assesses MA.5.A.6.1) • MA.5.A.2.2 (also assesses MA.5.A.2.3 and MA.5.A.6.1) • MA.5.A.2.4 (also assesses MA.5.A.6.1) • MA.5.A.6.3 • MA.5.A.6.4 • MA.5.A.6.5
Geometry and Measurement (30%)	**Geometry and Measurement (30%)**	**Geometry and Measurement (30%)**
• MA.3.G.3.1 • MA.3.G.3.2 • MA.3.G.3.3 • MA.3.G.5.1 • MA.3.G.5.2 • MA.3.G.5.3	• MA.4.G.3.1 • MA.4.G.3.2 • MA.4.G.3.3 • MA.4.G.5.1 • MA.4.G.5.2 • MA.4.G.5.3	• MA.5.G.3.1 • MA.5.G.3.2 • MA.5.G.5.1 • MA.5.G.5.2 • MA.5.G.5.3 • MA.5.G.5.4
Number: Fractions (20%)	**Number: Base Ten and Fractions (25%)**	**Expressions, Equations and Statistics (20%)**
• MA.3.A.2.1 • MA.3.A.2.3 (also assesses MA.3.A.2.2) • MA.3.A.2.4	• MA.4.A.2.3 (also assesses MA.4.A.2.1 and MA.4.A.2.2) • MA.4.A.2.4 (also assesses MA.4.A.2.1 and MA.4.A.2.2) • MA.4.A.6.3 • MA.4.A.6.5	• MA.5.A.4.1 • MA.5.A.6.2 • MA.5.S.7.1 (also assesses MA.5.A.4.2) • MA.5.S.7.2 (also assesses MA.5.A.4.2)

TABLE 8.4a: NGSSS BENCHMARK ASSESSESD AT GRADES 6-8 Source: Florida Department of Education FCAT 2.0 Item Specifications		
GRADE 6	**GRADE 7**	**GRADE 8**
MC: MULTIPLE-CHOICE; GR: GRIDDED-RESPONSE		
Big Idea 1: Develop an understanding of and fluency with multiplication and division of fractions and decimals.	**Big Idea 1:** Develop an understanding of and apply proportionality, including similarity.	**Big Idea 1:** Analyze and represent linear functions, and solve linear equations and systems of linear equations.
MA.6.A.1.1 Explain and justify procedures for multiplying and dividing fractions and decimals. **MC**	**MA.7.A.1.1** Distinguish between situations that are proportional or not proportional, and use proportions to solve problems. **MC, GR**	**MA.8.A.1.1** Create and interpret tables, graphs, and models to represent, analyze, and solve problems related to linear equations, including analysis of domain, range, and the difference between discrete and continuous data **MC, GR**
MA.6.A.1.2 Multiply and divide fractions and decimals efficiently. (Assessed with MA.6.A.1.3.)	**MA.7.A.1.2** Solve percent problems, including problems involving discounts, simple interest, taxes, tips, and percents of increase or decrease. **MC , GR**	**MA.8.A.1.2** Interpret the slope and the x- and y-intercepts when graphing a linear equation for a real-world problem. **MC , GR**
MA.6.A.1.3 Solve real-world problems involving multiplication and division of fractions and decimals. (Also assesses MA.6.A.1.2.) **MC , GR**	**MA.7.A.1.3** Solve problems involving similar figures. **MC, GR**	**MA.8.A.1.3** Use tables, graphs, and models to represent, analyze, and solve real-world problems related to systems of linear equations. (Also assesses MA.8.A.1.4) **MC, GR**
	MA.7.A.1.4 Graph proportional relationships and identify the unit rate as the slope of the related linear function. **MC**	**MA.8.A.1.4** Identify the solution to a system of linear equations using graphs. (Assessed with MA.8.A.1.3.)
	MA.7.A.1.5 Distinguish direct variation from other relationships, including inverse variation. **MC**	**MA.8.A.1.5** Translate among verbal, tabular, graphical, and algebraic representations of linear functions. **MC**
	MA.7.A.1.6 Apply proportionality to measurement in multiple contexts, including scale drawings and constant speed. **MC , GR**	**MA.8.A.1.6** Compare the graphs of linear and nonlinear functions for real-world situations. **MC**

Prior Knowledge: Items may require the student to apply mathematical knowledge described in NGSSS benchmarks from lower grades; however, the benchmarks from lower grades will not be assessed in isolation.

TABLE 8.4a: NGSSS BENCHMARK ASSESSESD AT GRADES 6-8 Source: Florida Department of Education FCAT 2.0 Item Specifications		
GRADE 6	**GRADE 7**	**GRADE 8**
MC: MULTIPLE-CHOICE; GR: GRIDDED-RESPONSE		
Big Idea 2: Connect ratio and rates to multiplication and division.	**Big Idea 2:** Develop an understanding of and use formulas to determine surface areas and volumes of three-dimensional shapes.	**Big Idea 2:** Analyze two-and-three-dimensional figures by using distance and angle**.**
MA.6.A.2.1 Use reasoning about multiplication and division to solve ratio and rate problems. **MC,GR**	**MA.7.G.2.1** Justify and apply formulas for surface area and volume of pyramids, prisms, cylinders, and cones. **MC, GR**	**MA.8.G.2.1** Use similar triangles to solve problems that include height and distances. **MC, GR**
MA.6.A.2.2 Interpret and compare ratios and rates. **MC**	**MA.7.G.2.2** Use formulas to find surface areas and volume of three-dimensional composite shapes **MC, GR**	**MA.8.G.2.2** Classify and determine the measure of angles, including angles created when parallel lines are cut by transversals. **MC, GR**
		MA.8.G.2.3 Demonstrate that the sum of the angles in a triangle is 180-degrees and apply this fact to find unknown measure of angles and the sum of angles in polygons. **MC, GR**
		MA.8.G.2.4 Validate and apply Pythagorean Theorem to find distances in real world situations or between points in the coordinate plane. **MC, GR**

Prior Knowledge: Items may require the student to apply mathematical knowledge described in NGSSS benchmarks from lower grades; however, the benchmarks from lower grades will not be assessed in isolation.

TABLE 8.4a: NGSSS BENCHMARK ASSESSESD AT GRADES 6-8 Source: Florida Department of Education FCAT 2.0 Item Specifications		
GRADE 6	**GRADE 7**	**GRADE 8**
MC: MULTIPLE-CHOICE; GR: GRIDDED-RESPONSE		
Big Idea 3: Write, interpret, and use mathematical expressions and equations.	**Big Idea 3:** Develop an understanding of operations on all rational numbers and solving linear equations.	**Big Idea 3:** Analyze and summarize data sets.
MA.6.A.3.1 Write and evaluate mathematical expressions that correspond to given situations. (Also assesses MA.6.A.3.3.) **MC, GR**	**MA.7.A.3.1** Use and justify the rules for adding, subtracting, multiplying, dividing, and finding the absolute value of integers**.** **MC**	**MA.8.S.3.1** Select, organize and construct appropriate data displays, including box-and-whisker-plots, scatter plots, and lines of best fit to convey information and make conjectures about possible relationships. **MC, GR**
MA.6.A.3.2 Write, solve, and graph one- and two- step linear equations and inequalities. (Also assesses MA.6.A.3.4.) **MC, GR**	**MA.7.A.3.2** Add, subtract, multiply, and divide integers, fractions, and terminating decimals, and perform exponential operations with rational bases and whole number exponents including solving problems in everyday contexts. **MC, GR**	**MA.8.S.3.2** Determine and describe how changes in data values impact measures of central tendency. **MC, GR**
MA.6.A.3.3 Work backward with two-step function rules to undo expressions. (Assessed with MA.6.A.3.1.)	**MA.7.A.3.3** Formulate and use different strategies to solve one-step and two-step linear equations, including equations with rational coefficients.	
MA.6.A.3.4 Solve problems given a formula. (Assessed with MA.6.A.3.2, MA.6.G.4.1, MA.6.G.4.2, and MA.6.G.4.3.)	(Also assesses MA.7.A.5.2.) **MC, GR**	
MA.6.A.3.5 Apply the Commutative, Associative, and Distributive Properties to show that two expressions are equivalent. **MC**	**MA.7.A.3.4** Use the properties of equality to represent an equation in a different way and to show that two equations are equivalent in a given context.	
MA.6.A.3.6 Construct and analyze tables, graphs, and equations to describe linear functions and other simple relations using both common language and algebraic notation. **MC**	**MC**	

Prior Knowledge: Items may require the student to apply mathematical knowledge described in NGSSS benchmarks from lower grades; however, the benchmarks from lower grades will not be assessed in isolation.

TABLE 8.4a: NGSSS BENCHMARK ASSESSESD AT GRADES 6-8 Source: Florida Department of Education FCAT 2.0 Item Specifications		
GRADE 6	**GRADE 7**	**GRADE 8**
MC: MULTIPLE-CHOICE; GR: GRIDDED-RESPONSE		
Supporting Idea: Algebra		
		MA.8.A.4.1 Solve literal equations for a specified variable. **MC**
		MA.8.A.4.2 Solve and graph one- and two-step inequalities in one variable. **MC, GR**
Supporting Idea: Geometry and Measurement		
MA.6.G.4.1 Understand the concept of Pi, know common estimates of Pi (3.14 ;) and use these values to estimate and calculate the circumference and the area of circles. (Also assesses MA.6.A.34.) **MC**	**MA.7.G.4.1** Determine how changes in dimensions affect the perimeter, area, and volume of common geometric figures, and apply these relationships to solve problems. **MC, GR**	**MA.8.G.5.1** Compare, contrast, and convert units of measure between different measurement systems (US customary or metric (SI)) and dimensions including temperature, area, volume, and derived units to solve problems. **MC, GR**
MA.6.G.4.2 Find the perimeters and areas of composite two-dimensional figures, including non-rectangular figures (such as semicircles) using various strategies. (Also assesses MA.6.A.3.4.) **MC, GR**	**MA.7.G.4.2** Predict the results of transformations, and draw transformed figures with and without the coordinate plane. **MC**	
MA.6.G.4.3 Determine a missing dimension of a plane figure or prism given its area or volume and some of the dimensions, or determine the area or volume given the dimensions. (Also assesses MA.6.A.3.4.) **MC**	**MA.7.G.4.3** Identify and plot ordered pairs in all four quadrants of the coordinate plane. **MC**	
	MA.7.G.4.4 Compare, contrast, and convert units of measure between different measurement systems (US customary or metric (SI)), dimensions, and derived units to solve problems. **MC, GR**	

Prior Knowledge: Items may require the student to apply mathematical knowledge described in NGSSS benchmarks from lower grades; however, the benchmarks from lower grades will not be assessed in isolation.

TABLE 8.4a: NGSSS BENCHMARK ASSESSESD AT GRADES 6-8 Source: Florida Department of Education FCAT 2.0 Item Specifications		
GRADE 6	**GRADE 7**	**GRADE 8**
MC: MULTIPLE-CHOICE; GR: GRIDDED-RESPONSE		
Supporting Idea: Number and Operations		
MA.6.A.5.1 Use equivalent forms of fractions, decimals, and percents to solve problems **MC, GR**	**MA.7.A.5.1** Express rational numbers as terminating or repeating decimals. **MC**	**MA.8.A.6.1** Use exponents and scientific notation to write large and small numbers and vice versa and to solve problems **MC, GR**
MA.6.A.5.2 Compare and order fractions, decimals, and percents, including finding their approximate location on a number line. **MC**	**MA.7.A.5.2** Solve non-routine problems by working backwards. (Assessed with MA.7.A.3.3.)	**MA.8.A.6.2** Make reasonable approximations of square roots and mathematical expressions that include square roots, and use them to estimate solutions to problems and to compare **MC**
MA.6.A.5.3 Estimate the results of computations with fractions, decimals, and percents, and judge the reasonableness of the results. **MC**		**MA.8.A.6.3** Simplify real number expressions using the laws of exponents. (Assessed with MA.8.A.6.4.)
		MA.8.A.6.4 Perform operations on real numbers (including integer exponents, radicals, percents, scientific notation, absolute value, rational numbers, and irrational numbers) using multi-step and real world problems. (Also assesses MA.8.A.6.3.) **MC, GR**
Supporting Idea: Data Analysis		
MA.6.S.6.1 Determine the measures of central tendency (mean, median, mode) and variability (range) for a given set of data. **MC, GR**	**MA.7.S.6.1** Evaluate the reasonableness of a sample to determine the appropriateness of generalizations made about the population. **MC**	
MA.6.S.6.2 Select and analyze the measures of central tendency or variability to represent, describe, analyze, and/or summarize a data set for the purpose of answering questions appropriately. **MC**	**MA.7.S.6.2** Construct and analyze histograms, stem-and leaf plots, and circle graphs. **MC, GR**	

Prior Knowledge: Items may require the student to apply mathematical knowledge described in NGSSS benchmarks from lower grades; however, the benchmarks from lower grades will not be assessed in isolation.

TABLE 8.4a: NGSSS BENCHMARK ASSESSESD AT GRADES 6-8 Source: Florida Department of Education FCAT 2.0 Item Specifications		
GRADE 6	**GRADE 7**	**GRADE 8**
MC: MULTIPLE-CHOICE; GR: GRIDDED-RESPONSE		
Supporting Idea: Probability		
	MA.7.P.7.1 Determine the outcome of an experiment and predict which events are likely or unlikely, and if the experiment is fair or unfair. **MC**	
	MA.7.P.7.2 Determine, compare, and make predictions based on experimental or theoretical probability of independent or dependent events. **MC**	

Prior Knowledge: Items may require the student to apply mathematical knowledge described in NGSSS benchmarks from lower grades; however, the benchmarks from lower grades will not be assessed in isolation.

Table 8.4b Grades 6-8 FCAT 2.0 Reporting Categories		
6th Grade	**7th Grade**	**8th Grade**
Fractions, Ratios/Proportional Relationships, and Statistics (40%)	**Geometry and Measurement (30%)**	**Expressions, Equations, and Functions (40%)**
• 6A11 • 6A13 (also assesses 6A12) • 6A21 • 6A22 • 6A51 • 6A52 • 6A53 • 6S61 • 6S62	• 7G21 • 7G22 • 7G41 • 7G42 • 7G43 • 7G44	• 8A11 • 8A12 • 8A13 (also assesses 8A14) • 8A15 • 8A16 • 8A41 • 8A42
Expressions and Equations (40%)	**Ratios/Proportional Relationships (25%)**	**Geometry and Measurement (35%)**
• 6A31 (also assesses 6A33) • 6A32 (also assesses 6A34) • 6A35 • 6A36	• 7A11 • 7A12 • 7A13 • 7A14 • 7A16	• 8G21 • 8G22 • 8G23 • 8G24
Geometry and Measurement (20%)	**Number: Base Ten (25%)**	**Number: Operations, Problems, and Statistics (25%)**
• 6G41 (also assesses 6A34) • 6G42 (also assesses 6A34) • 6G43 (also assesses 6A34)	• 7A31 • 7A32 • 7A33 (also assesses 7A52) • 7A51	• 8A61 • 8A62 • 8A64 (also assesses 8A63) • 8S31 • 8S32

TABLE 8.5a Benchmarks Assesses on the Algebra I EOC and Geometry EOC	
MC: Multiple Choice, FR: Fill-in Response **Prior Knowledge: Items may require the student to apply mathematical knowledge described in NGSSS benchmarks from lower grades; however, the benchmarks from lower grades will not be assessed in isolation.**	
Algebra 1 EOC	**Geometry EOC**
Body of Knowledge: Algebra	
MA.912.A.1.8 Use the zero product property of real numbers in a variety of contexts to identify solutions to equations. Assessed with MA.912.A.7.2	
MA.912.A.2.3 Describe the concept of a function, use function notation, determine whether a given relation is a function, and link equations to functions. (Also assesses MA.912.A.2.13) **MC, FR**	
MA.912.A.2.4 Determine the domain and range of a relation. (Also assesses MA.912.A.2.13.) **MC, FR**	
MA.912.A.2.13 Solve real-world problems involving relations and functions. Assessed with MA.912.A.2.3, MA.912.A.2.4	
MA.912.A.3.1 Solve linear equations in one variable that include simplifying algebraic expressions. (Also assesses MA.912.A.3.2.) **MC, FR**	
MA.912.A.3.2 Identify and apply the distributive, associative, and commutative properties of real numbers and the properties of equality. Assessed with MA.912.A.3.1	
MA.912.A.3.3 Solve literal equations for a specified variable. **MC**	
MA.912.A.3.4 Solve and graph simple and compound inequalities in one variable and be able to justify each step in a solution. **MC**	
MA.912.A.3.5 Symbolically represent and solve multi-step and real-world applications that involve linear equations and inequalities. **MC, FR**	
MA.912.A.3.7 Rewrite equations of a line into slope-intercept form and standard form. Assessed with MA.912.A.3.10	

TABLE 8.5a Benchmarks Assesses on the Algebra I EOC and Geometry EOC	
MC: Multiple Choice, FR: Fill-in Response Prior Knowledge: Items may require the student to apply mathematical knowledge described in NGSSS benchmarks from lower grades; however, the benchmarks from lower grades will not be assessed in isolation.	
Algebra 1 EOC	**Geometry EOC**
Body of Knowledge: Algebra	
MA.912.A.3.8 Graph a line given any of the following information: a table of values, the x and y-intercepts, two points, the slope and a point, the equation of the line in slope-intercept form, standard form, or point-slope form. (Also assesses MA.912.A.3.12.) **MC**	
MA.912.A.3.9 Determine the slope, x-intercept, and y-intercept of a line given its graph, its equation, or two points on the line. (Also assesses MA.912.A.3.12.) **MC, FR**	
MA.912.A.3.10 Write an equation of a line given any of the following information: two points on the line, its slope and one point on the line, or its graph. Also, find an equation of a new line parallel to a given line, or perpendicular to a given line, through a given point on the new line. (Also assesses MA.912.A.3.7, MA.912.A.3.12, and MA.912.G.1.4.) **MC, FR**	
MA.912.A.3.11 Write an equation of a line that models a data set and use the equation or the graph to make predictions. Describe the slope of the line in terms of the data, recognizing that the slope is the rate of change. (Also assesses MA.912.A.3.12.) **MC, FR**	
MA.912.A.3.12 Graph a linear equation or inequality in two variables with and without graphing technology. Write an equation or inequality represented by a given graph. Assessed with MA.912.A.3.8, MA.912.A.3.9, MA.912.A.3.10, and MA.912.A.3.11	
MA.912.A.3.13 Use a graph to approximate the solution of a system of linear equations or inequalities in two variables with and without technology. Assessed with MA.912.A.3.14	
MA.912.A.3.14 Solve systems of linear equations and inequalities in two and three variables using graphical, substitution, and elimination methods. (Also assesses MA.912.A.3.13 and MA.912.A.3.15.) **MC, FR**	

TABLE 8.5a Benchmarks Assesses on the Algebra I EOC and Geometry EOC	
MC: Multiple Choice, FR: Fill-in Response Prior Knowledge: Items may require the student to apply mathematical knowledge described in NGSSS benchmarks from lower grades; however, the benchmarks from lower grades will not be assessed in isolation.	
Algebra 1 EOC	**Geometry EOC**
Body of Knowledge: Algebra	
MA.912.A.3.15 Solve real-world problems involving systems of linear equations and inequalities in two and three variables. Assessed with MA.912.A.3.14	
MA.912.A.4.1 Simplify monomials and monomial expressions using the laws of integral exponents. **MC, FR**	
MA.912.A.4.2 Add, subtract, and multiply polynomials. **MC, FR**	
MA.912.A.4.3 Factor polynomial expressions. (Also assesses MA.912.A.5.1.) **MC**	
MA.912.A.4.4 Divide polynomials by monomials and polynomials with various techniques, including synthetic division. **MC**	
MA.912.A.5.1 Simplify algebraic ratios. Assessed with MA.912.A.4.3	
MA.912.A.5.4 Solve algebraic proportions. **MC, FR**	
MA.912.A.6.1 Simplify radical expressions. Assessed with MA.912.A.6.2	
MA.912.A.6.2 Add, subtract, multiply, and divide radical expressions (square roots and higher). (Also assesses MA.912.A.6.1.) **MC**	
MA.912.A.7.1 Graph quadratic equations with and without graphing technology. (Also assesses MA.912.A.7.8.) **MC**	
MA.912.A.7.2 Solve quadratic equations over the real numbers by factoring and by using the quadratic formula. (Also assesses MA.912.A.1.8 and MA.912.A.7.8.) **MC, FR**	
MA.912.A.7.8 Use quadratic equations to solve real-world problems. Assessed with MA.912.A.7.1 and MA.912.A.7.2	

