

MONTGOMERY COUNTY PUBLIC SCHOOLS

MATHEMATICS

PROGRAM
for Grades K-12



UNDERSTANDING
COMPUTING
APPLYING
REASONING
ENGAGING



ROCKVILLE, MARYLAND



VISION

A high-quality education is the fundamental right of every child. All children will receive the respect, encouragement, and opportunities they need to build the knowledge, skills, and attitudes to be successful, contributing members of a global society.

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850 Hungerford Drive
Rockville, Maryland 20850
www.montgomeryschoolsmd.org



Dear Parents,

In the 21st century, a deep understanding of mathematics, and the ability to apply that understanding, is more important than it has ever been. In Montgomery County Public Schools (MCPS), and across the country, mathematics instruction is changing to make sure we provide our students with the skills and knowledge they need for success in college and the workplace.

This booklet will provide you with some important information about why these changes are needed; how we are improving math instruction; what deep understanding means; and how we are working to meet the needs of all students to ensure their success.

Please take the time to go through this booklet and visit the MCPS website to find more helpful math resources and information. If you have further questions, please do not hesitate to ask your child's teacher or school principal.

Sincerely,

Joshua P. Starr, Ed. D.
Superintendent of Schools



WHY IS THE MATH CURRICULUM CHANGING?

THE TEACHERS AND ADMINISTRATORS of Montgomery County Public Schools (MCPS) are committed to providing each student with a challenging mathematics program. To help reach that goal, we review our curriculum, instruction, and assessments on an ongoing basis to ensure that a high level of rigor is available for every student. Periodically, there are wider reviews that result in systemwide improvements in the mathematics program. Over the last few years, there have been three major developments that have significantly impacted the mathematics program.

Math Work Group

In 2008–2009, a representative group of teachers, parents, principals, community members, and central office staff gathered for 18 months to review the MCPS mathematics program. Their work resulted in a number of recommendations regarding curriculum, acceleration, system achievement targets, and professional development. Several of the key recommendations included adopting the then-in-development *Common Core State Standards (CCSS)*, reviewing the impact of the CCSS on the MCPS math program and system targets, expanding professional development in mathematics, and eliminating grade-level skipping of mathematics content, while continuing practices that challenge students who consistently demonstrate *proficiency*.

Internationally Driven Common Core State Standards

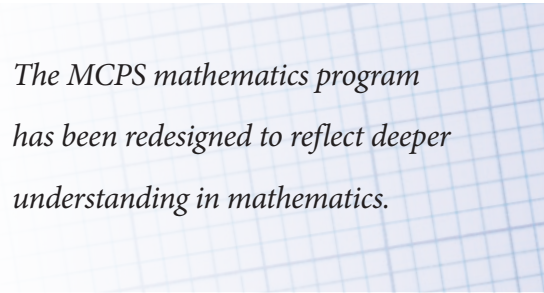
Over the last decade, the United States has consistently ranked below 20 other nations in K–12 mathematics. The CCSS in Mathematics were developed to improve students' understanding of mathematics compared with their international peers.

A consortium of 48 states was formed in 2008 to guide development of new standards, which outline what students should know and be able to do. The authors of the CCSS reviewed best practices internationally and consulted content experts to create a focused, coherent, and rigorous set of standards. Maryland adopted the CCSS in June of 2010.

Words in *blue italic* are defined on the back of this booklet.

As MCPS staff compared the CCSS with the 2001 MCPS curriculum standards, several trends became apparent. First, it was clear that many of the CCSS are more complex and challenging. In addition, many standards in the CCSS are located in earlier grades than in the previous MCPS curriculum. Both the CCSS and the 2001 MCPS curriculum standards contain a high level of rigor and coherence. But the CCSS, like standards in many successful nations, focus on students developing deep understanding in mathematics, defined as the appropriate balance among conceptual understanding, procedural skill, and problem solving with an emphasis on application.

Focusing mainly on procedural skill can reduce the development of students' long-term conceptual understanding and blunt the growth of problem-solving skills. The Math Work Group teachers made similar observations. They noted that students often came well prepared to take formulaic tests but had



The MCPS mathematics program has been redesigned to reflect deeper understanding in mathematics.

difficulty when presented with rich mathematical tasks that required use of number sense and strategic thinking. The MCPS mathematics program has been redesigned to help students gain a deeper understanding of math and apply that understanding in a variety of ways.

The Changing Definition of College and Career Readiness

Beginning with students who entered Grade 9 in 2011, the colleges and universities within the University System of Maryland are expecting students to complete Algebra 2 or a significant mathematics course with advanced content during their senior year. In addition, many schools and employers are looking for the 21st century skills such as persistence, collaboration, and critical and creative thinking that are the focus of Curriculum 2.0.



■ Curriculum 2.0 Mathematics Program Goals

THE HIGHER EXPECTATIONS of the CCSS, the recommendations of the Math Work Group, and new definitions of college and career readiness helped form the four goals of the K–12 Curriculum 2.0 Mathematics program:

- Develop students who value mathematics and see it as useful to solving problems and making sense of the world.
- Engage all students in experiences with mathematics content and processes that help them reach proficiency, defined as Understanding, Computing, Applying, Reasoning, and Engaging (*UCARE*) in mathematics.
- Ensure that all students master the knowledge, skills, and understanding necessary to be college and career ready by graduation.
- Prepare students with the desire and skills necessary to have the opportunity to take Advanced Placement or other college-level math courses in high school.



■ What is Deep Understanding in Math?

STUDENTS WHO DEMONSTRATE a deep understanding of mathematics see it