TABLE 8.5a Benchmarks Assesses on the Algebra I EOC and Geometry EOC	
MC: Multiple Choice, FR: Fill-in Response Prior Knowledge: Items may require the student to apply mathematical knowledge described in NGSSS benchmarks from lower grades; however, the benchmarks from lower grades will not be assessed in isolation.	
Algebra 1 EOC	**Geometry EOC**
Body of Knowledge: Algebra	
MA.912.A.10.1 Use a variety of problem-solving strategies, such as drawing a diagram, making a chart, guessing and checking, solving a simpler problem, writing an equation, working backwards, and creating a table. Assessed throughout.	
MA.912.A.10.2 Decide whether a solution is reasonable in the context of the original situation. Assessed throughout	
Body of Knowledge: Discrete Mathematics	
MA.912.D.7.1 Perform set operations such as union and intersection, complement, and cross product. **MC, FR**	**MA.912.D.6.2** Find the converse, inverse, and contrapositive of a statement. (Also assesses MA.912.D.6.3.) **MC**
MA.912.D.7.2 Use Venn diagrams to explore relationships and patterns and to make arguments about relationships between sets. **MC, FR**	**MA.912.D.6.3** Determine whether two propositions are logically equivalent. Assessed with MA.912.D.6.2
	MA.912.D.6.4 Use methods of direct and indirect proof and determine whether a short proof is logically valid. Assessed with MA.912.G.3.4 and MA.912.G.4.6
Body of Knowledge: Geometry	
MA.912.G.1.4 Use coordinate geometry to find slopes, parallel lines, perpendicular lines, and equations of lines. (Assessed with MA.912.A.3.10.)	**MA.912.G.2.3** Use properties of congruent and similar polygons to solve mathematical or real-world problems. (Also assesses MA.912.G.2.1, MA.912.G.4.1, MA.912.G.4.2, MA.912.G.4.4, and MA.912.G.4.5.) **MC, FR**
	MA.912.G.2.4 Apply transformations (translations, reflections, rotations, dilations and scale factors) to polygons to determine congruence, similarity, and symmetry. Know that images formed by translations, reflections, and rotations are congruent to the original shape. Create and verify tessellations of the plane using polygons. **MC, FR**
	MA.912.G.2.5 Explain the derivation and apply formulas for perimeter and area of polygons (triangles, quadrilaterals, pentagons, etc.). (Also assesses MA.912.G.2.7.) **MC, FR**

TABLE 8.5a Benchmarks Assesses on the Algebra I EOC and Geometry EOC	
MC: Multiple Choice, FR: Fill-in Response Prior Knowledge: Items may require the student to apply mathematical knowledge described in NGSSS benchmarks from lower grades; however, the benchmarks from lower grades will not be assessed in isolation.	
Algebra 1 EOC	**Geometry EOC**
Body of Knowledge: Geometry	
	MA.912.G.2.7 Determine how changes in dimensions affect the perimeter and area of common geometric figures. Assessed with MA.912.G.2.5
	MA.912.G.3.1 Describe, classify, and compare relationships among quadrilaterals including the square, rectangle, rhombus, parallelogram, trapezoid, and kite. Assessed with MA.912.G.3.4
	MA.912.G.3.2 Compare and contrast special quadrilaterals on the basis of their properties. Assessed with MA.912.G.3.4.
	MA.912.G.3.3 Use coordinate geometry to prove properties of congruent, regular and similar quadrilaterals. **MC**
	MA.912.G.3.4 Prove theorems involving quadrilaterals. (Also assesses MA.912.D.6.4, MA.912.G.3.1, MA.912.G.3.2, and MA.912.G.8.5.) **MC, FR**
	MA.912.G.4.1 Classify, construct, and describe triangles that are right, acute, obtuse, scalene, isosceles, equilateral, and equiangular. Assessed with MA.912.G.2.3.
	MA.912.G.4.2 Define, identify, and construct altitudes, medians, angle bisectors, perpendicular bisectors, orthocenter, centroid, incenter, and circumcenter. Assessed with MA.912.G.2.3
	MA.912.G.4.4 Use properties of congruent and similar triangles to solve problems involving lengths and areas. Assessed with MA.912.G.2.3
	MA.912.G.4.5 Apply theorems involving segments divided proportionally. Assessed with MA.912.G.2.3.
	MA.912.G.4.6 Prove that triangles are congruent or similar and use the concept of corresponding parts of congruent triangles. (Also assesses MA.912.D.6.4 and MA.912.G.8.5.) **MC**

TABLE 8.5a Benchmarks Assesses on the Algebra I EOC and Geometry EOC	
MC: Multiple Choice, FR: Fill-in Response Prior Knowledge: Items may require the student to apply mathematical knowledge described in NGSSS benchmarks from lower grades; however, the benchmarks from lower grades will not be assessed in isolation.	
Algebra 1 EOC	**Geometry EOC**
Body of Knowledge: Geometry	
	MA.912.G.4.7 Apply the inequality theorems: triangle inequality, inequality in one triangle, and the Hinge Theorem. **MC**
	MA.912.G.5.1 Prove and apply the Pythagorean Theorem and its converse. Assessed with MA.912.G.5.4.
	MA.912.G.5.2 State and apply the relationships that exist when the altitude is drawn to the hypotenuse of a right triangle. Assessed with MA.912.G.5.4
	MA.912.G.5.3 Use special right triangles (30°-60°-90° and 45°-45°-90°) to solve problems. Assessed with MA.912.G.5.4.
	MA.912.G.5.4 Solve real-world problems involving right triangles. (Also assesses MA.912.G.5.1, MA.912.G.5.2, MA.912.G.5.3) **MC, FR**
	MA.912.G.6.2 Define and identify: circumference, radius, diameter, arc, arc length, chord, secant, tangent and concentric circles. Assessed with MA.912.G.6.5.
	MA.912.G.6.4 Determine and use measures of arcs and related angles (central, inscribed, and intersections of secants and tangents). Assessed with MA.912.G.6.5.
	MA.912.G.6.5 Solve real-world problems using measures of circumference, arc length, and areas of circles and sectors. (Also assesses MA.912.G.6.2 and MA.912.G.6.4.) **MC, FR**
	MA.912.G.6.6 Given the center and the radius, find the equation of a circle in the coordinate plane or given the equation of a circle in center-radius form, state the center and the radius of the circle. (Also assesses MA.912.G.6.7.) **MC**

TABLE 8.5a Benchmarks Assesses on the Algebra I EOC and Geometry EOC	
MC: Multiple Choice, FR: Fill-in Response Prior Knowledge: Items may require the student to apply mathematical knowledge described in NGSSS benchmarks from lower grades; however, the benchmarks from lower grades will not be assessed in isolation.	
Algebra 1 EOC	**Geometry EOC**
Body of Knowledge: Geometry	
	MA.912.G.6.7 Given the equation of a circle in center-radius form or given the center and the radius of a circle, sketch the graph of the circle. Assessed with MA.912.G.6.6
	MA.912.G.7.1 Describe and make regular, non-regular, and oblique polyhedra, and sketch the net for a given polyhedron and vice versa. (Also assesses MA.912.G.7.2.) **MC, FR**
	MA.912.G.7.2 Describe the relationships between the faces, edges, and vertices of polyhedra. Assessed with MA.912.G.7.1
	MA.912.G.7.4 Identify chords, tangents, radii, and great circles of spheres. Assessed with MA.912.G.7.5
	MA.912.G.7.5 Explain and use formulas for lateral area, surface area, and volume of solids. (Also assesses MA.912.G.7.4, MA.912.G.7.6.) **MC, FR**
	MA.912.G.7.6 Identify and use properties of congruent and similar solids. Assessed with MA.912.G.7.5
	MA.912.G.7.7 Determine how changes in dimensions affect the surface area and volume of common geometric solids. **MC, FR**
	MA.912.G.8.2 Use a variety of problem-solving strategies, such as drawing a diagram, making a chart, guess-and-check, solving a simpler problem, writing an equation and working backwards. Embedded throughout
	MA.912.G.8.3 Determine whether a solution is reasonable in the context of the original situation. Embedded throughout.
	MA.912.G.8.4 Make conjectures with justifications about geometric ideas. Distinguish between information that supports a conjecture and the proof of a conjecture. **MC**

TABLE 8.5a Benchmarks Assesses on the Algebra I EOC and Geometry EOC	
MC: Multiple Choice, FR: Fill-in Response Prior Knowledge: Items may require the student to apply mathematical knowledge described in NGSSS benchmarks from lower grades; however, the benchmarks from lower grades will not be assessed in isolation.	
Algebra 1 EOC	**Geometry EOC**
Body of Knowledge: Geometry	
	MA.912.G.8.5 Write geometric proofs, including proofs by contradiction and proofs involving coordinate geometry. Use and compare a variety of ways to present deductive proofs, such as flow charts, paragraphs, two-column, and indirect proofs. Assessed with MA.912.G.3.4 and MA.912.G.4.6.
Body of Knowledge: Trigonometry	
	MA.912.T.2.1 Define and use the trigonometric ratios (sine, cosine, tangent, cotangent, secant, and cosecant) in terms of angles of right triangles. **MC, FR**

TABLE 8.5b High School Mathematical Content Assessed and Reporting Categories	
ALGEBRA	**GEOMETRY**
Functions, Linear Equations, and Inequalities (55%)	**Two-Dimensional Geometry (65%)**
• 912A23 (also assesses 912A213) • 912A24 (also assesses 912A213) • 912A31 (also assesses 912A32) • 912A33 • 912A34 • 912A35 • 912A38 (also assesses 912A312) • 912A39 (also assesses 912A312) • 912A310 (also assesses 912A37, 912A312, and 912G14) • 912A311 (also assesses 912A312) • 912A314 (also assesses 912A313 and 912A315)	• 912G11 • 912G13 • 912G22 • 912G23 (also assesses 912G21, 912G41, 912G42, 912G44, and 912G45) • 912G24 • 912G25 (also assesses 912G27) • 912G33 • 912G34 (also assesses 912D64, 912G31, 912G32, and 912G85) • 912G46 (also assesses 912D64 and 912G85) • 912G47 • 912G54 (also assesses 912G51, 912G52, and 912G53) • 912G65 (also assesses 912G62 and 912G64) • 912G66 (also assesses 912G67) • 912G84
Rationals, Radicals, Quadratics, and Discrete Mathematics (25%)	**Three-Dimensional Geometry (20%)**
• 912A54 • 912A62 (also assesses 912A61) • 912A71 (also assesses 912A78) • 912A72 (also assesses 912A18 and 912A78) • 912D71 • 912D72	• 912G71 (also assesses 912G72) • 912G75 (also assesses 912G74 and 912G76) • 912G77 (also assesses 912G27)
Polynomials (20%)	**Trigonometry and Discrete Mathematics (15%)**
• 912A41 • 912A42 • 912A43 (also assesses 912A51) • 912A44	• 912D62 (also assesses 912D63) • 912T21

VOCABULARY

This vocabulary list is a resource to assist teachers in the development of mathematics concepts. These concepts and words can be introduced at the specified grade level initially and each subsequent grade thereafter. These concepts spiral throughout the curriculum to enhance understanding and learning. Starting the use of key terminology as early as Kindergarten will support the acquisition of the terms and concepts by grade five.

KINDERGARTEN	FIRST GRADE	SECOND GRADE
Attribute	Addend	Addend
Circle	Algorithm	Algorithm
Circle	Associative property	Array
Cube	Attribute	Capacity
Cylinder	Capacity	Chart
Difference	Circle	Cube
Edge	Circle	Customary units
Event	Commutative property	Difference
Geometry	Compose	Digit
Height	Conceptual understanding	Equal
Hexagon	Congruent	Equality
Length	Cube	Equivalent
Mean	Decompose	Estimate
Model	Difference	Even number
Numeral	Digit	Factor
Ordinal number	Focus	Fraction
Pattern	Geometry	Function
Point	inverse operation	Geometry
Rectangle	Isosceles triangle	Length
Representations	Length	Line
Set	Line	Mass
Side	Magnitude	Model
Slide	Mean	Multiples
Sphere	Model	Nonstandard units of measure
Square	Multiples	Number line
Triangle	Non-routine problem	Numeral
Vertex	Nonstandard units of measure	Numeration
Weight	Number line	Odd number
Whole Number	Numeral	Odds
	Operation	Operation
	Pattern	Ordinal number
	Plane	Pattern
	Real-world problem	Perimeter
	Set	Place value
	Side	Procedure
	Similarity	Real-world problem
	Solid figures	Rectangle
	Sphere	Relation
	Square	Rule
	Standard algorithm (for division)	Scale

KINDERGARTEN	FIRST GRADE	SECOND GRADE
	Sum	Sequence
	Triangle	Set
	Unit	Side
	Vertex	Square
	Weight	Standard algorithm (for division)
	Whole Number	Sum
		Table
		Transitive property
		Triangle
		Unit
		Volume
		Weight
		Whole Number

FCAT MATHEMATICS GLOSSARY: GRADES 3-5

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The glossary is a referenced list provided for item writers and is not intended to comprise a comprehensive vocabulary list for students. The terms defined in this glossary pertain to the NGSSS in mathematics for Grades 3 – 5 and the content assessed on FCAT 2.0 Mathematics.

Acute angle — An angle with a measure less than 90° and greater than 0°.

Addend — Any number being added.

Algebraic order of operations — The order of performing computations is first parentheses, then exponents, followed by multiplication and/or division (as read from left to right), then addition and/or subtraction (as read from left to right). For example:

$5^2 + (12 - 2) \div 2 - 3 \times 2$

$5^2 + 10 \div 2 - 3 \times 2$

$25 + 10 \div 2 - 3 \times 2$

$25 + 5 - 6$

$30 - 6$

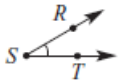
24

Algebraic rule — A mathematical expression that contains variables and describes a pattern or relationship.

Altitude — The perpendicular distance from a vertex in a polygon to its opposite side. Altitude may also be used to refer to an elevation in some real-world contexts.

Angle ($\angle$) — A figure formed by two rays with the same endpoint (vertex). Angles are measured in degrees.

In the figure, the angle can be named $\angle$RST, $\angle$TSR, or $\angle$S.



Approximate value — A number or measurement that is close to or near its exact value.

Area — The measure, in square units, of the inside region of a closed two-dimensional figure (e.g., a rectangle with sides of 4 units by 6 units has an area of 24 square units).

Area = base $\times$ height

Array — A set of objects arranged in rows and columns.

Associative — The way in which three or more numbers are grouped for addition or multiplication does not change their sum or product, respectively

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property	[e.g., (5 + 6) + 9 = 5 + (6 + 9) or (2 × 3) × 8 = 2 × (3 × 8)].
Attribute	A quality or characteristic, such as color, thickness, shape, or size.
Axis (of a graph) (pl. axes)	The horizontal and vertical number lines used in a coordinate plane system.
Bar graph	A graph that uses either vertical or horizontal bars to display countable or discrete data.
Base (algebraic)	The number used as a factor in exponential form. For example, 23 is the exponential form of 2 × 2 × 2. The numeral two (2) is called the base, and the numeral three (3) is called the exponent.
Base (geometric)	The line segment or face of a geometric figure that is perpendicular to the height.
Benchmark	A point of reference from which other measurements or values may be made or judged.
Benchmark angles	The angles 0°, 45°, 90°,180°, 270°, and 360°.
Benchmark fractions	The fractions 0, $\frac{1}{10}, \frac{1}{5}, \frac{1}{4}, \frac{1}{3}, \frac{1}{2}, \frac{2}{3}, \frac{3}{4},$ and 1.
Break	A zigzag on the x-or y-axis in a line or bar graph indicating that the data displayed do not include all of the values that exist on the number line used. Also called a squiggle.
Capacity	The amount of space that can be filled in a container. Both capacity and volume are used to measure three-dimensional spaces; however, capacity usually refers to fluid measures, whereas volume is described as cubic units.
Chart	A data display that presents information in columns and rows.
Closed figure	A two-dimensional figure that divides the plane into two parts—the part inside the figure and the part outside the figure (e.g., circles, squares, rectangles).
Coefficient	The number that multiplies the variable(s) in an algebraic expression (e.g., 4xy). If no number is specified, the coefficient is 1.
Commutative	The order in which two numbers are added or multiplied does not change their sum or product, respectively

property	(e.g., 2 + 3 = 3 + 2, or 4 × 7 = 7 × 4).
Compatible numbers	Numbers that are easy to compute mentally.
Compose	To form by putting together (e.g., a geometric figure or a number).
Composite figure	A figure made up of several different figures.
Composite number	A whole number that has more than two factors.
Concave polygon	A polygon with one or more diagonals that have points outside the polygon
Discrete data	Distinct values that are not connected by intermediate values and are a finite set of values.
Distributive property	The product of a number and the sum or difference of two numbers is equal to the sum or difference of the two products [e.g., x(a + b) = ax + bx].
Dividend	A quantity that is to be divided.
Divisible	Capable of being divided by another number without a remainder.
Divisor	The number by which another number is divided.
Dozen	A quantity made of twelve items.
Edge	A line segment where two faces of a polyhedron meet.
Elevation	The height or altitude above sea level.
Equal	Having the same value (=).
Equation	A mathematical statement that two expressions are equal.
Equidistant	Equally distant.
Equilateral triangle	A triangle with three congruent sides.
Equivalent	Having or naming the same value.
Equivalent	Expressions that have the same value but are presented in a different

FCAT MATHEMATICS GLOSSARY: GRADES 3-5

expressions	format using the properties of numbers.
Equivalent forms of a number	The same number expressed in different forms (e.g., $\frac{3}{4}$, 0.75, 75%).
Estimation	The use of strategies to determine a reasonably accurate approximation, without calculating an exact answer (e.g., clustering, rounding, grouping, using benchmarks).
Evaluate an algebraic expression	Substitute numbers for the variables and follow the algebraic order of operations to find the numerical value of the expression. Substitute numbers for the variables and follow the algebraic order of operations to find the
Expanded form	A form of writing numbers that shows the value of each digit (e.g., 426 = 400 + 20 + 6).
Exponent	The number of times the base occurs as a factor. For example, 23 is the exponential form of 2 × 2 × 2. The numeral two (2) is called the base, and the numeral three (3) is called the exponent.
Expression	A mathematical phrase or part of a number sentence that combines numbers, operation signs, and sometimes variables. An expression does not contain equal or inequality signs.
Face	One of the plane surfaces bounding a three-dimensional figure; a side.
Factor	A number or expression that divides evenly into another number (e.g., 1, 2, 4, 5, 10, and 20 are factors of 20.)
Figure	A shape in two or three dimensions.
Fraction	A rational number expressed in the form *ab*, where *a* is called the numerator and *b* is called the denominator.
Frequency table	A table that shows how often each item, number, or range of numbers occurs in a set of data.
Function	A relationship in which every element of one set has one assigned element in the other set.
Greatest common factor (GCF)	The greatest number that is a factor of two or more numbers.

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Grid	See coordinate grid or plane.
Gross	A quantity made of 144 items.
Height	A line segment extending from the apex or a vertex of a figure to its base and forming a right angle with the base or plane that contains the base.
Horizontal	Parallel to, or in the plane of the horizon.
Identity property of addition	The sum of a number and zero is always that number (e.g., a + 0 = a).
Identity property of multiplication	The product of a number and one is always that number (e.g., a × 1 = a).
Increment (interval)	On a graph, the distance between numbers from one grid line to another.
Indirect measure	The measurement of an object through the known measure of another object.
Inequality	A sentence that states one expression is greater than (>), greater than or equal to (≥), less than (<), less than or equal to (≤), or not equal to (≠), another expression (e.g., a 5 or x < 7 or 2y+ 3≥ 11).
Integers	The numbers in the set {. . . -4, -3, -2, -1, 0, 1, 2, 3, 4 . . .}.
Intersect	To meet or cross.
Intersection	The point at which lines or curves meet; the line where planes meet.
Interval	See increment.
Inverse operation	An operation that is the opposite, or “undoes” the first operation (e.g., subtraction is the inverse operation of addition, and multiplication is the inverse operation of division).
Isosceles triangle	A triangle with two congruent sides and two congruent angles.
Kite	A quadrilateral with two distinct pairs of adjacent congruent sides.
Labels (for a graph)	The titles given to a graph, the axes of a graph, or the scales on the axes of a graph.

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Lateral face	A face of a prism or pyramid that is not a base.
Least common multiple (LCM)	The lowest number that is a multiple of two or more numbers.
Length	A one dimensional measure that is the measurable property of line segments.
Line	A collection of an infinite number of points in a straight pathway with unlimited length and having no width.
Line graph	A graph that displays continuous data using connected line segments.
Line plot	A diagram or graph showing frequency of data on a number line.
Line segment	A portion of a line that consists of two defined endpoints and all the points in between.
Linear measure (length)	A one-dimensional measure that is the measurable property of line segments.
Mass	The amount of matter in an object.
Maximum	The greatest or highest value or quantity.
Metric units	The units of measure developed in Europe and used in most of the world. Like the decimal system, the metric system uses the base 10. • **Metric units** for mass may include milligrams, grams, and kilograms. • **Metric units** for length may include millimeters, centimeters, meters, and kilometers • **Metric units** for volume may include cubic millimeters, cubic centimeters, and cubic meters. • **Metric units** for capacity may include milliliters, centiliters, liters, and kiloliters
Midpoint of a line segment	The point on a line segment equidistant from the endpoints.
Minimum	The least or lowest value or quantity.
Multiples	The numbers that result from multiplying a whole number by the set of whole numbers (e.g., the multiples of 15 are 0, 15, 30, 45, 60, 75, etc.).
Negative integer	Any integer that is less than 0.
Net	A two-dimensional diagram that can be folded or made into a three-

	dimensional figure.
Non-routine problem	A problem that can be solved more than one way, rather than a set procedure; these problems may include multiple decision points and multiple steps (grade-level dependent).
Nonstandard units of measure	Objects such as blocks, paper clips, crayons, or pencils that can be used to obtain a measure.
Number line	A line on which ordered numbers can be written or visualized and may include negative numbers.
Obtuse angle	An angle with a measure greater than 90° and less than 180°.
Operation	Any mathematical process, such as addition, subtraction, multiplication, division, or raising to a power.
Ordered pair	The location of a single point on a rectangular coordinate system where the first and second values represent the position relative to the x-axis and y-axis, respectively [e.g., (x, y) or (3, 4)]. See also coordinates.
Organized data	Data arranged in a display that is meaningful and that assists in the interpretation of the data. See data displays/graphs.
Origin	The point of intersection of the x-and y-axes in a rectangular coordinate system, where the x-coordinate and y-coordinate are both zero (0).
Parallel	A relationship between lines, line segments, rays or planes that are a constant distance apart.
Parallelogram	A quadrilateral in which both pairs of opposite sides are parallel.
Partial product	An intermediary product leading to the final result of multiplying two numbers (e.g., $20 \times 3 = 60$ is a partial product for 24×13).
Partitive division	In division, partitioning, or separating a quantity so that there is an equal amount in each group (e.g., dividing 20 pennies into 4 groups with the same number of pennies in each group).
Pattern	A predictable or prescribed sequence of numbers, objects, etc.
Percent	A special-case ratio that compares numbers to 100 (the second term). For example, 25% means the ratio of 25 to 100.

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Perimeter	The distance around a figure.
Perpendicular	Lines, line segments, rays, or planes that intersect to form a right angle.
Plane	An infinite two-dimensional geometric surface defined by three nonlinear points or two distinct parallel or intersecting lines.
Pictograph	A data display constructed with pictures or symbols to represent and compare data.
Place value	The value of a digit in a number, based on the location of the digit.
Plane figure	A two-dimensional figure that lies entirely within a single plane.
Point	A specific location in space having no discernible length or width.
Polygon	A closed plane figure, having at least three sides that are line segments and are connected at their endpoints.
Polyhedron (pl. polyhedra)	A solid figure bounded by polygons.
Positive integer	Any integer that is greater than 0.
Precision (of measurement)	An indication of how exact, or "finely," a measurement was made.
Prime factorization	The expression of a number as the product of prime factors.
Prime number	Any positive integer with only two whole-number factors, 1 and itself (e.g., 2, 3, 5, 7, 11, etc.).
Prism	A polyhedron that has two congruent and parallel faces joined by faces that are parallelograms. Prisms are named by their bases.
Procedural step—	An action taken to solve a problem (e.g., there are three procedural steps to solve the following expression: 2(7 + 5), which has two operations).
Product	The result of multiplying numbers together.
Properties of equality	1) A balanced equation will remain balanced if you add, subtract, multiply, or divide both sides by the same number. 2) A quantity equal to another

	quantity can be substituted for it.
Pyramid	A three-dimensional figure in which the base is a polygon and the faces are triangles with a common vertex.
Quadrant	Any of the four regions formed by the axes in a rectangular coordinate system.
Quadrilateral	Any polygon with four sides and four angles, including parallelogram, rhombus, rectangle, square, trapezoid, and kite.
Quotient	The result of dividing two numbers.
Ray	A portion of a line that begins at an endpoint and goes on indefinitely in one direction.
Real-world problem	A problem that is an application of a real-life situation involving mathematics.
Rectangle	A parallelogram with four right angles.
Rectangular prism	A three-dimensional figure (polyhedron) with congruent rectangular parallel bases and lateral faces that are parallelograms.
Reflection	A transformation that produces the mirror image of a geometric figure over a line of reflection. Also called a flip.
Regular polygon	A polygon that is both equilateral (all sides congruent) and equiangular (all angles congruent).
Relation	A table that relates inputs to outputs or a set of ordered pairs (x, y).
Relative size	The size of one number in comparison to the size of another number or numbers.
Remainder	In a whole-number division problem, the final undivided part that is less than the divisor and left over after dividing.
Rhombus (pl. rhombi)	A parallelogram with four congruent sides.
Right angle	An angle that measures exactly 90°.

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Right prism	A prism in which all lateral faces and edges are perpendicular to the bases.
Right rectangular prism (Rectangular solid)	A polyhedron with congruent rectangular parallel bases, joined by faces that are also rectangles. The lateral edges of the faces are perpendicular to the bases.
Right triangle	A triangle having one right angle.
Rotation	A transformation of a figure by turning it about a point or axis. The amount of rotation is usually expressed in the number of degrees (e.g., a 90° rotation). The direction of the rotation is usually expressed as clockwise or counterclockwise. Also called a turn.
Rule	A general statement written in numbers, symbols, or words that describes how to determine any term in a pattern or relationship.
Scalar drawing (or model	A drawing (or model) that uses proportional lengths in the drawing (or model) and the actual image.
Scale	The numeric values, set at fixed intervals, assigned to the axes of a graph.
Scalene triangle	A triangle having no congruent sides.
Sequence	An ordered list of numbers with either a constant difference (arithmetic) or a constant ratio (geometric).
SI units (International System of Units)	Scientific method of expressing the magnitudes or quantities of important natural phenomena. Base units acceptable for elementary mathematics items are meter, kilogram, and second.
Side	The edge of a polygon (e.g., a triangle has three sides), the face of a polyhedron, or one of the rays that make up an angle.
Simplify	The process of converting a fraction or mixed number to an equivalent fraction or mixed number, in which the greatest common factor of the numerator and the denominator of the fraction is one.
Solid figure	A three-dimensional figure that completely encloses a portion of space (e.g., a rectangular prism, cube, sphere, and pyramid).
Sphere	A three-dimensional figure in which all points on the figure are equidistant from a center point.

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Square	A rectangle with four congruent sides; also, a rhombus with four right angles.
Squiggle	See break.
Standard algorithm (for division)	A procedure for finding a two- or more-place quotient of a division problem when a two- or more-step procedure is used (steps include dividing, multiplying, comparing, subtracting, and regrouping).
Standard units of measure	Accepted measuring devices and units of the customary or metric system.
Straight angle	An angle that measures exactly 180°.
Successive subtraction	A method of repeatedly subtracting the same amount to solve a division problem, including measurement models of division.
Sum	The result of adding numbers together.
Surface area of a geometric solid	The sum of the areas of the faces and any curved surfaces of the figure that create a geometric solid figure.
Symmetry	A term describing the result of a line drawn through the center of a figure such that the two halves of the figure are reflections of each other across the line (line symmetry). When a figure is rotated about a point and fits exactly on itself, the figure has rotational symmetry.
Table	A data display that organizes information about a topic into categories.
Tally chart (or table)	A chart, or table, consisting of tallies, or slash marks, having a one-to-one correspondence between the number of objects and the number of slash marks (e.g., 6 = ~~𝍸~~ I).
Three-dimensional figure	A figure having length, height, and width (depth).
Transformation	An operation on a geometric figure by which an image is created. Common transformations include reflections (flips), translations (slides), and rotations (turns).
Translation	A transformation in which every point in a figure is moved in the same direction and by the same distance. Also called a slide.

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Trapezoid	A quadrilateral with exactly one pair of parallel sides.
Two-dimensional figure	A figure having length and width.
Variable	Any symbol, usually a letter, which could represent a number.
Venn diagram	A diagram that shows relationships among sets of objects.
Vertex (pl. vertices)	The point common to the two rays that form an angle; the point common to any two sides of a polygon; the point common to three or more edges of a polyhedron.
Vertical	Perpendicular to the plane of the horizon.
Volume	The amount of space occupied in three dimensions and expressed in cubic units. Both capacity and volume are used to measure empty spaces; however, capacity usually refers to fluid measures, whereas volume is described as cubic units.
Weight	Measures that represent the force of gravity on an object.
Whole numbers	The numbers in the set {0, 1, 2, 3, 4 . . .}.
Width	One of the dimensions of a two- or three-dimensional figure.
x-axis	The horizontal number line on a rectangular coordinate system.
y-axis	The vertical number line on a rectangular coordinate system.

FCAT 2.0 MATHEMATICS GLOSSARY: GRADES 6-8

The following glossary is a reference list provided for item writers and is **not** intended to comprise a comprehensive vocabulary list for students. The terms defined in this glossary pertain to the NGSSS in mathematics for Grades 6–8 and the content assessed on FCAT 2.0 Mathematics.

Absolute value	A number's distance from zero (0) on a number line. Distance is expressed as a positive value (e.g., |3| = 3 and |-3| = 3)
Acute angle	An angle that measures less than 90° and greater than 0°.
Addend	Any number being added.
Additive identity	The number zero (0). When zero (0) is added to another number the sum is the number itself (e.g., 5 + 0 = 5).
Additive inverse property	A number and its additive inverse have a sum of zero (0) (e.g., in the equation 3 + -3 = 0, 3 and -3 are additive inverses of each other).
Algebraic equation (inequality)	A mathematical sentence containing variables in which two expressions are connected by an equality (inequality) symbol. See also equation and inequality.
Algebraic expression	An expression containing numbers and variables (e.g., 7*x*), and operations that involve numbers and variables (e.g., 2*x* + y). Algebraic expressions do not contain equality or inequality symbols.
Algebraic order of operations	The order of performing computations is parentheses first, then exponents, followed by multiplication and/or division (as read from left to right), then addition and/or subtraction (as read from left to right). For example: = 5 + (12 - 2) ÷ 2 - 3 x 2 = 5 + 10 ÷ 2 - 3 x 2 = 5 + 5 - 6 = 10 - 6 = 4
Algebraic rule	A mathematical expression that contains variables and describes a pattern or relationship.
Altitude	The perpendicular distance from a vertex in a polygon to its opposite side.
Angle	A figure formed by two rays extending with the same endpoint (vertex). Angles are measured in degrees.
Approximate value	A number or measurement that is close to or near its exact value.
Area	The measure, in square units, of the inside region of a closed two-dimensional figure (e.g., a rectangle with sides of 4 units by 6 units has an area of 24 square units).

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Associative property	The way in which three or more numbers are grouped for addition or multiplication does not change their sum or product, respectively [e.g., (5 + 6) + 9 = 5 + (6 + 9) or (2 x 3) x 8 = 2 x (3 x 8)].
Axis (of a graph) (*pl*. axes)	The horizontal and vertical number lines used in a coordinate plane system.
Bar graph	A graph that uses either vertical or horizontal bars to display data.
Base (algebraic)	The number used as a factor in exponential form. For example 2^3 is the exponential form of 2 x 2 x 2. The numeral two (2) is called the base, and the numeral three (3) is called the exponent.
Base (geometric)	The line or plane of a geometric figure, from which an altitude can be constructed, upon which a figure is thought to rest.
Benchmark	A point of reference from which other measurements or values may be made or judged.
Benchmark angles	The angles 0°, 45°, 90°, 180°, 270°, and 360°.
Benchmark fractions	The fractions 0, 1/10, 1/5, 1/4, 1/3, 1/2, 2/3, 3/4, and 1.
Biased sample	A sample that is not representative of a population.
Box-and-whisker plot	A basic graphing tool that displays centering, spread, and distribution of a data set.
Break	A zigzag on the χ- or γ-axis in a line or bar graph indicating that the data being displayed do not include all of the values that exist on the number line used. Also called a squiggle.
Capacity	The amount of space that can be filled in a container. Both capacity and volume are used to measure three-dimensional spaces; however, capacity usually refers to fluid measures, whereas volume is described as cubic units.
Categorical data	Absolute; if data can be represented by one and only one category (e.g., a person's gender), it is called qualitative data. Categorical data are qualitative.
Central angle	An angle that has its vertex at the center of a circle, with radii as its sides.
Chart	A data display that presents information in columns and rows.
Circle graph	A data display that divides a circle into regions representing a portion of the total set of data. The circle represents the whole set of data.
Circumference	The distance around a circle.
Circumscribed	A descriptor for a geometric figure that is drawn around and encloses

	(while certain **points** are touching) another geometric figure.
Closed figure	A two-dimensional figure that divides the plane in which the figure lies into two parts—the part inside the figure and the part outside the figure (e.g., circles, squares, rectangles).
Coefficient	The number that multiplies the variable(s) in an algebraic expression (e.g., 4*xy*). If no number is specified, the coefficient is 1.
Commutative property	The order in which two numbers are added or multiplied does not change their sum or product, respectively (e.g., 2 + 3 = 3 + 2 or 4 x 7 = 7 x 4).
Compatible numbers	Numbers that are easy to compute mentally.
Complementary angles	Two angles with measures that sum to be exactly 90°.
Compose	To form by putting together (e.g., a geometric figure or a number).
Composite figure	A figure made up of several different figures.
Composite number	A whole number that has more than two factors.
Compound inequality	Two inequalities that are combined into one statement by the words *and* or.
Concave polygon	A polygon with one or more diagonals that have points outside the polygon.
Concentric circles	Two or more coplanar circles that share the same center.
Cone	A pyramid with a circular base.
Congruent	Figures or objects that are the same shape and size.
Constant	A number for which the value does not change.
Continuous data	data that can take any of an infinite number of values between whole numbers.
Continuous graph	A graph in which there are no gaps or holes (e.g., a line graph).
Convex polygon	A polygon with each interior angle measuring less than 180°.
Coordinate grid or plane	A two-dimensional network of horizontal and vertical lines that are parallel and evenly-spaced; especially designed for locating points, displaying data, or drawing maps.
Coordinates	Numbers that correspond to points on a coordinate plane in the form (*x,y*), or a number that corresponds to a point on a number line.
Corresponding angles	Angles that are in the same position on two parallel lines in relation to a transversal.

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Counting principle	If a first event has *n* outcomes and a second event has *m* outcomes, then the first event followed by the second event has *n* x *m* outcomes.
Cube	A solid figure with six congruent square faces.
Customary units	The units of measure developed and used in the United States. • Customary units for length are inches, feet, yards, and miles. • Customary units for weight are ounces, pounds, and tons. • Customary units for volume are cubic inches, cubic feet, and cubic yards. • Customary units for capacity are fluid ounces, cups, pints, quarts, and gallons.
Cylinder	A three-dimensional figure with two parallel bases that are congruent circles.
Data displays/graphs	Different ways of displaying data in charts, tables, or graphs, including pictographs, circle graphs, single-, double-, or triple-bar and line graphs, line plots, histograms, Venn diagrams, stem-and-leaf plots, box-and-whisker plots, and scatter plots.
Decompose	To separate into parts or elements (e.g., geometric figures or numbers).
Degree	The unit of measure for angles or temperature (°).
Dependent events	Two events are dependent if the outcome of one event affects the probability that the other event will occur.
Depth	The distance or length from front to back of a three-dimensional object or the quality of being deep (e.g., body of water). Derived units—Units of measurement of a derived quantity in a given system of quantities.
Derived units	Units of measurement of a derived quantity in a given system of quantities. Derived units are expressed algebraically in terms of base units by means of mathematical symbols of multiplication and division (e.g., mph).
Diagonal	A line segment that joins two nonadjacent vertices of a polygon.
Diameter	A line segment from any point on the circle passing through the center to another point on the circle.
Difference	A number that is the result of subtraction.
Dilation	A proportional increase or decrease in size in all dimensions.
Dimension	A measure in one direction (e.g., length, width, height, or depth).
Direct measure	The measure of an object obtained by using measuring devices, either standard devices of the customary or metric systems, or nonstandard

	devices such as a paper clip or pencil.
Direct variation	The relation between two quantities for which the ratio remains constant. The ratio of *y* to *x* is a constant, *k*, or *y/x*= *k* and a graph of the relationship will always contain the origin (0, 0).
Discrete data	Distinct values that are not connected by intermediate values and are a finite set of values.
Distributive property	The product of a number and the sum or difference of two numbers is equal to the sum or difference of the two products. [e.g., x(α + b) = αx+ bx.]
Dividend	A quantity that is to be divided.
Divisible	A number capable of being divided by another number without a remainder.
Divisor	The number by which another number is divided.
Domain	The complete set of possible values of the independent variable in a function.
Dozen	A quantity made of twelve items.
Edge	A line segment where two faces of a polyhedron meet.
Elevation	The height or altitude above sea level.
Empirical probability	The likelihood of an event happening that is based on experience and observation rather than on theory.
Equal	Having the same value (=).
Equation	A mathematical sentence in which two expressions are connected by an equality symbol. See also algebraic equation (inequality).
Equidistant	Equally distant.
Equilateral triangle	A triangle with three congruent sides.
Equivalent	Having or naming the same value.
Equivalent expressions	Expressions that have the same value but are presented in a different format using the properties of numbers.
Equivalent forms of a number	The same number expressed in different forms (e.g., ¾, 0.75, 75%)
Estimation	The use of rounding and/or other strategies to determine a reasonably accurate approximation, without calculating an exact answer (e.g., clustering, front-end estimating, grouping, etc.).
Evaluate an	Substitute numbers for the variables and follow the algebraic order of

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algebraic expression	operations to find the numerical value of the expression.
Expanded form	A form of writing numbers that shows the value of each digit (e.g., 426 400 + 20 + 6).
Exponent (exponential form)	The number of times the base occurs as a factor. For example, 2^3 is the exponential form of 2 X 2 X 2. The numeral two (2) is called the base, and the numeral three (3) is called the exponent.
Expression	A collection of numbers, symbols, and/or operation signs that stands for a number.
Extraneous information	Information that is not necessary to solving the problem.
Extrapolate	To estimate or infer a value or quantity beyond the known range of data.
Face	One of the plane surfaces bounding a three-dimensional figure; a side.
Factor	A number or expression that divides evenly into another number [e.g., 1, 2, 4, 5, 10, and 20 are factors of 20 and (x +1) is one of the factors of (x^2 -1)].
Figure	A shape in two or three dimensions.
Fraction	Any part of a whole is called a fraction (e.g., one-half written in fractional form is ½)
Frequency table	A table that shows how often each item, number, or range of numbers occurs in a set of data.
Function (of *x*)	A relation in which each value of x is paired with a unique value of y.
Function table	A table of x- and y-values (ordered pairs) that represents the function, pattern, relationship, or sequence between the two variables.
Greatest common factor (GCF)	The greatest number that is a factor of two or more numbers.
Grid	See *coordinate grid* or *plane*
Gross	A quantity made of 144 items.
Height	A line segment extending from the vertex or apex of a figure to its base and forming a right angle with the base or plane that contains the base.
Histogram	A bar graph with no spaces between the bars. The height of each bar shows the frequency of data within that interval.
Horizontal	Parallel to, or in the plane of the horizon.
Hypotenuse	The longest side of a right triangle; the side opposite the right angle.
Hypothesis	A proposition or supposition developed to provide a basis for further

	investigation or research.
Identity property of addition	The sum of a number and zero is always that number (e.g., a + 0= a).
Identity property of multiplication	The product of a number and one is always that number (e.g., a X 1= a).
Increment (interval)	On a graph, the distance between numbers from one grid line to another.
Independent events	Two events are independent if the outcome of one event does not affect the probability that the other will occur.
Indirect measure	The measurement of an object through the known measure of another object.
Indirect variation	See *inverse variation*
Inequality	A sentence that states one expression is greater than, greater than or equal to, less than, less than or equal to, or not equal to, another expression (e.g., $a \neq 5$ or $x < 7$ or $2y + 3 \geq 11$). See also algebraic inequality.
Inscribed angle	An angle that has a vertex on a circle and sides that contain chords of the circle.
Integers	The numbers in the set {. . . -4, -3, -2, -1, 0, 1, 2, 3, 4 . . .}.
Intercept	The value of a variable when all other variables in the equation equal zero (0). On a graph, the values where a function crosses the axes.
Intersection	The point at which lines or curves meet; the line where planes meet.
Interval	See *increment*
Inverse operation	An action that undoes a previously applied action. For example, subtraction is the inverse operation of addition.
Inverse variation	The relation between two quantities for which the constant of proportionality varies inversely to each other. The product of *x* and *y* is a constant, *k*, or $xy = k$.
Irrational number	A real number that cannot be expressed as a ratio of two integers (e.g., $\sqrt{2}$).
Isosceles triangle	A triangle with two congruent sides and two congruent angles.
Kite	A quadrilateral with two distinct pairs of adjacent congruent sides.
Labels (for a graph)	The titles given to a graph, the axes of a graph, or to the scales on the axes of a graph.
Lateral face	A face of a prism or pyramid that is not a base.

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Least common multiple (LCM)	The lowest number that is a multiple of two or more numbers.
Length	A one-dimensional measure that is the measurable property of line segments.
Likelihood	The chance that something is likely to happen. See probability.
Line	A collection of an infinite number of points in a straight pathway with unlimited length and having no width.
Line of best fit	A line drawn on a scatter plot to estimate the relationship between two sets of data.
Line graph	A graph that displays data using connected line segments.
Line plot	A diagram or graph showing frequency of data on a number line.
Line segment	A portion of a line that consists of two defined endpoints and all the points in between.
Linear equation	An algebraic equation in which the variable quantity or quantities are raised to the zero or first power and the graph is a straight line [e.g., $20 = 2(w + 4) + 2w$ and $y = 3x + 4$].
Linear inequality	An algebraic inequality in which the variable quantity or quantities are raised to the zero or first power and the graph is a region whose boundary is the straight line formed by the inequality.
Linear measure (length)	A one-dimensional measure that is the measurable property of line segments.
Literal equation	An equation that involves two or more variables.
Mass	The amount of matter in an object.
Maximum	The greatest or highest value or quantity.
Mean	The arithmetic average of a set of numbers. It is also a measure of central tendency.
Measures of central tendency	Numerical values used to describe the overall clustering of data in a set, or the overall “average” of a set of data. The three most common measures of central tendency are the mean, median, and mode.
Median	The middle point of a set of rank-ordered numbers where half of the numbers are above the median and half are below it. It is also a measure of central tendency.
Metric units	The units of measure developed in Europe and used in most of the world. Like the decimal system, the metric system uses the base 10. • Metric units for length are millimeters, centimeters, meters, and kilometers.

	• Metric units for mass are milligrams, grams, and kilograms. • Metric units for volume are cubic millimeters, cubic centimeters, and cubic meters. • Metric units for capacity are milliliters, centiliters, liters, and kiloliters.
Midpoint of a line segment	The point on a line segment equidistant from the endpoints.
Minimum	The least or lowest value or quantity.
Mode	The score or data point found most often in a set of numbers. There may be no mode, one mode, or more than one mode in a set of numbers. It is also a measure of central tendency.
Multiples	The numbers that result from multiplying a given whole number by the set of whole numbers (e.g., the multiples of 15 are 0, 15, 30, 45, 60, 75, etc.).
Multiplicative identity	The number one (1). The product of a number and the multiplicative identity is the number itself (e.g., 5 x 1 = 5).
Multiplicative inverse (reciprocal)	Any two numbers with a product of 1 (e.g., 4 and ¼). Zero (0) has no multiplicative inverse.
Natural numbers (counting numbers)	The numbers in the set {1, 2, 3, 4, 5 . . .}.
Negative exponent	Used to designate the reciprocal of a number to the absolute value of the exponent. Also used in scientific notation to designate a number smaller than one (1). For example, 3.45×10^{-2} equals 0.0345.
Negative integer	Any integer that is less than 0.
Net	A two-dimensional diagram that can be folded or made into a three-dimensional figure.
Nonroutine problem	A problem that can be solved more than one way, rather than a set procedure; these problems may include multiple decision points and multiple steps (grade-level dependent).
Number line	A line on which ordered numbers can be written or visualized.
Oblique	A relationship between lines and/or plane figures that is not perpendicular or parallel.
Obtuse angle	An angle with a measure of more than 90° but less than 180°.
Odds	The ratio of one event occurring (favorable outcome) to it not occurring (unfavorable outcome) if all outcomes are equally likely.
Operation	Any mathematical process, such as addition, subtraction, multiplication, division, raising to a power, or finding the square root.

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Operational shortcut	A method having fewer arithmetic calculations.
Ordered pair	The location of a single point on a rectangular coordinate system where the first and second values represent the position relative to the *x*-axis and *y*-axis, respectively [e.g., (*x, y*) or (3, -4)].
Organized data	Data arranged in a display that is meaningful and that assists in the interpretation of the data. See data displays.
Origin	The point of intersection of the *x*- and *y*-axes in a rectangular coordinate system, where the *x*-coordinate and *y*-coordinate are both zero (0).
Outcome	A possible result of an experiment.
Outlier	A value that is much higher or much lower than the other values in a set of data. Parallel—A relationship between lines, line segments, rays or planes that are a constant.
Parallel	A relationship between lines, line segments, rays or planes that are a constant distance apart.
Parallelogram	A quadrilateral in which both pairs of opposite sides are parallel.
Pattern	A predictable or prescribed sequence of numbers, objects, etc. Patterns and relationships may be described or presented using manipulatives, tables, graphics (pictures or drawings), or algebraic rules (functions).
Percent	A special-case ratio which compares numbers to 100 (the second term). For example, 25% means the ratio of 25 to 100.
Perimeter	The distance around a polygon.
Perpendicular	Two lines, two line segments, or two planes that intersect to form a right angle.
Pi (π)	The symbol designating the ratio of the circumference of a circle to its diameter. It is an irrational number with common approximations of either 3.14 or $\frac{22}{7}$.
Pictograph	A data display constructed with pictures or symbols to visualize any ratios between two measures or counts.
Place value	The position of a single digit in a number.
Plane	An infinite two-dimensional geometric surface defined by three non-linear points or two distinct parallel or intersecting lines.
Plane figure	A two-dimensional figure that lies entirely within a single plane.
Point	A specific location in space that has no discernible length or width.
Polygon	A closed plane figure, having at least three sides that are line segments

	and are connected at their endpoints.
Polyhedron (*pl*. polyhedra)	A solid figure bounded by polygons.
Positive integer	Any integer that is greater than 0.
Precision (of measurement)	An indication of how exact, or "finely," a measurement was made.
Prime factorization	The expression of a number as the product of prime factors.
Prime number	Any whole number with only two whole number factors, 1 and itself (e.g., 2, 3, 5, 7, 11, etc.).
Prism	A polyhedron that has two congruent and parallel faces joined by faces that are parallelograms. Prisms are named by their bases.
Probability	A measure of the likelihood that a given event will occur; expressed as a ratio of one event occurring (favorable outcomes) to the number of equally likely possible outcomes. See also empirical probability and theoretical/expected probability.
Procedural step	An action taken to solve a problem (e.g., there are three procedural steps to evaluate the following expression: 2(7 + 5), which has two operations).
Product	The result of multiplying numbers together.
Properties of equality	1) A balanced equation will remain balanced if you add, subtract, multiply, or divide both sides by the same number. 2) A quantity equal to another quantity can be substituted for it.
Proportion	A mathematical sentence stating that two ratios are equal.
Proportional	Having the same or a constant ratio. Two quantities that have the same ratio are considered directly proportional (e.g., If $y = kx$, then y is said to be directly proportional to x and the constant of proportionality is k). Two quantities in which products are always the same are considered inversely proportional (e.g., If $xy = k$, then y is said to be inversely proportional to x).
Pyramid	A three-dimensional figure whose base is a polygon and whose faces are triangles with a common vertex.
Pythagorean theorem	The square of the hypotenuse (c) of a right triangle is equal to the sum of the square of the legs (a and b), as shown in the equation $c^2 = a^2 + b^2$.
Quadrant	Any of the four regions formed by the axes in a rectangular coordinate system.

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Quadrilateral	Any polygon with four sides and four angles, including parallelogram, rhombus, rectangle, square, trapezoid, and kite.
Quotient	The result of dividing two numbers.
Radical	An expression that has a root (square root, cube root, etc.) For example, $\sqrt{25}$ is a radical. Any root can be specified by an index number, *b*, in the form $\sqrt[b]{a}$ (e.g., $\sqrt[3]{8}$). A radical without an index number is understood to be a square root.
Radical sign	The symbol ($\sqrt{\ }$) used before a number to show that the number is a radicand. See also *radical*.
Radicand	The number that appears within a radical sign (e.g., in $\sqrt{25}$, 25 is the radicand).
Radius (*pl. radii)*	A line segment extending from the center of a circle or sphere to a point on the circle or sphere.
Randomly selected	Having the same probability of being chosen.
Range	1) The lowest value (L) in a set of numbers through the highest value (H) in the set. When the width of the range is expressed as a single number, the range is calculated as the difference between the highest and lowest values (H - L). Other presentations show the range calculated as (H - L + 1). Depending on the context, the result of either calculation would be considered correct. 2) The complete set of all possible resulting values of the dependent variable of a function.
Rate	A ratio that compares two quantities of different units (e.g., feet per second).
Rate of change	The ratio of change in one quantity to the corresponding change in another quantity.
Ratio	The comparison of two quantities (e.g., the ratio of *a* and *b* is *a: b* or *a/b*, where $b \neq 0$).
Rational number	A real number that can be expressed as a ratio of two integers.
Ray	A portion of a line that begins at an endpoint and goes on indefinitely in one direction.
Real numbers	The set of all rational and irrational numbers.
Real-world problem	A problem that is an application of a real-life situation involving mathematics.

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Reciprocal	See multiplicative inverse.
Rectangle	A parallelogram with four right angles.
Rectangular coordinate system	See *coordinate grid* or *plane*
Rectangular prism	A three-dimensional figure (polyhedron) with congruent rectangular parallel bases and lateral faces that are parallelograms.
Reduction	See *dilation*
Reflection	A transformation that produces the mirror image of a geometric figure over a line of reflection. Also called a flip.
Regular polygon	A polygon that is both equilateral (all sides congruent) and equiangular (all angles congruent).
Relation	A set of ordered pairs (*x, y*).
Relative size	The size of one number in comparison to the size of another number or numbers.
Remainder	In a whole-number division problem, the final undivided part that is less than the divisor and left over after dividing.
Rhombus (*pl.* rhombi)	A parallelogram with four congruent sides.
Right angle	An angle whose measure is exactly 90°.
Right circular cylinder	A cylinder in which the bases are parallel circles perpendicular to the side of the cylinder.
Right prism	A prism in which all the lateral faces and edges are perpendicular to the bases.
Right square pyramid	A polyhedron in which one face, the base, is a square, and the other faces, the lateral faces, are triangles with a common vertex that is directly above the center of the base.
Right rectangular prism (Rectangular solid)	A three-dimensional figure (polyhedron) with congruent, polygonal bases and lateral faces that are all parallelograms.
Right triangle	A triangle having one right angle.
Right triangle geometry	Finding the measures of missing sides or angles of a right triangle when given the measures of other sides or angles.
Rise	The vertical change on the graph between two points.
Rotation	A transformation of a figure by turning it about a center point or axis. The amount of rotation is usually expressed in the number of degrees (e.g., a 90° rotation). Also called a turn.

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Run	The horizontal change on a graph between two points.
Scalar drawing (or model)	A drawing (or model) that uses proportional lengths in the drawing (or model) and the actual image.
Scale	The numeric values, set at fixed intervals, assigned to the axes of a graph.
Scale factor	The constant that is multiplied by the length of each side of a figure that produces an image that is the same shape as the original figure.
Scale model	A model or drawing based on a ratio of the dimensions for the model and the actual object it represents.
Scalene triangle	A triangle having no congruent sides.
Scatter plot	A graph of data points, usually from an experiment that is used to observe the relationship between two variables.
Scientific notation	A shorthand method of writing very large or very small numbers using exponents in which a number is expressed as the product of a power of 10 and a number that is greater than or equal to one (1) and less than 10 (e.g., $7.59 \times 10^5 = 759{,}000$).
Sequence	An ordered list of numbers with either a constant difference (arithmetic) or a constant ratio (geometric).
SI units (International System of Units)	Scientific method of expressing the magnitudes or quantities of important natural phenomena.
Side	The edge of a polygon (e.g., a triangle has three sides), the face of a polyhedron, or one of the rays that make up an angle.
Similar figures	Figures that are the same shape, have corresponding, congruent angles, and have corresponding sides that are proportional in length.
Similarity	A term describing figures that are the same shape but are not necessarily the same size or in the same position.
Simplify	The process of converting a fraction or mixed number to an equivalent fraction or mixed number, in which the greatest common factor of the numerator and the denominator of the fraction is one.
Slant height	The length of a segment from the vertex to the lateral edge of a right cone; the height of any lateral face of a regular pyramid.
Slope	The ratio of change in the vertical axis (y-axis) to each unit change in the horizontal axis (x-axis) in the form $\frac{rise}{run}$ or $\frac{\Delta y}{\Delta x}$. Also, the constant, m, in the linear equation for the slope-intercept form $y = mx + b$.

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Solid figure	A three-dimensional figure that completely encloses a portion of space (e.g., a rectangular prism, cube, sphere, right circular cylinder, right circular cone, pyramid).
Sphere	A three-dimensional figure in which all points on the figure are equidistant from a center point.
Square	A rectangle with four congruent sides; also, a rhombus with four right angles.
Square root	A positive real number that can be multiplied by itself to produce a given number (e.g., the square root of 144 is 12 or $\sqrt{144}$ = 12).
Squiggle	See *break*
Standard units of measure	Accepted measuring devices and units of the customary or metric system.
Stem-and-leaf plot	A graph that organizes data by place value to compare data frequencies.
Straight angle	An angle that measures exactly 180°.
Sum	The result of adding numbers together.
Supplementary angles	Two angles with measures the sum of which is exactly 180°.
Surface area of a geometric solid	The sum of the areas of the faces and any curved surfaces of the figure that create the geometric solid.
Symmetry	A term describing the result of a line drawn through the center of a figure such that the two halves of the figure are reflections of each other across the line (line symmetry). When a figure is rotated around a point and fits exactly on itself, the figure has rotational symmetry.
System of linear equations	Two or more related linear equations. A system of linear equations can have no common solutions, one common solution, or many common solutions. The solution to a system of linear equations is an ordered number set that makes all of the equations true.
Table	A data display that organizes information about a topic into categories.
Tally chart (or table)	A chart, or table, consisting of tallies, or slash marks, having a one-to-one correspondence between the number of objects and the number of slash marks (e.g., 6 = ~~////~~ /).
Term	A number, variable, product, or quotient in an expression. A term is not a sum or difference (e.g., $5x^2 + 6$ has two terms, $5x^2$ and 6).
Theoretical probability	The likelihood of an event happening based on theory rather than on experience and observation.

FCAT 2.0 MATHEMATICS GLOSSARY: GRADES 6-8

Three-dimensional figure	A figure having length, height, and width (depth).
Transformation	An operation on a geometric figure by which another image is created. Common transformations include reflections (flips), translations slides), rotations (turns) and dilations.
Translation	A transformation in which every point in a figure is moved in the same direction and by the same distance. See also slide.
Transversal	A line that intersects two or more lines at different points.
Trapezoid	A quadrilateral with exactly one pair of parallel sides.
Tree diagram	A diagram in which all the possible outcomes of a given event are displayed.
Trend	A general pattern in a set of data (e.g., if a line graph moves generally upward from left to right, the trend is increasing).
Trend line	A line on a graph indicating a statistical trend.
Truncate	To make numbers with many digits easier to read and use by ignoring all digits to the right of the chosen place. The truncated number is an approximation, not an exact equivalence of the original number.
Two-dimensional figure	A figure having length and width.
Unorganized data	Data that are presented in a random manner.
Variable	Any symbol, usually a letter, which could represent a number.
Variability	see *range*
Venn diagram	A diagram that shows relationships among sets of objects.
Vertex (*pl.* vertices)	The point common to the two rays that form an angle; the point common to any two sides of a polygon; the point common to three or more edges of a polyhedron.
Vertical	Perpendicular to the plane of the horizon.
Vertical angles	The opposite or non-adjacent angles formed when two lines intersect.
Volume	The amount of space occupied in three dimensions and expressed in cubic units. Both capacity and volume are used to measure empty spaces; however, capacity usually refers to fluid measures, whereas
Weight	Volume is described as cubic units.

FCAT 2.0 MATHEMATICS GLOSSARY: GRADES 6-8

Whole numbers	The numbers in the set {0, 1, 2, 3, 4 . . .}.
Width	One of the dimensions of a two- or three-dimensional figure.
***x*-axis**	The horizontal number line on a rectangular coordinate system.
***x*-intercept**	The value of x at the point where a line or graph intersects the x-axis. The value of y is zero (0) at this point.
***y*-axis**	The vertical *number line* on a *rectangular coordinate system.*
***y*-intercept**	The value of *y* at the *point* where a *line* or *graph intersects* the *y-axis.* The value of *x* is zero (0) at this *point.*

END-OF-COURSE MATHEMATICS GLOSSARY: GRADES 9-10

The terms defined in this glossary pertain to the *Next Generation Sunshine State Standards* in mathematics for Grades 9 and 10 and the content assessed on the mathematics End-of-Course assessments. Italicized words or phrases within a definition are defined separately in this glossary.

Absolute value	A number's distance form zero on a number line. Distance is expressed as a positive value.
Acute angle	An angle that measures less than 90° and greater than 0°.
Algebraic expression	An expression that includes at least one variable. Algebraic expressions do not contain equality or inequality symbols (= or ≠).
Altitude	The perpendicular distance from the top of a geometric figure to its opposite side.
Angle	Two rays or two line segments extending from a common end point called a vertex. Angles are measured in degrees, in radians, or in gradians.
Approximate	A number or measurement that is close to or near its exact value.
Arc	Part of a circle.
Area	The number of square units needed to cover a surface.
Associative property	The way in which three or more numbers are grouped for addition or multiplication does not change their sum or product, respectively [e.g., (5 + 6) + 9 = 5 + (6 + 9) or (2 x 3) x 8 = 2 x (3 x 8)].
Asymptote	A straight line associated with a curve such that as a point moves along an infinite branch of the curve the distance from the point to the line approaches zero and the slope of the curve at the point approaches the slope of the line.
Attribute	A quality or characteristic, such as color, thickness, size, and shape.
Axes	The horizontal and vertical number lines used in a coordinate plane system.
Axiom	Postulate, or axiom, indicates a statement or assumption that is taken to be true without proof; and which can be used to prove other statements or theorems.
Bar graph	A graph that uses either vertical or horizontal bars to display countable data
Benchmark	A point of reference from which other measurements or values may be made or judged.
Binomial Theorem	A theorem that specifies the expansion of a binomial of the form $(x + y)^n$ as the sum of n + 1 terms of which the general term is of the form $\frac{n!}{(n-k)!\,k!}x^{(n-k)}y^k$ where k takes on values from 0 to n.
Bisector	A line segment, line, or plane that divides a geometric figure into two congruent halves.
Capacity	The amount of space that can be filled in a container. Both capacity and volume are used to measure three-dimensional spaces.

END-OF-COURSE MATHEMATICS GLOSSARY: GRADES 9-10

Centroid	For a triangle, this is the point at which the three medians intersect.
Chain Rule	A method for finding the derivative of a composition of functions. The formula is $\frac{d}{dx}f(g(x)) = f'(g(x))g'(x)$
Change of Base Formula	A formula that allows you to rewrite a logarithm in terms of logs written with another base. Assume that x, a, and b are all positive. Also assume that a ≠ 1, b ≠1. Change of base formula: $\log_a x = \frac{\log_b x}{\log_b a}$
Chart	A data display that presents information in columns and rows.
Chord	A line segment whose endpoints lie on a circle.
Circle	A closed plane figure with all points of the figure the same distance from the center.
Circle	A closed plane figure with all points of the figure the same distance from the center. The equation for a circle with center (h, k) and radius r is: $(x - h)^2 + (y - k)^2 = r^2$
Circle graph	A data display that divides a circle into regions representation a portion to the total set of data. The circle represents the whole set of data.
Circumcenter	The center of a circumcircle.
Circumference	The distance around a circle.
Circumscribed	A descriptor for a geometric figure that is drawn around and enclosing (while certain points are touching) another geometric figure.
Coefficient	The number that multiplies the variable(s) in an algebraic expression (e.g., 4xy). If no number is specified, the coefficient is 1.
Commutative property	The order in which two numbers are added or multiplied does not change their sum or product, respectively (e.g., 2 + 3 = 3 + 2, or 4 × 7 = 7 × 4).
Complex fraction	A fraction with one or more fractions embedded in the numerator and/or denominator (e.g., (3/8)/(2/7)).
Complex number	A number that can be written in the form a + bi, where a and b are real numbers and i is the square root of -1.
Composition of functions	Combining two functions by taking the output of one and using it as the input of another. If the output of g is used as the input of f, then the composition is

	referred to as "f of g of x" and is denoted f(g(x)) or f?g(x).
Compound Interest	A method of computing interest in which interest is computed from the up-to-date balance. That is, interest is earned on the interest and not just on original balance.
Concave	Defines a shape that curves inward; opposite of convex.
Concentric circles	Circles that have the same center.
Conditional probability	A probability that is computed based on the assumption that some event has already occurred. The probability of event B given that event A has occurred is written P(B|A).
Cone	A pyramid with a circular base.
Congruent	Figures or objects that are the same shape and size.
Conic section	The family of curves including circles, ellipses, parabolas, and hyperbolas. All of these geometric figures may be obtained by the intersection of a double cone with a plane. All conic sections have equations of the form $Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0$.
Conjugate root theorem	If P is a polynomial in one variable with real coefficients, and a + bi is a zero of P with a and b real numbers, then its complex conjugate a - bi is also a zero of P.
Constant	Any value that does not change.
Contrapositive	Switching the hypothesis and conclusion of a conditional statement and negating both. “If p, then q.” becomes “If not q, then not p.” The contrapositve has the same truth value as the original statement.
Converse	Switching the hypothesis and conclusion of a conditional statement. “If p, then q.” becomes “If q, then p.”
Convex	Defines a shape that curves outward; opposite of concave. A geometric figure is convex if every line segment connecting interior points is entirely contained within the figure's interior.
Coordinate	Numbers that correspond to points on a coordinate plane in the form (x, y), or a number that corresponds to a point on a number line.
Coordinate plane	A two-dimensional network of horizontal and vertical lines that are parallel and evenly-spaced; especially designed for locating points, displaying data, or drawing maps.
Correlation	The degree to which two variables are associated.
Correlation coefficient	A number that is a measure of the strength and direction of the correlation between two variables. Correlation coefficients are expressed using the

	variable r, where r is between 1 and –1, inclusive. The closer r is to 1 or –1, the less scattered the points are and the stronger the relationship. Only data points with a scatter plot which is a perfectly straight line can have r = –1 or r = 1. When r < 0 the data have a negative association, and when r > 0 the data have a positive association.
Cosine	Cosine function is written as cos?. Cos(q) is the x-coordinate of the point on the unit circle so that the ray connecting the point with the origin makes an angle of q with the positive x-axis. When q is an angle of a right triangle, then cos(q) is the ratio of the adjacent side with the hypotenuse.
Counterexample	An example which disproves a proposition.
Counting principle	if a first event has n outcomes and a second event has m outcomes, then the first event followed by the second event has n x m outcomes.
Cube	Solid figure with six congruent, square faces
Cylinder	A three dimensional figure with two parallel congruent circular bases and a lateral surface that connects the boundaries of the bases. More general definitions of cylinder may not require circular bases.
Degree	The unit of measure for angles (°), equal to $^{1}/_{360}$ of a complete revolution. There are 360 degrees in a circle.
Derivative	The limit of the ratio of the change in a function to the corresponding change in its independent variable as the latter change approaches zero. Derivative of f(x) at x=a is $f'(a) = \lim_{h \to 0} \frac{f(a+h) - f(a)}{h}$
Determinant	A square array of numbers bordered on the left and right by a vertical line and having a value equal to the algebraic sum of all possible products where the number of factors in each product is the same as the number of rows or columns, each factor in a given product is taken from a different row and column, and the sign of a product is positive or negative depending upon whether the number of permutations necessary to place the indices representing each factor's position in its row or column in the order of the natural numbers is odd or even.
Diagonal	A line segment that joins two non-adjacent vertices in a polygon.
Diameter	A line segment from any point on the circle (or sphere) passing through the center to another point on the circle (or sphere).
Difference	A number that is the result of subtraction
Differentiation	The process of finding a derivative.
Digit	A symbol used to name a number. There are ten digits: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9. In the number 49, 4 and 9 are digits.

END-OF-COURSE MATHEMATICS GLOSSARY: GRADES 9-10

Dilation	Dilation of a figure is a transformation where the points of the figure is transformed from (x,y) to (kx,ky). The scale factor k is a positive real number. If k is bigger than 1, the transformation is an enlargement. If k is between 0 and 1, then it is a contraction.
Dimension	The number of coordinates used to express a position.
Dimensional analysis	Keeping track of units during computation to assure accurate and appropriate reporting of information.
Discount	An amount that is subtracted from the regular price of an item.
Discriminant	An algebraic expression related to the coefficients of a quadratic equation that can be used to determine the number and type of solutions to the equation. If ax^2+bx+c=0, the discriminant is D=b^2-4ac.
Divisible	A number capable of being divided by another number without a remainder.
Domain	The set of values of the independent variable(s) for which a function or relation is defined.
Dot Product	The dot product can be defined for two vectors **X** and **Y** by **X.Y = IXI IYI cos?**, where ? is the angle between the vectors and **IXI** is the magnitude of the vector **X**.
e	e=2.7182818284...., is an irrational number and the base of the natural logarithm. e is sometimes known as Napier's constant although the symbol e honors Euler.
Eccentricity	A number that indicates how drawn out or attenuated a conic section is $e = \frac{c}{a}$. Eccentricity is represented by the letter e (no relation to *e* = 2.718...). The eccentricity can be interpreted as the fraction of the distance along the half of the major axis at which the focus lies: . Here, *c* = the distance from the center to a focus, *a* = the distance of the half of the major axis.
Edge	A line segment where two faces of a polyhedron meet.
Ellipse	For two given points, the foci, an ellipse is the locus of points such that the sum of the distance to each focus is constant. An ellipse has two axis of symmetry. The longer is called major axis and the shorter is called minor axis. The equation for a horizontal ellipse with center (h, k) is $\frac{(x-h)^2}{a^2}+\frac{(y-k)^2}{b^2}=1$, where a and b are real numbers and a is half of the major axis and b is half of the minor axis. Note that if a=b, it is a circle.
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End behavior	A function's value for extreme values of its independent variable.
Equal	Having the same value (=).
Equality	A mathematical statement of the equivalence of two quantities. Equivalence properties of equality includes reflexive (a=a), symmetric (if a=b, then b=a), and transitive (if a=b and b=c, then a=c) properties. A balanced equation will remain balanced if you add, subtract, multiply or divide (excluding division by zero) both sides by the same number.
Equally likely	Two events with the same probability of occurrence.
Equation	A mathematical sentence stating that the two expressions have the same value. Also read the definition of equality.
Equidistant	Equally distant.
Equilateral triangle	A triangle with three congruent sides.
Equivalent	Having the same value.
Estimate	Is an educated guess for an unknown quantity or outcome based on known information. An estimate in computation may be found by rounding, by using front-end digits, by clustering, or by using compatible numbers to compute.
Estimation	The use of rounding and/or other strategies to determine a reasonably accurate approximation, without calculating an exact answer.
Euclidean geometry	A geometry in which Euclid's fifth postulate holds, sometimes also called parabolic geometry. Two-dimensional Euclidean geometry is called plane geometry, and three-dimensional Euclidean geometry is called solid geometry. Euclid's fifth postulates: 1. A straight line segment can be drawn joining any two points. 2. Any straight line segment can be extended indefinitely in a straight line. 3. Given any straight line segment, a circle can be drawn having the segment as radius and one endpoint as center. 4. All right angles are congruent. 5. If two lines are drawn which intersect a third in such a way that the sum of the inner angles on one side is less than two right angles, then the two lines inevitably must intersect each other on that side if extended far enough. This postulate is equivalent to what is known as

	the parallel postulate.
Event	A set of possible outcomes.
Exponent (exponential form)	The number of times the base occurs as a factor, for example 2^3 is the exponential form of 2 x 2 x 2. The number two (2) is called the base, and the number three (3) is called the exponent.
Exponential Function	A function of the form $y = ab^{cx+b} + e$, where a, b, c, d, e, x are real numbers, a, b, c are nonzero, b≠1, and b>0.
Expression	A mathematical phrase that contains variables, functions, numbers, and/or operations. An expression does not contain equal or inequality signs.
Extreme Value Theorem	If a function f(x) is continuous on a closed interval [a, b], then f(x) has both a maximum and a minimum on [a, b]. If f(x) has a maximum or minimum value on an open interval (a, b), then the maximum or minimum value occurs at a critical point.
Face	One of the plane surfaces bounding a three-dimensional figure.
Factor	A number or expression that is multiplied by one or more other numbers or expressions to yield a product.
Fibonacci sequence	The sequence of numbers formed by adding two previous numbers to get the next number, with the first and the second terms are 1.
Finite	A set that contains a nonnegative integral number of elements.
Flip	A reflection which is a transformation that produces the mirror image of a geometric figure over a line for reflection.
Formula	A rule that shows the relationship between two or more quantities; involving numbers and/or variables.
Fraction	A rational number expressed in the form $^a/_b$, where a is called the numerator and b is called the denominator. A fraction may mean part of a whole, ratio of two quantities, or may imply division.
Frequency table	A table that shows how often each item, number, or range of numbers occurs in a set of data.
Function	A relation in which each value of x is paired with a unique value of y. More formally, a function from A to B is a relation f such that every $a \in A$ is uniquely associated with an object $F(a) \in B$.
Function table	A table of x and y values that represents a function, pattern, relationship, or sequence between the two variables.
Fundamental	Every polynomial equation with degree greater than zero has at least one root

END-OF-COURSE MATHEMATICS GLOSSARY: GRADES 9-10

Theorem of Algebra	in the set of complex numbers. Corollary: Every polynomial P(x) of degree n (n > 0) can be written as the product of a constant k (k ≠ 0) and n linear factors $P(x) = k (x – r_1) (x – r_2) (x – r_3)…(x – r_n)$ Thus a polynomial equation of degree n has exactly n complex roots, namely $r_1, r_2, r_3,…, r_n$.
Fundamental Theorem of Calculus	If *f* is continuous on the closed interval [a, b] and F is the antiderivative (indefinite integral) of *f* on [a, b], then $\int_a^b f(x)\,dx = F(b) - F(a).$
Geometric Sequence	A sequence in which consecutive terms have a common ratio. A geometric sequences can be written as $a_n=a_1r^{n-1}$ (n=1, 2, 3, …) where an is the nth term of the sequence, a1 is the first term, r is the common ratio.
Geometric Series	The sum of the terms of a geometric sequence. The sum of the first n terms of a geometric sequence is given by $S_n = \frac{a_1 - a_1 r^n}{1 - r}$
Geometric solid	A closed three-dimensional geometric figure.
Geometry	The branch of mathematics that explores the position, size, and shape of figures.
Golden Ratio	The number or $\frac{1+\sqrt{5}}{2}$ about 1.618, often represented by f. It is often encountered when taking the ratios of distances in simple geometric figures such as the pentagon and decagon, and has connection with Fibonacci sequence. Let Fn be the nth term of the Fibonacci sequence. Then, $\lim_{n\to\infty} \frac{F_n}{F_{n-1}} = \varphi$.
Great circle	Is a section of a sphere that contains a diameter of the sphere.
Gross	A quantity made of 144 items.
Height	A line segment extending from the vertex or apex of a figure to its base and forming a right angle with the base or plane that contains the base.
Hexagon (wolfram)	Is a six-sided polygon.
Hinge Theorem	The hinge theorem says that if two triangles ?ABC and ?DEF have congruent sides AB=DE and AC=DF and mA>mD, then BC>EF.
Histogram	A bar graph that shows how many data values fall into a certain interval. The number of data items in an interval is a frequency. The width of the bar represents the interval, while the height indicates the number of data items, or frequency, in that interval.

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Hyperbola	Is a conic section defined as the locus of all points P in the plane the difference of whose distances $r_1 = F_1P$ and $r_2 = F_2$ from two fixed points (the foci F_1 and F_2) separated by a distance 2c is a given positive constant k; $r_2 - r_1$.
Hypotenuse	The longest side of a right triangle; the side opposite the right angle.
Hypothesis	A proposition or supposition developed consistent with known data to provide a basis for further investigation or research.
Identity property of addition	The sum of a number and zero is always that number (e.g., a + 0 = 0 + a = a).
Image	A figure that is the result of a transformation.
Imaginary part	The coefficient of i in a complex number.
Implicit Differentiation	Is the procedure of differentiating an implicitly defined function with respect to the desired variable x while treating the other variables as unspecified functions of x.
Incenter	The center of a polygon's inscribed circle
Increment	On a graph, the distance between numbers from one grid line to another.
Indefinite Integral	The set of all antiderivatives of a function, denoted by $\int f(x)dx$
Independent events	Two events are independent if the outcome of one event does not affect the probability that the other will occur. For independent events P(A and B)=P(A)P(B).
Independent variable	The factor that is changed in an experiment in order to study changes in the dependent variable.
Induction, Method of	The truth of an infinite sequence of propositions P_i for i=1, 2, 3,… is established if (1) is true, and (2) P_k's truth implies that P_{k+1} is true for all k≥1.
Inequality	A sentence that states one expression is greater than (>), greater than or equal to (≥), less than (<), less than or equal to (≤), another expression.
Infinite	Has no end or goes on forever, not finite. A set is infinite if it can be placed in one-to-one correspondence with a proper subset of itself.
Instantaneous Rate of Change	The rate of change at a particular moment. For a function, the instantaneous rate of change at a point is the same as the slope of the tangent line at that point.
Integers	The numbers in the set {…-4, -3, -2, -1, 0, 1, 2, 3, 4…}.
Integral	Integer valued.
Intercept	The points where a curve or line drawn on a rectangular-coordinate-system

	graph intersect the vertical and horizontal axes.
Interior angle	An angle formed inside a plane figure.
Intermediate Value Theorem	If f is continuous on a closed interval [a, b], and c is any number between f(a) and f(b) inclusive, then there is at least one number x in the closed interval such that f(x)=c. The theorem states that the image of a connected set under a continuous function is connected.
Intersection	The intersection of two sets A and B is the set of elements common to A and B. For lines or curves, it is the point at which lines or curves meet; for planes, it is the line where planes meet.
Interval	The set of all real numbers between two given numbers. The two numbers on the ends are the endpoints. If the endpoints, a and b are included, the interval is called closed and is denoted [a, b]. If the endpoints are not included, the interval is called open and denoted (a, b). If one endpoint is included but not the other, the interval is denoted [a, b) or (a, b] and is called a half-closed (or half-open interval).
Inverse of a Matrix	The inverse of a square matrix *A*, sometimes called a reciprocal matrix, is a matrix *A*<sup-1< /> such that $AA^{-1} = I$, where I is the identity matrix. Not all square matrices have inverse matrices.
inverse operation	An action that undoes a previously applied action. For example, subtraction is the inverse operation of addition.
Irrational number	A real number that cannot be expressed as a ratio of two integers.
Isosceles triangle	A triangle with at least two congruent sides and two congruent angles. An equilateral triangle is a special case of an isosceles triangle having not just two, but all three sides and angles equal.
Joint variation	A quantity varies directly with two or more quantities. For example, z varies jointly with x and y means that z=kxy, where k is a constant.
Kite	A quadrilateral with two distinct pairs of adjacent congruent sides.
Laws of Logarithms	• $\log_b(xy) = \log_b x + \log_b y$ • $\log_b \frac{x}{y} = \log_b x - \log_b y$ • $\log_b x^n = n \log_b x$ • $\log_b x = \frac{\log_a x}{\log_a b}$ |
Length	A one-dimensional measure that is the measurable property of line segments.
Likelihood	The chance that something is likely to happen (probability).
Limit	A number to which the terms of a sequence get closer so that beyond a

	certain term all terms are as close as desired to that number. A function f(z) is said to have a limit $\lim_{z \to a} f(z) = c$ if, for all e>0, there exists a d>0 such that $\left\|f(z) - c\right\| < \varepsilon$ whenever $0 < \left\|z - a\right\| < \delta$.
Line	A collection of an infinite number of points in a straight pathway with unlimited length and having no width.
Line graph	A collection of an infinite number of points in a straight pathway with unlimited length and having no width.
Line segment	A portion of a line that consists of two defined endpoints and all the point in between.
Linear equation	An algebraic equation in which the variable quantity or quantities are raised to the zero or first power.
Linear Programming	Is the optimization of a linear function based on some set of linear constraints.
Literal equations	An equation that contains more than one variable; an implicit equation; often mathematical formula.
Local Maximum	The highest point in a particular section of a graph.
Local Minimum	The lowest point in a particular section of a graph.
Logarithm	"The logarithm of x to the base b" is the power to which b must be raised to be equal to x. $f(x) = \log_b x$ is the inverse function of $h(x) = b^x$.
Logarithmic Differentiation	The taking of the logarithm of both sides of an equation before differentiating.
Magnitude	The amount of a quantity. Magnitude is never negative.
Mass	The amount of matter of an object.
Matrices	A rectangular table of elements which may be numbers or any abstract quantities that can be added and multiplied. Matrices are used to describe linear equations, keep track of the coefficients of linear transformations, and to record data that depend on multiple parameters. Dimensions of a matrix are the number of rows and the number of columns of a matrix, written r x c.
Mean	There are several statistical quantities called means, e.g., harmonic mean, arithmetic mean, and geometric mean. However, "mean" commonly refers to the arithmetic mean that is also called arithmetic average. Arithmetic mean is a mathematical representation of the typical value of a series of numbers, computed as the sum of all the numbers in the series divided by the count of all numbers in the series. Arithmetic mean is the balance point if the numbers are considered as weights on a beam.
Mean Value Theorem	Let f(x) be differentiable on the open interval (a, b) and continuous on the

	closed interval [a, b]. Then there is at least one point c in (a, b) such that $f'(c) = \frac{f(b) - f(a)}{b - a}$. The theorem states that the tangent line to the function f(x) at x=c is parallel to the line passing through (a, f(a)) and (b, f(b)).
Median	When the numbers are arranged from least to greatest, the middle number of a set of numbers, or the mean of two middle numbers when the set has two middle numbers is called median. Half of the numbers are above the median and half are below it.
Midpoint of a line segment	The point on a line segment equidistant from the endpoints.
Mode	The most frequent value(s) of a set of data. A data set may have more than one mode if two or more data values appear the most. When no data value occurs more than once in a data set, there is no mode.
Model	To represent a mathematical situation with manipulatives (objects), pictures, numbers or symbols.
Modus ponens	See law of detachment.
Modus Ponens	Suppose that the statements *p* and *p* implies *q* are both true. Then we may write: *p* and (*p* implies *q*). By the definition of the implication, this is: p and (not-p or q). By the distributive law, we now have: (*p* and not-*p*) or (p and *q*). By the law of contradiction p and not-*p* is false, so p and q must be true. This shows we may conclude that q is true, because we have already supposed that p is true. We may summarize this result as follows: From *p* and (*p* implies *q*) we conclude *q*.
Monomial	A polynomial with one term such as 5, -2xyz, or xy^4
Multiples	The numbers that result from multiplying a given whole number by the set of whole numbers.
Net	A two-dimensional diagram that can be folded or made into a three-dimensional figure.
Network	A graph with vertices and edges. In a network a vertex is a point that represents an object. The edge is a connection between vertices.
Newton-Raphson method	An iterative process using derivatives that can often (but not always) be used to find zeros of a differentiable function.
Normal Distribution	A continuous probability distribution that is bell shaped and symmetric with a single peak. Normal distributions are distinguished from one another by their mean μ and standard deviation s. The probability function for a normal distribution on real numbers is as follows.

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	$P(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-(x-\mu)^2/(2\sigma^2)}$
Number line	A line of infinite extent whose points correspond to the real numbers according to their distance in a positive or negative direction from a point arbitrarily taken as zero.
Number Sentence	A mathematical sentence that includes numbers, operation symbols, and a greater than or less than symbol or an equal sign. Note: 10 + 1 = 11 x 2 = 22 is continuing the number string with violating the equality because 10+1≠22. Therefore, it is not an acceptable representation for an equation or for showing computation with number sentences.
Number theory	The study of the properties of whole numbers (primes, divisibility, factors, multiples).
Oblique	Tilted at an angle; neither vertical nor horizontal.
Obtuse angle	An angle with a measure of more than 90° but les than 180°.
Odds	The ratio of one event occurring (favorable outcome) to it not occurring (unfavorable outcome) if all outcomes are equally likely.
Operation	Any mathematical process, such as addition, subtraction, multiplication, division, raising to a power, or finding the square root.
Order of Operations	The rules for performing operations in expressions; perform the operations in parenthesis first, exponents second, multiplication and division from left to right third, and addition and subtraction from left to right fourth.
Ordered pair	The location of a single point on a rectangular coordinate system where the first and second values represent the position relative to the x-axis and y-axis, respectively.
Origin	The point of intersection of the x- and y-axes in a rectangular coordinate system, where the x-coordinate and y-coordinate are both zero. On a number line, the origin is the 0 point. In three dimensions, the origin is the point (0, 0, 0).
Orthocenter	The point at which the three (possibly extended) altitudes of a triangle intersect.
Outcome	A possible result of an experiment.
Outlier	An outlier is a data point that lies outside the overall pattern of a distribution. An outlier is usually a point which falls more than 1.5 times the interquartile range above the third quartile or below the first quartile. Outliers can also be identified on a scatter plot.

END-OF-COURSE MATHEMATICS GLOSSARY: GRADES 9-10

Parabola	A locus of points whose perpendicular distances to a line, called the directrix, and to a fixed point, called the focus, are equal. The graph of any quadratic function is a parabola and a parabola always has a quadratic equation. The equation for a vertical parabola is $y = a(x - h)^2 + k$, where (h,k) is the vertex of the parabola.
Parallel lines	Two lines in the same plane that are a constant distance apart. Parallel lines have equal slopes.
Parallelogram	A quadrilateral in which both pairs of opposite sides are parallel.
Parametric equations	A set of equations that express a set of quantities as explicit functions of a number of independent variables, known as "parameters." For example, one set of parametric equations for a circle are given by x=rcost and y=rsint, where r is the radius of the circle.
Pattern	A predictable or prescribed sequence of numbers, objects, etc. Patterns and relationships may be described or presented using multiple representations such as manipulatives, tables, graphics (pictures or drawings), or algebraic rules (functions).
Pentagon	A polygon with five sides.
Percent	Per hundred; a special ratio in which the denominator is always 100. The language of percent may change depending on the context. The most common use is in part-whole contexts, for example, where a subset is 40 percent of another set. A second use is change contexts, for example, a set increases or decreases in size by 40 percent to become 140% or 60% of its original size. A third use involves comparing two sets, for example set A is 40% of the size of set B, in other words, set B is 250 percent of set A.
Perimeter	The distance around a two dimensional figure.
Permutation	An arrangement, or listing, of objects or events in which order is important.
Perpendicular	Two lines, two line segments, or two planes are said to be perpendicular when they intersect at a right angle.
Pictograph	A data display constructed with pictures or symbols to represent data.
Place value	The value of a digit in a number, based on the location of the digit.
Plane	An infinite two-dimensional geometric surface defined by three non-linear points or two distance parallel or intersecting lines.
Plot	To locate a point by means of coordinates, or a curve by plotted points, or to represent an equation by means of a curve so constructed.
Point	A specific location in space that has no discernable length or width.

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Points of Inflection	See Inflection points.
Polar Coordinates	A way to describe the location of a point on a plane. A point is given coordinates (r, θ). r is the distance from the point to the origin. θis the angle measured counterclockwise from the positive x-axis to the segment connecting the point to the origin. The polar coordinates are defined in terms of Cartesian coordinates by x=*r*cost and y=*r*sint .
Polygon	A closed plane figure, having at least three side that are line segments and are connected at their endpoints.
Polynomial	The sum or difference of terms which have variables raised to positive integer powers and which have coefficients that may be real or complex. Examples: $5x^3 – 2x^2 + x – 13$, $x^2y^3 + xy$, and $(1 + i)a^2 + ib^2$. Standard form for a polynomial in one variable: $a_nx^n + a_{n–1}x^{n–1} + ... + a^2x^2 + a_1x + a_0$ Even though the prefix poly- means many, the word polynomial refers to polynomials with 1 term (monomials), 2 terms (binomials), 3 terms, (trinomials), etc.
Polynomial Function	A function that can be written as $f(x) = a_nx^n + a_{n-1}x^{n-1} + ... + a_1x^1 + a_0$, where might be real or complex.
Postulate	Postulate, or axiom, indicates a statement or assumption that is taken to be true without proof; and which can be used to prove other statements or theorems.
Power	The rate at which work is done, expressed as the amount of work per unit time and commonly measured in units such as the watt and horsepower.
Prism	A polyhedron that has two congruent and parallel faces joined by faces that are parallelograms.
Probability	A measure of the likelihood that a given event will occur; expressed as a ratio of one event occurring (favorable outcomes) to the number of equally likely possible outcomes (sample space). Probability is expressed on a linear scale from 0 (impossibility) to 1 (certainty), also expressed as a percentage between 0 and 100%. Experimental probability of an event A is the ratio of the number of times the event A occurs to the total number of trials or times the activity is performed. Theoretical probability of an event A is the ratio of the number of outcomes in event A to the number of outcomes in the sample space.
Procedure	A specific prescription for carrying out a mathematical task such as adding, multiplying, simplifying, and factoring.
Product	The result of multiplying numbers together.
Proof	A logical argument that demonstrates the truth of a given statement. In a formal proof, each step can be justified with a reason; such as a given, a definition, an axiom, or a previously proven property or theorem. A mathematical statement that has been proven is called a theorem.

END-OF-COURSE MATHEMATICS GLOSSARY: GRADES 9-10

Properties of Equality	1) A balanced equation will remain balanced if you add, subtract, multiply or divide both sides by the same number. 2) A quantity equal to another quantity can be substituted for it. Reflexive property: a=a Symmetric property: If a=b then b=a. Transitive property: If a=b and b=c then a=c.
Proportion	A mathematical sentence stating that two ratios are equal.
Proportional	Having the same or a constant ratio. Two quantities that have the same ratio are considered directly proportional. Two quantities whose products are always the same are considered inversely proportional.
Pyramid	A three-dimensional figure whose base is a polygon and whose faces are triangles with a common vertex.
Pythagorean Theorem	The square of the hypotenuse (c) of a right triangle is equal to the sum of the squares of the legs (a and b), as shown in the equation $c^2 = a^2 + b^2$.
Quadratic Equation	A second-order polynomial equation in a single variable x with a≠0: $ax^2 + bx + c = 0$. Because it is a second-order polynomial equation, the fundamental theorem of algebra guarantees that it has two solutions that may be both real or both complex.
Quadratic Formula	A formula for the roots of a quadratic equation. Given $ax^2 + bx + c = 0$, then $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$.
Quadrilateral	Any polygon with four sides, including parallelogram, rhombus, rectangle, square, trapezoid, kite.
Quotient	The result of dividing two numbers.
Radian	A unit for measuring angles. 180° = p radians, and 360° = 2p radians. The number of radians in an angle equals the number of radii it takes to measure a circular arc described by that angle.
Radical	The symbol $\sqrt[n]{x}$ used to indicate a root. The expression $\sqrt[n]{x}$ is therefore read “x radical n” or "the nth root of x." A radical without an index number is understood to be a square root.
Radius	A line segment extending from the center of a circle or sphere to a point on the circle or sphere. Plural radii.
Rate	A ratio that compares two quantities of different units.
Rate of change	The ratio of change in one quantity to the corresponding change in another quantity.
Ratio	The comparison of two quantities, the ratio of a and b is a:b or a to b or a/b, where b ≠ 0.

END-OF-COURSE MATHEMATICS GLOSSARY: GRADES 9-10

Rational Function	A function that can be written as R(x) = P(x) / Q(x) where P(x) and Q(x) are polynomials and Q(x) ≠ 0.
Rational Number	A number that can be expressed as a ratio a/b, where a and b are integers and b≠0.
Rational Root Theorem	If the coefficients of the polynomial $d_n x^n + d_{n-1}x^{n-1} + ... + d_0$ are specified to be integers, then rational roots must have a numerator which is a factor of d_0 and a denominator which is a factor of (with either sign possible).
Real number	The set of all rational and irrational numbers.
Real-world problem	A problem that is an application of a mathematical concept in a real-life situation.
Rectangle	A parallelogram with four right angles.
Rectangular prism	A six-sided polyhedron with congruent rectangular parallel bases, joined by faces that are parallelograms.
Reduction	Contraction (a type of dilation), a proportional decrease in size in all dimensions.
Reflection	A transformation that produces the mirror image of a geometric figure over a line of reflection, also called a flip.
Regression	The process of finding a regression equation.
Regular polygon	A polygon that is both equilateral (all sides congruent) and equiangular (all angles congruent).
Relation	A relation from A to B is any subset of the cross product (Cartesian product) of A and B.
Remainder	In a whole-number division problem, the final undivided part that is less than the divisor and "left over" after dividing.
Remainder Theorem	If a polynomial P(x) is divided by (x-r), then the remainder is a constant given by P(r).
Representations	Physical objects, drawings, charts, words, graphs, and symbols that help students communicate their thinking.
Right angle	An angle whose measure is exactly 90°.
Right triangle	A triangle having an interior right angle.
Root	A root of a polynomial is a number x such that P(x)=0. A polynomial of degree n has n complex roots.

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Rotation	A transformation of a figure by turning it about a center point or axis. The amount of rotation is usually expressed in the number of degrees (e.g., a 90° rotation). Also called a turn.
Rule	A general statement written in numbers, symbols, or words that describes how to determine any term in a pattern or relationship. Rules or generalizations may include both recursive and explicit notation. In the recursive form of pattern generalization, the rule focuses on the rate of change from one element to the next. Example: Next = Now + 2; Next = Now x 4. In the explicit form of pattern generalization, the formula or rule is related to the order of the terms in the sequence and focuses on the relationship between the independent variable and the dependent variable. For example: y=5t - 3 Words may also be used to write a rule in recursive or explicit notation. Example: to find the total fee, multiply the total time with 3; take the previous number and add two to get the next number.
Sample space	The set of all possible outcomes of an experiment.
Sampling distribution	Sampling distribution of a statistic tells us what values the statistic takes in repeated samples from the same population and how often it takes those values. Sampling distributions assign probabilities to the values the statistic can take.
Scalar	Any real number; a scalar has magnitude but no direction.
Scale	The numeric values, set at fixed intervals, assigned to the axes of a graph.
Scale factor	The ratio of any two corresponding lengths in two similar geometric figures. The ratio of areas of two similar figures is the square of the scale factor and the ratio of the volumes of two similar figures is the cube of the scale factor.
Scatter plot	A graph of paired data in which the data values are plotted as points in (x, y) format.
Scientific Notation	A shorthand method of writing very large or very small numbers using exponents in which a number is expressed as the product of a integer power of 10 and a number that is greater than or equal to one (1) and less that 10(e.g., 7.59.x 10^5 = 759,000).
Secant	A line, ray, or segment that intersects a circle at two points (i.e. that contains a chord). A secant to a sphere is a line, ray, or segment that intersects a sphere at two points.
Sequence	A list of numbers set apart by commas, such as -1, 1, -1, 1, -1, …
Series	An indicated sum of successive terms of a sequence.
Set	A set is a finite or infinite collection of distinct objects in which order has no significance.

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Side	The edge of a polygon (e.g., a triangle has three sides), the face of a polyhedron, or one of the rays that make up an angle.
Similarity	A term describing figures that are the same shape but are not necessarily the same size or in the same position.
Simplify	The process of converting a fraction or mixed number, to an equivalent fraction, or mixed number, in which the greatest common factor of the numerator and the denominator of the fraction is one. Simplify also refers to using the rules of arithmetic and algebra to rewrite an expression as simply as possible.
Simulation	A model of an experiment that would be too difficult or too time-consuming to actually perform.
sine	Sine function is written as sinθ. Sin(q) is the y-coordinate of the point on the unit circle so that the ray connecting the point with the origin makes an angle of q with the positive x-axis. When q is an angle of a right triangle, then sin(q) is the ratio of the opposite side to the hypotenuse.
Slide	A translation, where every point of a figure is moved in the same direction and by the same distance.
Slope	The ratio of change in the vertical axis (y-axis) to each unit change in the horizontal axis (x-axis) in the form rise/run or ?y/?x. Also the constant, *m*, in the linear equation for the slope-intercept form $y = mx + b$, where $m = \frac{y_1 - y_2}{x_1 - x_2}$
Solid figures	Three-dimensional figures that completely enclose a portion of space (e.g., a rectangular prism, cube, sphere, right circular cylinder, right circular cone, and square pyramid).
Sphere	A three-dimensional figure in which all points on the figure are equidistant from a center point.
Square	A rectangle with four congruent sides; also, a rhombus with four right angles .
Square Root	A square root, also called a radical, of *x* is a number *r* such that . Note that any positive real number has two square roots, one positive and one negative. For example, the square roots of 9 are -3 and +3, since $(-3)^2 = (+3)^2 = 9$. Any nonnegative real number *x* has a unique nonnegative square root *r*; this is called the principal square root and is written $r = x^{1/2}$ or $r = \sqrt{x}$; v symbol is used for principal square roots. For example, the principal square root of 9 is , while the other square root of 9 is $-\sqrt{9} = -3$. In common usage, unless otherwise specified, "the" square root is generally taken to mean the principal square root.
Statistics	The mathematical study of the likelihood and probability of events occurring based on known information and inferred by taking a limited number of

	samples. Statistics plays an extremely important role in many aspects of economics and science, allowing educated guesses to be made with a minimum of expensive or difficult-to-obtain data.
Sum	The result of adding numbers or expressions together.
Symmetry	An intrinsic property of a mathematical object which causes it to remain invariant under certain classes of transformations (such as rotation, reflection, or translation).
Synthetic division	A shortcut method for dividing a polynomial by another polynomial of the first degree. It can be used in place of the standard long division algorithm. This method reduces the polynomials factor into a set of numeric values. After these values are processed, the resulting set of numeric outputs is used to construct the polynomial quotient and the polynomial remainder.
System of equations	A group of two or more equations that are related to the same situation and share variables. The solution to a system of equations is an ordered number set that makes all of the equations true.
System of linear equations	Two or more related linear equations that have a common solution (A system of linear equations can have no common solutions, one common solution, or many common solutions).
Table	A data display that organizes information about a topic into categories using rows and columns.
Term	A number, variable, product, or quotient in an expression (e.g. $5x^2$, -2y, 8). A term is not a sum or difference (For example, 5x2 + 6 has two terms, 5x2 and 6.)
Tessellation	A covering of a plane with congruent copies of the same pattern with no holes and no overlaps.
Theorem	A statement or conjecture that can be proven to be true based on postulates, definitions, or other proven theorems. The process of showing a theorem to be correct is called a proof.
Transformation	An operation on a figure by which another image is created. Common transformations include reflections (flips), translations (slides), rotations (turns) and dilations.
Translation	A transformation in which every point in a figure is moved in the same direction and by the same distance.
Transversal	A line that intersects two or more lines at different points.
Triangle	A polygon with three sides.

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Triangle Inequality	The triangle inequality states that the sum of the lengths of any two sides of a triangle is greater than the length of the third side (a+b>c, a+c>b, and b+c>a, where a, b, and c are the side lengths of a triangle). Triangle inequality for vectors is defined as follows: Let x and y be vectors. Then the triangle inequality is given by $\|\mathbf{x}\| - \|\mathbf{y}\| \leq \|\mathbf{x}+\mathbf{y}\| \leq \|\mathbf{x}\| + \|\mathbf{y}\|$ Geometrically, the right-hand part of this inequality states that the sum of the lengths of any two sides of a triangle is greater than the length of the remaining side.
Trigonometry	The study of angles and of the angular relationships of planar and three-dimensional figures.
Unit	A determinate quantity (as of length, time, heat, or value) adopted as a standard of measurement.
Unit circle	The circle with radius 1 which is centered at the origin on the x-y plane.
Variable	Any symbol, usually a letter, which could represent a number. A variable might vary as in f(x)=2x+1, or a variable might be fixed as in 2x+1=5.
Variance	The average of the squared differences from the mean.
Vector	A quantity, drawn as an arrow, with both direction and magnitude. For example, force and velocity are vectors. If a quantity has magnitude but not direction, it is called a scalar. Temperature, length, and mass are examples of scalars.
Velocity	The time rate at which a body changes its position vector; quantity expressed by direction and magnitude in units of distance over time.
Vertex	The point common to the two rays that form an angle; the point common to any two sides of a polygon; the point common to three or more edges of a polyhedron.
Volume	A measure of the amount of space an object takes up; also the loudness of a sound or signal.
Weight	The force with which a body is attracted to Earth or another celestial body, equal to the product of the mass of the object and the acceleration of gravity.
Whole Number	The numbers in the set {0, 1, 2, 3, 4, ...}
Width	The shorter length of a two-dimensional figure. The width of a box is the horizontal distance from side to side (usually defined to be greater than the depth, the horizontal distance from front to back).
x-axis	The horizontal number line on a rectangular coordinate system.
x-intercept	The value of x at the point where a line or a curve intersects the x-axis. The value of y is zero at this point.

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y-axis	The vertical number line on a rectangular coordinate system
y-intercept	The value of y at the point where a line or a curve intersects the y-axis. The value of x is zero at this point.

Chapter 9

Professional Learning

INTRODUCTION

Shared responsibility within the school house promotes the feeling **"**What I do makes a difference in how well students learn." Everyone sees themselves as part of a larger system that works together toward a common goal. Shared responsibility can not be accomplished by legislation, a grant program, a single leader, or a few interested teachers or parents. Rather, it will be established by the school's overall capacity for broad-based participation in the creation and fulfillment of a vision focused on student learning. The development of professional learning communities within the school house provides the vehicle to develop shared responsibility.

Developing Capacity: Mathematics Learning Communities

Professional learning communities provide a powerful way for teachers and administrators to work together to affect the practices of schools and improve student achievement. The core principles of a professional learning community ensure students learn, provide a culture of collaboration in the school house, and a focus on the results of continuous improvement efforts of learning teams. (DuFour, 2005)

School and department missions promise, "all students can learn." In order to achieve this mission, teachers and administrators engage in ongoing dialogues with each other exploring the critical questions of "what do we want our students to learn," "how will we know when the students have learned it," and most importantly, "how will we respond when a student experiences difficulty in learning?" (DuFour, 2005) The answer to the third question separates traditional school cultures from the collaborative culture of a learning community. As a school or group of teachers begin to function as a learning community, strategies are designed to ensure that the struggling learners receive additional time and support. Learning communities develop strategies in which the intervention/response to the student is timely, provides help for the student as soon as the student begins to struggle rather than relying on remediation, retention, or summer school. This intervention is required for the student until they have mastered the necessary content.

As the faculty begins to recognize that they must work together to achieve their goal of "all students can learn," the professional learning community is built. Teachers work in teams to analyze their data, develop actions in common, and engage in an ongoing dialogue of questions that promotes deep team learning and thus improves student achievement. This results-focused culture moves teachers beyond their individual knowledge and experience to embrace knowledge and action in common.

Professional learning communities determine their success by looking at their team's results. Learning teams continually identify the current level of student

achievement, establish goals to improve the current status, work together toward achieving the goal that was set, and provide evidence of progress. These learning communities turn their data into useful and relevant information. As learning teams begin to develop common assessments, teachers begin to identify how their students are doing as compared to other students and ask their colleagues to help them reflect on areas of concern. Ideas, strategies, materials, and talents of the entire team are shared. This represents the most potent professional learning available for teachers, improving content knowledge and pedagogy.

Professional learning communities are powerful. As educators work in a collaborative inquiry environment, they have a profound effect on the practice of the school. As educators implement learning communities and implement the core principles, student achievement and love of learning increases.

Elementary Mathematics Liaisons Learning Community

Curriculum and Instruction has been undertaking the effort to build leadership capacity throughout the District in the content area of elementary mathematics. As a part of this effort, a cadre of Elementary Mathematics Liaisons (ten schools per region) was identified in May, 2007. Currently, all elementary schools select an Elementary Mathematics Liaison/Coach (EML/Coach) to participate in monthly professional learning community dialogues. The vision of this office is that the elementary mathematics liaisons will utilize their leadership to improve teaching and learning in their respective school environments. EML/Coaches will strengthen their knowledge of content and pedagogy through participation in these monthly dialogues, disseminate information, and share best practice instructional strategies with staff at their schools.

Secondary Department Chairpersons Learning Community

The Secondary Department Chairpersons professional learning community consists of teacher leaders who meet as a community of learners to share ideas and reflect on their current practice. The department chairpersons engage in strategies to build learning communities as modeled by district staff at learning community gatherings. This process provides the conduit for communication and continued learning among teacher leaders in Mathematics via email and the Mathematics learning community discussion board. They continue this dialogue with their colleagues at their home schools developing a learning community within their departments. These collaborative conversations allow community members to

- collectively analyze individual teacher and school data;
- set common goals and actions;
- discuss instructional strategies and materials;
- discuss pacing of content and courses;

- share questions and concerns about content and procedures; and
- review results.

These discussions provide every mathematics teacher with someone to turn to and talk to, and are explicitly structured to improve the classroom practice of teachers both individually and collectively.

Mathematics Coaches Learning Community

Mathematics Coaches are a part of the leadership team at their assigned school and serve as a resource for professional development, progress monitoring and student data analysis. Coaches also assist with differentiated instruction. Mathematics Coaches have minimal classroom responsibilities and work with small groups of students and teachers on a scheduled basis. Mainly, the responsibilities of the mathematics coach is to provide professional development to teachers in each of the major content areas assessed through the FCAT 2.0 and in the Common Core State Standards, administer and interpret instructional assessments, model effective instructional strategies, and provide daily support to classroom teachers.

Mathematics Coaches should spend the majority of their time supporting in-class teaching, by coaching and mentoring, making observations, team-teaching, and modeling lessons. They should also support teachers by assisting in the planning of lessons based on data analysis, examining student work, providing professional development in content and pedagogy, and evaluating the student assessments.

The remaining time should be spent on instruction and activities that are directly related to the School Improvement Plan. Activities described include planning time for reflection and/or collaborative problem solving, professional development for the mathematics department, and analysis of departmental data on student achievement. In addition, the Mathematics Coach should prepare and maintain records and reports related to professional development activities, and develop school-site plans and goals utilizing the performance data of students identified as low performing.

Mathematics Coaches should assist in the monitoring of classroom instruction on a daily basis, provide instructional strategies for block/flexible scheduling, and take the lead in the implementation and utilization of technology-based curricular intervention programs that have already been established in the district. Coaches will receive continued support and professional development from the District Supervisors of Mathematics. In addition, Mathematics Coaches will work closely with Assistant Principals for Curriculum (APC), Vice Principals (VP) and other members of the school leadership team. See Table 9.1 for sample monthly, weekly, and daily schedules for Mathematics Coaches.

TABLE 9.1: MATHEMATICS COACH RECOMMENDED YEARLY ACTIVITIES BY MONTH		
MONTH	**FOCUS TOPIC(S)**	**ACTIVITIES**
September **October**	Initial training Data analysis → School data → FCAT 2.0 Survey Test Data driven decision making based on results Monthly Student Assessment	• Math Coach Training –Assistance Plan and Math Coach Model • Training in the use of data -SPI • Mathematics Department Chair Leadership Conference • Data analysis; assist teachers with their data analysis (using Excel) • Creating action plan addressing data analysis results • Mentor/Coach Teachers (with focus on beginning teachers); model lesson where applicable • Training for Coaches in the use of technology and research-based programs
November	Data analysis → Monthly test Data driven decision making based on results Resources: *Best Practices* Monthly Student Assessment	• Resource finding and facilitating in creating activities to address benchmarks with which students showed difficulty on the pre-test Activities fostering *habit of writing in mathematics* Activities fostering *habit of reading in mathematics* • Sharing best practices (including activities using technology) in *collaborative planning* sessions • Mentor/Coach Teachers (with focus on beginning teachers); model lesson where applicable
December	Data analysis → Monthly test Data driven decision making based on results Resources: Monthly Student Assessment	• Effective assessment strategies • Analyzing student work • Mentoring/Coaching model with individual teachers; model lesson where applicable • In-service teachers on the use of State prepared Item Specs
January	Data analysis → Monthly test Data driven decision making based on results Student Assessment	• Early release- Professional Development • Mentoring/Coaching model with individual teachers; model lesson where applicable • Small group tutorial

TABLE 9.1: MATHEMATICS COACH RECOMMENDED YEARLY ACTIVITIES BY MONTH		
MONTH	**FOCUS TOPIC(S)**	**ACTIVITIES**
February	Data analysis → Monthly test Data driven decision making based on results Student Assessment	• Analyzing data to develop individual FCAT 2 .0 action plan to review benchmarks students still find difficult • Mentoring/Coaching model; model lesson where applicable • Small group tutorial
March	FCAT 2.0 School Reports	• Mentoring/Coaching model; work with individual teachers/students as the schedule permits
April	Projects Professional Development NCTM Conference	• Math projects/special programs • Evaluating projects • Mentoring/Coaching model with individual teachers; model lesson where applicable
May	Reflections on the Math Coach Model Evaluation	• Mentoring/Coaching individual teachers; model lessons where applicable • Look back at the school year and plan for the next school year
June	Closing of school Evaluation of student progress Summer planning	• Closing of the school year details • Look back at the school year and begin thinking of next school year's action plan

TABLE 9.2: MATHEMATICS COACH SAMPLE WEEKLY SCHEDULE					
BLOCK	**MONDAY**	**TUESDAY**	**WEDNESDAY**	**THURSDAY**	**FRIDAY**
1 7:30 a.m. to 9:40 a.m.	Assist Intensive Math teacher Tutorial	Assist Intensive Math teacher Small Group Tutorial	Meet with or assist APC/VP Plan with Dept. Chair and Reading Coach	Mentor/Coach Math teachers (with focus on beginning teachers)	Mentor/Coach Math teachers (with focus on beginning teachers)
2 9:45 a.m. to 11:50 a.m.	Facilitate Intensive Math Teacher Tutorial	Facilitate Intensive Math teacher Small Group Tutorial	Plan with APC/VP Leadership Team	Mentor/Coach Math teachers (with focus on beginning teachers)	Mentor/Coach Math teachers (with focus on beginning teachers)
Lunch					
3 12:30 p.m. to 2:30 p.m.	Assist Intensive Math Teachers Small group Tutorial Meet with District Curriculum Support Specialist	Assist Intensive Math Teachers Small Group Tutorial	Planning Time: (may include one or more of the following) • Classroom visitation objectives • Implementation of the instructional focus calendar • Meeting with reading coach and/or other school support	Mentor/Coach Math teachers (with focus on beginning teachers) Meet with District Curriculum Support Specialist	Mentor/Coach Math teachers (with focus on beginning teachers)

TABLE 9.3: MATHEMATICS COACH SAMPLE DAILY SCHEDULE			
BLOCK	**TIME**	**TARGET GROUP**	**ACTIVITY: DESCRIPTION**
1	7:30 a.m. to 8:30 a.m.	Intensive Math Teachers	Facilitate teacher in day's lesson; co-teaching
	8:40 a.m. to 9:40 a.m.	Small group on-site PD	Work with small groups of students-high end Level 2 students
2	9:45 a.m. to 10:45 a.m.	Intensive Math Teachers	Facilitate teacher in day's lesson; co-teaching
	10:50 a.m. to 11:50 a.m.	Level 1 and 2 students	Work with small groups of students Differentiated Instruction
Lunch 11:50 a.m. to 12:25 p.m.			
3	12:30 p.m. to 1:30 p.m.	Algebra I or Geometry Teacher	Facilitate Teacher in day's lesson; co-teaching, Meet with District Curriculum Support Specialist
	1:30 p.m. to 2:30 p.m.	Algebra I or Geometry Students	Work with small groups of students-high end Level 2 students

Professional Learning Activities

The Mathematics *Professional Learning Plan* will provide support for district and school staff to acquire the skills, content knowledge, and instructional strategies needed to ensure high quality teaching and learning of mathematics. Continuing and sustained professional development are critical elements of educational achievement and professional satisfaction.

Mathematics professional learning is designed to provide rigorous research-based, field-tested learning experiences, programs, and resources for teachers, in order to increase student achievement.

Mathematics professional learning participants will:

- Engage in activities designed to develop an understanding of instructional strategies in teaching and assessing the elementary/secondary level mathematics content and process standards as per NCTM
- Engage in activities that will enhance their understanding of the process used to develop questions, problem, and activities that stimulate students to think more deeply about mathematical ideas
- Examine recommended strategies and techniques for the purpose of adapting materials to various student-achievement levels.
- Utilize manipulatives, technology, and effective strategies to promote understanding of the Sunshine State Standards

- Develop a range of strategies for solving problems, such as using diagrams, constructing tables, and analyzing solutions.
- Examine and promote understanding of the Next Generation Sunshine State Standards benchmarks and the secondary-level course expectations
- Reflect on learning experiences through the use of journal and/or collegial sharing.

Specifically, teachers will learn how to plan an effective instructional block, foster higher order thinking skills through the use of hands-on activities and real-world applications, incorporate performance tasks, and employ effective differentiated instructional strategies.

After participating in the professional learning activities, the participants will:

- Demonstrate competency in using effective instructional strategies in teaching and assessing mathematics content standards
- Engage their students in hands-on, standards-based activities that contribute to the strengthening of mathematical process standards
- Increase their understanding of ways to integrate manipulatives, technology, and effective strategies into classroom practices to increase student achievement
- Utilize differentiated instruction and effective strategies into classroom practices in order to increase student achievement
- Demonstrate knowledge of the latest trends in mathematics education
- Identify ways to align teaching methods with current research on the diversity of learning methods and apply them in their classroom.

Follow-Up

Follow-up activities may include:

- developing and designing a lesson that focuses on preparation, meaning, content, practice and performance activities
- reflecting on curriculum, instruction, and/or assessment that has occurred in his/her classroom
- providing and sharing information on how they will be able to use the knowledge and skills learned during the professional development activity in his/her professional learning community.

Master Plan Points

All professional development activities will be designed to provide an opportunity for participants to earn a minimum of 7 points, and a maximum of 60 points, with one point for each hour of professional development. Master Plan Points (MPP) will be awarded after follow-up is completed in the allotted time. Teachers must be present at all sessions of a given workshop in order to receive credit for participation. No partial credit will be awarded for partial attendance.

Stipends

If a professional development activity is held on a Saturday or during the summer, teachers may receive a daily stipend. Professional development activities occurring on a school day may require substitute coverage.

Center for Professional Learning Registration

To register for a professional development activity, use the Professional Development Menu and Registration System.

1. Enter the Miami-Dade County Public Schools website: www.dadeschools.net
2. On the home page click on Employees and then click **PD Menu and Registration System.**
3. Enter Username (Your Employee # by default)
4. Enter Password (Your Personal MDCPS Password)
5. Click **Login**
6. In the blue menu on left hand side of the page- Click on **Find a Session** (this will be a drop down menu)
7. Choose a listing from the **Find a Session** Menu.
8. Choose the search category, *By Department*
9. Click Instructional
10. Click on "**Department of Mathematics Science and Advanced Academics**" to find the course in which you wish to enroll
11. All of the course offerings for the department will now appear
12. Scroll down the list of course offerings
13. Click on the course you'd like to register for
14. Accept the participant agreement and click register
15. For non-restricted enrollments registration is finalized at this point; for restricted enrollments notification will be emailed once enrollment screening requirements are reviewed by instructor.

Registration confirmation

In order to be admitted to a class, the name must appear as registered on the instructor's official sign in roster. Once a participant has successfully registered for a class, a confirmation email will be sent. The instructor will screen the participants before the enrollment is confirmed and a second confirmation email will be sent.

Location

The location for mathematics professional learning activities will vary, based on course requirements and facility availability. For example, if an in-service requires a computer lab/computer lab access, a school with an accessible computer lab is requested to host the in-service. If the in-service is region specific, the in-service will be within the region.

Course Offerings

The following is a list of mathematics professional development offerings.

TABLE 9.4: MATHEMATICS PROFESSIONAL DEVELOPMENT			
NAME: **DESCRIPTION**	**AUDIENCE**	**TIMELINE**	**DELIVERY**
EARLY CAREER MATHEMATICS TEACHERS			
Exploring the CCSS/NGSSS in Elementary Mathematics: The participant will explore the CCSS/NGSSS standards, the grade-level course description, the grade-level pacing guide, and progress monitoring for students. Participants learn to read a benchmark, understand and apply levels of complexity, and implement standards-based instruction. Brain-compatible, researched-based mathematics teaching strategies that provide for diverse learning styles will be utilized to make connections between the mathematics content and the NCTM process standards. Implementing Florida CCSS/NGSSS for Elementary Mathematics and proper delivery of instructional strategies needed to improve student learning will be explored.	Teachers teaching Mathematics (Grades K-5)	**September/ October** **February/ March**	**Face-to-Face by:** • C & I Math Staff • Exemplary teachers • National Board Certified Teachers (NBTC)

TABLE 9.4: MATHEMATICS PROFESSIONAL DEVELOPMENT			
NAME: **DESCRIPTION**	**AUDIENCE**	**TIMELINE**	**DELIVERY**
MIDDLE GRADES MATHEMATICS TEACHERS			
Exploring the Middle Grades Math CCSS/NGSSS: The participant will explore the Next Generation Sunshine State Standards (NGSSS) and the Common Core State Standards (CCSS), the grade-level course description, and the grade-level pacing guide to include essential content. Participants will learn to unwrap a benchmark, understand and apply the levels of complexity, and implement standards-based instruction. Brain-compatible, researched-based mathematics teaching strategies that provide for diverse learning styles will be utilized to make connections between the mathematics content and the Common Core practice standards. Implementing Florida CCSS/NGSSS for middle grades mathematics and proper delivery of instructional strategies needed to improve student learning will be explored.	Middle Grades Mathematics Teachers	**November, February, June**	**Face-to-Face by:** • Department of Mathematics Staff • Exemplary teachers • National Board Certified Teachers (NBTC)
MATHEMATICS SCHOOL-SITE LEADERS			
Elementary Mathematics Learning Community Dialogues: The professional development is designed to enable the participant to work collaboratively with other instructional leaders to research, examine, and implement current strategies and teaching techniques, and discuss recent trends in mathematics education. Through focused activities, participants will plan for, develop, engage in and review their leadership/ teaching practices, and	Elementary Mathematics Liaison / Coaches (selected by school site administrator)	**September** **October** **November** **December** **January** **May**	**Face-to-Face by:** • Math Staff • Guest Speakers **Discussion Board technology facilitated by:** • Math Staff in collaboration with IT

TABLE 9.4: MATHEMATICS PROFESSIONAL DEVELOPMENT			
NAME: **DESCRIPTION**	**AUDIENCE**	**TIMELINE**	**DELIVERY**
explain to others ideas and strategies that can help raise student achievement levels and understanding of the standards. Elementary Mathematics Liaisons will be expected to participate in quarterly meetings, disseminate information, and share best practice instructional strategies with staff at their school.			
Mathematics Department Chairpersons Dialogue (Middle Schools): The professional development is designed to enable the participant to work collaboratively with other instructional leaders to examine District mandates, current strategies and teaching techniques, and discuss recent trends in mathematics education. Middle grades mathematics leaders will identify ways to align teaching methods with current research on the diversity of learning needs to raise student achievement levels and understanding of the standards. Middle grades math leaders will be expected to participate in quarterly meetings, disseminate information, and share best practices with staff at their schools.	Middle School Mathematics Chairpersons	**September, October, November, January, February, May**	**Face-to-Face by:** • Department of Mathematics Staff • Guest Speakers **Discussion Board technology facilitated by:** Department of Mathematics Staff in collaboration with Instructional Technology (IT)
Mathematics Department Chairpersons Dialogue (Senior High Schools): Examine strategies and techniques for adapting District mandates and materials to various student-achievement levels. Identify ways to align teaching methods with current research on the diversity of learning methods.	Senior High School Mathematics Chairpersons	**September, October, November, May**	**Face-to-Face by:** • Department of Mathematics Staff Guest Speakers **Discussion Board technology facilitated by:** Department of Mathematics Staff in collaboration with IT

TABLE 9.4: MATHEMATICS PROFESSIONAL DEVELOPMENT			
NAME: **DESCRIPTION**	**AUDIENCE**	**TIMELINE**	**DELIVERY**
Coaches Leadership Institute (Middle Schools): Examine strategies and techniques for adapting District mandates and materials to various student-achievement levels. Identify ways to align teaching methods with current research on the diversity of learning methods.	Middle School Math Coaches	**September, November, December May**	**Face-to-Face by:** • C & I Math Staff • Region CSS **Discussion Board technology facilitated by:** • C & I math Staff in collaboration with IT **Pod casting facilitated by:** C & I Math Staff in collaboration with IT
Coaches Leadership Dialogue (Senior High Schools): Examine strategies and techniques for adapting District mandates and materials to various student-achievement levels. Identify ways to align teaching methods with current research on the diversity of learning methods.	Senior High Schools Math Coaches	**September, October, November, May**	**Face-to-Face by:** • C & I Math Staff • Region CSS **Discussion Board technology facilitated by:** • C & I math Staff in collaboration with IT **Pod casting facilitated by:** C & I Math Staff in collaboration with IT
ELEMENTARY MATHEMATICS TEACHERS, EARLY CAREER AND EXPERIENCED			
Examining the CCSS/NGSSS in Elementary Mathematics: (Grade-Level Specific) Teachers will expand their understanding of grade level standards as they implement the strategies, activities, and concepts learned in the workshop when designing lessons. Implementation of the strategies learned will support addressing the diverse learning needs of all students and the CCSS/NGSSS. Teachers will gain a strong command in identifying what students should know and be able to do by the end of the school year. Activities will be focused on understanding of both content standards and performance standards, a necessary component for effective instruction of mathematics.	Teachers teaching Mathematics (Grades K-5)	**September/ October** **February/ March** **June**	**Face-to-Face by:** • C & I Math Staff • Exemplary teachers • NBCT

TABLE 9.4: MATHEMATICS PROFESSIONAL DEVELOPMENT			
NAME: **DESCRIPTION**	**AUDIENCE**	**TIMELINE**	**DELIVERY**
Effective Use of Mathematics Pacing Guides (Grade-Level Specific) This professional development is designed to enable the participants to enhance his/her mathematical content knowledge while reviewing the mathematics essential content and objectives for each nine-week period and discussing the concepts that are central to their grade level. They will engage in open dialogues about the challenges students are likely to encounter in learning certain concepts; and learn about and share practices in how to teach these concepts effectively and assess students' understanding. Implementation of lessons learned during each nine week period and sharing back at the next session will be critical to enable the participants to make and practice curricular decisions as they analyze student work and address needs through designing lessons that differentiate instruction and attend to learning styles. Participants will focus on how to positively impact student achievement.	Teachers teaching Mathematics (Grades K-5)	**August/ September** **October** **January** **March**	**Face-to-Face by:** • C & I Math Staff • Exemplary teachers • NBCT
Effective Use of the Math Instructional Block Teachers will participate in in-depth discussions to investigate the best approach for teaching the CCSS/NGSSS standards to meet the needs of our students. Participants will engage in a review of their teaching practices, and collaboratively plan for ideas and strategies that can help increase student	Elementary Teachers Teaching Mathematics (Including ESE)	**September/ October** **February/ March**	**Face-to-Face by:** • C & I Math Staff • Exemplary teachers • NBCT

TABLE 9.4: MATHEMATICS PROFESSIONAL DEVELOPMENT			
NAME: **DESCRIPTION**	**AUDIENCE**	**TIMELINE**	**DELIVERY**
understanding of the mathematics standards during the 60-minute instructional block.			
Elementary Mathematics Textbook Training (K-5 Teachers) This professional development introduced the participant to the newly adopted elementary mathematics textbooks and online resources. It provided the participant with the pedagogical basis for teaching with the new materials and focus on the instructional strategies, curricula, and uses of technology to help students gain conceptual understanding of mathematics and how to effectively implement the Next Generation Sunshine States Standards (CCSS/NGSSS). Participants will learn how to use the variety of assessments embedded within the program to inform instruction questions, and learn and how to use the intervention system (that comes with the program) for all 3 tiers of intervention addressing the needs of all learners.	Elementary Teachers Teaching Mathematics (Including ESE)	**September/ October**	**Face-to-Face by:** • GO Math! Consultants • C & I Math Staff
Elementary Mathematics Textbook Training Phase 2 (Tech) This professional development trained the participant how to implement the technological components of the GO Math! CCSS Series, including the strategies, activities, and management system (i.e., setting up classes and assigning work online) when designing lessons and during mathematics instruction.	Elementary Teachers Teaching Mathematics (Including ESE)	**October/ November**	**Face-to-Face by:** • GO Math! Consultants • C & I Math Staff

TABLE 9.4: MATHEMATICS PROFESSIONAL DEVELOPMENT			
NAME: **DESCRIPTION**	**AUDIENCE**	**TIMELINE**	**DELIVERY**
Additionally, implementation of the technological tools learned will address the diverse learning needs of all students and the CCSS/NGSSS.			
Elementary Mathematics Textbook Training Phase 3 This professional development will support teacher implementation of the latter part of the Go Math! series, which gets students ready for the next grade-level curriculum. Participant will be guided through the pedagogical basis for teaching the content in the fourth quarter, focusing on instructional strategies, curricula, and uses of technology to help students gain mastery of their grade-level mathematics. Participants will further explore how to use the variety of assessments embedded within the program to inform instruction questions to prepare students for the next grade-level.	Elementary Teachers Teaching Mathematics (Including ESE)	**March/April**	**Face-to-Face by:** • GO Math! Consultants • C & I Math Staff
SECONDARY MATHEMATICS, EARLY CAREER AND EXPERIENCED TEACHERS			
Infusing Technology in the Mathematics Classroom: This professional learning activity is designed to examine the use of graphing calculators in the mathematics classroom. Teachers will learn effective techniques and strategies to use the calculator as a demonstration tool to introduce mathematical concepts.	Secondary mathematics teachers (grades 8-12)-2011 Summer Institute Follow-Up	**November**	**Face-to-Face by:** • C & I Math Staff • Exemplary teachers • NBCT **Discussion Board technology facilitated by:** C & I math Staff in collaboration with IT
Reasoning and Sense Making via the TI graphing calculators: This professional learning activity is designed to examine the use of graphing calculators in the	Secondary mathematics teachers (grades 8-12), Beginners	**October**	**Face-to-Face by:** • C & I Math Staff • Exemplary teachers • NBCT **Discussion Board technology facilitated by:**

TABLE 9.4: MATHEMATICS PROFESSIONAL DEVELOPMENT			
NAME: **DESCRIPTION**	**AUDIENCE**	**TIMELINE**	**DELIVERY**
mathematics classroom. Teachers will learn the effective techniques and strategies to use the calculator as a demonstration tool to introduce mathematical concepts.			C & I math Staff in collaboration with IT
Reasoning and Sense Making- Algebra I: This professional learning activity is designed to enhance teacher content knowledge and pedagogy in Algebra I. Teachers will learn the effective techniques and strategies to use in their math classrooms	Secondary mathematics teachers (grades 8-12)	**November, June**	**Face-to-Face by:** • C & I Math Staff • Exemplary teachers • NBCT **Discussion Board technology facilitated by:** C & I math Staff in collaboration with IT
Reasoning and Sense Making - Geometry: This professional learning activity is designed to enhance teacher content knowledge and pedagogy in Geometry. Teachers will learn the effective techniques and strategies to use in their math classrooms.	Secondary mathematics teachers (grades 8-12)	**November, June**	**Face-to-Face by:** • C & I Math Staff • Exemplary teachers • NBCT **Discussion Board technology facilitated by:** C & I math Staff in collaboration with IT
Reasoning and Sense Making- Algebra II: This professional learning activity is designed to enhance teacher content knowledge and pedagogy in Algebra I. Teachers will learn the effective techniques and strategies to use in their math classrooms.	Senior High School mathematics teachers (grades 9 – 12)	**February, June**	**Face-to-Face by:** • C & I Math Staff • Exemplary teachers • NBCT **Discussion Board technology facilitated by:** C & I math Staff in collaboration with IT
Cognitive Tutor Algebra I and Geometry: Teachers' Knowledge will be enhanced in using and implementing the Cognitive Tutor Software program for the respective content areas. Algebra I and Geometry training will be available for secondary teachers. Participating teachers must be implementing the program in their school.	Secondary mathematics teachers (grades 8-12)	**November, June**	**Face-to-Face by:** • Cognitive Tutor trainers **Discussion Board technology facilitated by:** • C & I math Staff in collaboration with IT

TABLE 9.4: MATHEMATICS PROFESSIONAL DEVELOPMENT			
NAME: **DESCRIPTION**	**AUDIENCE**	**TIMELINE**	**DELIVERY**
FLDOE FCAT 2.0 Item Specifications Training and Test Design Summary: Participants will be introduced to the content and format of the assessment and the assessment's items for item writers and reviewers as well as review the alignment of items with the Next Generation Sunshine State Standards.	Secondary mathematics teachers (grades 6-8)	**June, December**	**Face-to-Face by:** • C & I Math Staff • Exemplary teachers • NBCT
Norman Webb's Depth of Knowledge and Higher Order Thinking Skills: Participants will explore the Depth of Knowledge (DOK) model employed to analyze the cognitive expectation demanded by the CCSS/NGSSS, curricular activities and the FCAT 2.0 assessment. The model is based upon the assumption that curricular elements may all be categorized based upon the cognitive demands required to produce an acceptable response.	Secondary mathematics teachers (grades 6-8)	**June**	**Face-to-Face by:** • C & I Math Staff • Exemplary teachers • NBCT

COMPREHENSIVE MATHEMATICS PLAN

Chapter 10

PARENT CONNECTIONS

COMPREHENSIVE MATHEMATICS PLAN'S ALIGNMENT WITH THE PARENT ACADEMY

The Office of Curriculum and Instruction (Mathematics) is committed to increasing parental awareness of mathematics educational issues and knowledge of mathematics content. In order to achieve this goal, the District provides parents with information on strategies that they can use at home to support their children's mathematical learning. In additions, parent training and support are provided through workshops, newsletters, fact sheets, tip sheets, the web site, and resource packets.

The Parent Academy of Miami-Dade County Public Schools ® is a year-round initiative designed to help parents become full partners in their children's education. Having access to classes and courses being offered in facilities all over this large countywide school system, parents have the opportunity to enroll in classes that interest them most. The Office of Curriculum and Instruction, (Mathematics) supports the Parent Academy by providing highly qualified teachers to conduct parent workshops in mathematics as needed throughout the school year. Some of these workshops include mathematics literacy, mathematics best practices, and how the Florida Comprehensive Assessment Test affects a child's progress.

PARENTAL INVOLVEMENT

We know from research that children are more likely to be successful learners of any subject when parents actively support their learning. Today, helping children make the effort to learn, appreciate and master mathematics is more important than ever. Our increasingly technological world demands strong skills in mathematics, not only in the workforce but also in everyday life, and these demands will only increase over the lifetimes of our children. The Comprehensive Mathematics Plan provides a practical guide which parents may use as a reference while working at home with their children.

Many people are frightened by mathematics and see it as something that can only be understood by the mind of a genius. Often parents feel that mathematics is too difficult and that they cannot help their children with it. However, parents can help children not only learn mathematics, but also have a life-long love of the subject by encouraging their natural curiosity.

Increasing the number of people going into the fields of math and science is a national goal. However, even if a student is not planning to pursue a career in one of those fields, he has to be prepared to live and work in a world that is

becoming increasingly complex and technical. Parents can begin by helping our children learn to read, write, count, calculate, and learn more about the world around them. This guide will provide basic information about mathematics in addition to a sample of activities and a list of books that parents can use with their children that will spark their mathematical interest. Many of these activities are simple.

What is Mathematics?

Mathematics is the science of numbers and their operations, interrelations, combinations, generalizations, and abstractions. It can also be defined as:

- experiences that help students shift their thinking about mathematics and define mathematics as a study of patterns and relationships
- a science and a way of thinking
- an art, characterized by order and internal consistency
- a language, using carefully defined terms and symbols; and a tool.

What Can Parents Do?

As children go about their daily lives exploring and discovering things around them, they are exposed to the world of mathematics. In this technological age when mathematics is extremely important, it is imperative that children learn math at home. Parents can relate math to everyday life by encouraging children to be problem solvers, to communicate mathematically, and to develop reasoning ability.

Be a problem solver:

- question, investigate and explore solutions to problems,
- stick with a problem and find a solution
- understand that there may be different ways to arrive at an answer
- apply math to everyday situations and uses it successfully
- be involved in family decision-making using math.

Communicate mathematically:

- use words, numbers and mathematical symbols to explain situations
- talk about how you arrive at an answer
- listen to others' ways of thinking
- write about math not just give answers
- ask about the process used

Demonstrate reasoning ability:

- think logically
- look for similarities and differences in things
- thinking about relationships among things
- explain answers to simple problems and more complicated ones as well

TOP TEN THINGS PARENTS CAN DO

- **Be involved at school.** Parental involvement helps teachers in helping your children be successful at school.

- **Provide resources at home for learning.** Provide appropriate time to do math with your child everyday. Support your child while he is doing homework but don't do it for him. Create a specific homework space that's clutter-free and quiet. Encourage double-checking work. Utilize day-to-day opportunities in your home to showcase math (e.g., counting silverware or measuring while cooking, etc.)

- **Set a good example of the *love of math*.** Show your child by your own actions that you believe math is both enjoyable and useful. Fill your child's life with a love for learning math by respecting his/her questions and encouraging his efforts.

- **Encourage students to do their best in math.** Show your child that you want him/her to do his/her best in math. Allow your child to make mistakes, as it's the only way teachers can measure if he/she understands the material. It is also how children learn responsibility for the quality of their work. Do not pressure your child by setting goals too high; at the same time, do not lower your expectations. Consider the grade-level/course expectations and seek resources to help your child when he/she needs academic support.

- **Help your child see that the mathematics he is learning is very much a part of everyday life.** From statistics in sports to the sale price of clothing to the amount of gas needed to travel from one city to another, mathematics is important to us every day. Help your child to link his "school" math to practical events.

- **Point out that many jobs require mathematical skills.** Your child may recognize that many people must have good math skills to do their jobs—scientists, doctors, computer technicians, accountants and bankers, for example. However, she may not realize that many other jobs also require math. Point out that math also is used in jobs such as running a business; being a plumber, carpenter, electrician or mechanic; being a salesperson or clerk; and designing clothes—or buildings. Let her know that having strong math skills will open up many great career opportunities.

- **Call teachers early if you think there's a problem.** Do not wait for teachers to call you.

- **Accept your responsibility as *monitor of student progress*.** Teach your child self-discipline and self-monitoring of his/her learning. You are not

expected to be the instructor of the content, but you are expected to monitor if your child has tried to complete the homework, studied for an upcoming assessment, and reviewed the day's classroom objectives.

- **Be a partner with your child's teacher.** When you need to speak to the teacher in reference to a specific issue with your child, do it privately. Never criticize your child's teacher in front of your child.

- **Stimulate your child's interest in technology.** Help your child learn how to use calculators—but don't let him rely solely on them to solve math problems. Encourage him to learn to use computers to extend what he is learning and to find math games and math-related Web sites that will increase his interest in math.

Benefits of Parent Involvement

Students

- Higher grades, test scores, and graduation rates
- Better school attendance
- Increased motivation, better self-esteem
- Greater enrollment in postsecondary education

Teachers

- Communication/relations with students, parents, families, and communities improves
- Community support of schools increases
- Teaching effectiveness (proficiency) increases
- Job satisfaction goes up
- Greater morale (and self-esteem)

Parents

- Communication/relations with children and teachers improves
- Decision-making skills become stronger
- Attitude toward school and school personnel improves
- Self-esteem goes up

Tips for a Successful Parent-Teacher Conference

A parent–teacher conference is a time to talk about how a student is doing in school. It is the face-to-face opportunity to ask questions about your child's progress. It is also a time for you and the teacher to work together as a team to discuss ways you both can help your son or daughter. Whether your child is in elementary, middle, or secondary school, parent-teacher conferences are important. If your school does not schedule regular conference time, you can request them. By working together, you can achieve success at school.

Before the Conference

- **Schedule an appointment.** Give the teacher a general idea of the issues you would like to discuss.

- **Talk to your child.** Ask if there is anything your child would like you to talk about with the teacher. Explain the purpose of the meeting is ultimately to help him/her. If your child attends a middle or senior high school, consider including him/her in the conference.

- **Make a list of topics.** Before you go to the meeting, make a list of topics to discuss with the teacher. Along with questions about academics and behavior, you may want to talk to the teacher about topics such as your child's home life, personalities, and/or habits that may help the teacher in working with the child.

During the Conference

- **Establish rapport**. Thank the teacher for the opportunity to meet with him/her to discuss your child's education.

- **Ask questions**. Questions you ask during the conference can help you express your hopes for the student's success in class and for the teacher. Ask the important questions first. The teacher's answers should help you both work together to help your child. The following is a list some questions to consider to ask the teacher with respect to academics:
  1. *What skills and knowledge will my child be expected to master this year?*
  2. *How will my child be evaluated?*
  3. *What can I do to stay more involved in my child's academic progress?*
  4. *How do you accommodate differences in learning?* What if my child is a slow learner and falls behind, or is a fast learner and is bored?
  5. *How are older students prepared for further learning after high school?*

- **Address problems.** Discuss any difficulties (either academic or behavioral) your child might be having at school.
  - Avoid angry or apologetic reactions. Instead, ask for examples.

- Ask what is being done about the problem and what strategies seem to help at school.

- **Develop an action plan** that may include steps that parents can take at home and steps the teacher will take when the problem comes up at school. Set up a way to check on your child's progress.

- **End the conference.** Preview what you discussed and restate your action plan. Schedule a follow up meeting if needed.

After the Conference

Discuss the conference with your child. Stress the good things that were covered and be direct about problems that were identified. If an action plan is in place, explain to the child what was arranged. When an action plan is in place, make sure you, your child and the teacher follow through.

Keep in touch with the teacher, even if things are going well.

Mathematics in the Home

Your home is a great place for you to begin to explore and "talk" mathematics with your child. Incorporating math activities and language into familiar daily routines will show your child how math works in his everyday life and provide him with a safe environment in which to take risks by trying new things. Here are a few samples of what *mathematics in the home* looks like:

Preschool

Number Hunt

By counting, using number names and learning to recognize differences in number values, children build a foundation for the development of number sense and mathematical reasoning.

What You Need
- 3 plastic eggs that come apart (or similar containers)
- Buttons
- Plastic netting

What to Do
Take your child for a walk. You can walk around your neighborhood, through a park, or just around the rooms in your home. As you walk, say silly things for him to do, such as the following:
- — Take two big steps and three little steps.
- — Take three little steps, hop one time, take three big steps.
- — Take one little step, turn around two times.

  - — Hop four times, turn around one time.
  - — Take three big steps forward and two big steps backward.
- Count aloud each kind of action that your child performs and compliment him for his efforts—"1, 2—1, 2, 3—1, 2. That's great!"
- Let your child turn the tables and say silly things for you to do as you walk.
- For your kindergarten child, expand the activity by asking him to "guess" (estimate) how many of his steps it will it take, for example, to get from the tree to the corner. After he makes his estimate, have him count steps to see how close the estimate is. Next ask him how many of your steps it will take. Will it take you more steps or fewer to go the same distance? Again, have him count to see if his answers are correct.

Kindergarten–Grade 1

A-Weigh We Go!

Observing, estimating, weighing and comparing are all essential mathematics skills.

What You Need
- Bathroom or kitchen scales
- Objects to weigh, such bags of sugar, flour, potatoes or onions; boxes of detergent and cookies; shoes of different sizes
- Paper and pencil
- A small plastic zipper bag filled with sugar and much larger zipper bag filled with cornflakes (or popped popcorn)
- Suitcase

What to Do
- Show your child two objects, such as a five-pound bag of sugar and a 10 pound bag of potatoes, and ask him to guess which weighs the most. Show him how to use a scale to weigh the objects and see if his guess is right or wrong.
- Next show him several objects and ask him to guess how much each weighs. Have him write his estimates, and then weigh the objects to see if they're correct.
- If you choose, have your child estimate his own weight, as well as that of other family members, and use the bathroom scale to check his guesses.
- Extend the activity or make it more challenging by doing the following:

  - — Show your child the small plastic bag filled with sugar and the larger bag filled with cornflakes or popped popcorn. Ask your child which will weigh more, the smaller or the larger bag? Have him weigh the bags to check whether his guess is correct. Afterwards, point out that bigger does not always mean heavier.
  - — Ask your child how he can weigh a suitcase that is too large to fit on the bathroom scale. Listen carefully to his answers—try some of his

suggestions, if possible—and praise him for learning to think through problems. If he doesn't come up with a solution, show him that one way to find the weight of the suitcase is for him to stand on the scales while holding it and noting the total weight. Then put the suitcase aside and weigh him again and note his weight. If he subtracts his weight from the total weight, the answer is the weight of the suitcase.

Grades 3–5

Simply Symmetrical

A shape is symmetrical if it can be cut along a straight line into two halves that are mirror images of each other. Learning about symmetry gives children a good sense of geometric principles and calls on their mathematical reasoning abilities.

What You Need
- Shapes such as a circle, a square and a rectangle, cut from heavy paper
- Sheets of paper (rectangular)
- Pencil, marker or crayon
- Magazine pictures of symmetrical objects
- Safety scissors
- Glue

What to Do
As your child watches, show her the square that you've made. Fold it in half and show her that the two parts are exactly alike—or *symmetrical.*
Do the same with the circle and the rectangle. Then give the shapes to your child and ask her to make the folds herself.
Extend the activity by having her do the following:

— Find as many ways as she can to fold half of the square onto the other half. *(There are four ways: two diagonals and two lines "down the middle").*

— Do the same for the rectangle. *(There are only two ways: down the middle of the long side, then down the middle of the short side. In going from a square to a rectangle, the diagonals are lost as lines of symmetry.)*

— Do the same with the circle. *(Circles can fold along any diameter. Use this discovery to introduce your child to the word "diameter"—the length of a straight line that passes through the center of a circle)*.

— Ask her to find the center of a circle by folding it in half twice. *(She'll discover that any diameter—line of folding in half—passes through the center of the circle, an activity that will prepare her for understanding more complicated geometry later on.)*

Sources:
National Parent Teacher Association- http://www.pta.org/

Back to School with Family Education - http://www.familyeducation.com/home/
U.S. Department of Education: ED.gov-
http://www.ed.gov/parents/academic/help/math/index.html

Chapter 11

Community Involvement

COMMUNITY EVENTS AND MATHEMATICS COMPETITIONS

The Office of Academics and Transformation, Department of Mathematics and Science, promotes community awareness of all stakeholders in the mathematics education of M-DCPS students through a variety of strategies such as media exposure and mathematics competitions for students. The goal is for the community to acknowledge and embrace the important role mathematics play in life.

MEDIA EXPOSURE

RADIO AND TELEVISION ADS

The Department of Mathematics and Science, will initiate a marketing campaign featuring radio and television ads geared to the entire community that espouse the importance of mathematical literacy. Ads will feature students, teachers, and professionals such as engineers, doctors, lawyers, explaining how mathematics played a crucial role in their formative years. Professionals will also explain the impact mathematics has on their current roles.

STUDENT COMPETITIONS

David Essner Mathematics Competition

This is an annual competition among Miami-Dade County secondary school students. It is open to all secondary schools, public and private, in Miami-Dade County. Each competition consists of two parts:

1. A preliminary 90-minute multiple-choice exam given at the participating schools during the first Thursday in December. All secondary school students are eligible to take this exam, although it is recommended only for those who have had an honors algebra and pre-calculus course. Each school must agree to administer the exam to their student competitors.
2. A second exam given in late January or early February at the University of Miami. This is a 3-hour exam open only to school winners and others who made a sufficiently high score on the preliminary exam. This exam normally consists of 5 problems whose solutions require creative thought and must be presented with logical clarity.

Each school winner receives a certificate. The Top Ten winners of the second exam are invited to an awards dinner, along with parents or other guests and school representatives. Awards to the Top Five include cash prizes, plaques, and mathematics books; certificates and books are provided to those in the Top Ten.

Elementary Math Bowl

The Elementary Mathematics Bowl is sponsored by the Dade County Council of Teachers of Mathematics and supported by the District. This contest involves

elementary age students in individual and team written and mental math activities.

MATHCOUNTS®

This program is a national math enrichment, coaching, and competition program that promotes middle school mathematics achievement through grassroots involvement in every U.S. state and territory. Having existed for over 27 years, MATHCOUNTS is one of the most successful education partnerships involving volunteers, educators, industry sponsors, and students. After several months of coaching, participating schools select students to compete individually or as part of a team in one of the more than 500 written and oral competitions held nationwide and in U.S. schools overseas. Winners at the local level proceed to state competitions, where the top four Mathletes® and top coach earn the right to represent their state or territory at the national level. At all levels, MATHCOUNTS challenges students' math skills, develops their self-confidence, and rewards them for their achievements. President Barack Obama and former Presidents George W. Bush, William J. Clinton, George H.W. Bush and Ronald W. Reagan have all recognized MATHCOUNTS national winners at White House ceremonies. The MATHCOUNTS program has also received two White House citations as an outstanding private-sector initiative.

Miami-Dade SECME (Science Engineering Communication and Mathematics Enhancement) Alliance

SECME is a vehicle for involving minorities in the science, mathematics, and engineering fields. The program is a national strategic alliance to renew and strengthen the professional capacity of K-12 educators, motivate and mentor students, and empower parents so that all students can learn and achieve at higher levels. SECME encourages K-12 students to pursue careers in science, technology, engineering and mathematics through partnerships with local universities, government and industry agents. M-DCPS SECME hosts an annual engineering Olympiad for secondary schools and an Engineering Festival for elementary schools. SECME students and engineers have appeared on local television programs such as Club E and "Mathematics, Science & Engineering At Our Schools" that showcased SECME engineering activities and career tips for students. Currently, SECME in Miami-Dade County Public Schools reaches more than 100 schools (K-12) and directly impacts over 2,000 students.

Mu Alpha Theta (*MAθ)*

This National High School and Two-Year College Mathematics Honor Society has more than 88,000 student members in more than 1,800 schools. *MAθ* is dedicated to inspiring keen interest in mathematics, developing strong scholarship in the subject, and promoting the enjoyment of mathematics in high school and two-year college students. Mu Alpha Theta achieves these goals

by providing a method for schools to recognize and encourage those students who enjoy and excel in mathematics, organizing a National Convention for teachers and students to participate in math-related events and interact with others from across the country, rewarding outstanding and extracurricular achievement by offering special awards to both students and their faculty advisors, and providing Mathematics Competitions to participating members at their own school through the Log 1 Contest, the Rocket City Math League and the Presentation Contest.

UNIVERSITY PARTNERS

The Department of Mathematics, Science, and Advanced Academic Programs has formed partnerships with Miami Dade College (MDC), Florida International University (FIU), Florida Memorial University, the University of Miami (UM), SECME Inc. (formerly the *Southeastern Consortium for Minorities in Engineering*), and NASA's Science, Engineering, Mathematics and Aerospace Academy (SEMAA) to create an Internet portal that provides mathematics teachers with access to best practices vis-à-vis accredited online professional development, lesson plans and activities based on the leading research in how people learn, how to teach mathematics and how to integrate reading into the process.

The *Math Matters Every Day (M^2ED)* portal is an online source for professional development, instructional strategies, classroom resources, and an online community for math instructors across the state. The design team consists of partners with complimentary skill sets and audiences, maximizing dissemination. Key features for content- and non-content teachers include the ability to: learn key math concepts; find literacy strategies aligned with mathematics; access content from home using low bandwidth dial-up connections; earn teacher education credit towards certification; and find lessons and activities illustrating how Math Matters Every Day in grade bands K-2, 3-5, 6-8, and 9-12.

Florida International University, Miami Dade College and the University of Miami staff have designed and implemented modules of the project. Each Institute of Higher Education (IHE) designated faculty members and web developers to work with M-DCPS educational staff to design the modules. The Math Matters website can be accessed at http://math.dadeschools.net/mathMatters/.

Other Information

In addition to workshops and events, parents can access detailed information regarding preparing their children for mathematics at http://www.ed.gov/parents/academic/help/math/math.pdf.

The School Board of Miami-Dade County, Florida, adheres to a policy of nondiscrimination in employment and educational programs/activities and programs/activities receiving Federal financial assistance from the Department of Education, and strives affirmatively to provide equal opportunity for all as required by:

Title VI of the Civil Rights Act of 1964 - prohibits discrimination on the basis of race, color, religion, or national origin.

Title VII of the Civil Rights Act of 1964, as amended - prohibits discrimination in employment on the basis of race, color, religion, gender, or national origin.

Title IX of the Education Amendments of 1972 - prohibits discrimination on the basis of gender.

Age Discrimination in Employment Act of 1967 (ADEA), as amended - prohibits discrimination on the basis of age with respect to individuals who are at least 40.

The Equal Pay Act of 1963, as amended - prohibits sex discrimination in payment of wages to women and men performing substantially equal work in the same establishment.

Section 504 of the Rehabilitation Act of 1973 - prohibits discrimination against the disabled.

Americans with Disabilities Act of 1990 (ADA) - prohibits discrimination against individuals with disabilities in employment, public service, public accommodations and telecommunications.

The Family and Medical Leave Act of 1993 (FMLA) - requires covered employers to provide up to 12 weeks of unpaid, job-protected leave to "eligible" employees for certain family and medical reasons.

The Pregnancy Discrimination Act of 1978 - prohibits discrimination in employment on the basis of pregnancy, childbirth, or related medical conditions.

Florida Educational Equity Act (FEEA) - prohibits discrimination on the basis of race, gender, national origin, marital status, or handicap against a student or employee.

Florida Civil Rights Act of 1992 - secures for all individuals within the state freedom from discrimination because of race, color, religion, sex, national origin, age, handicap, or marital status.

School Board Rules 6Gx13- 4A-1.01, 6Gx13- 4A-1.32, and 6Gx13- 5D-1.10 - prohibit harassment and/or discrimination against a student or employee on the basis of gender, race, color, religion, ethnic or national origin, political beliefs, marital status, age, sexual orientation, social and family background, linguistic preference, pregnancy, or disability.

Veterans are provided re-employment rights in accordance with P.L. 93-508 (Federal Law) and Section 295.07 (Florida Statutes), which stipulate categorical preferences for employment.

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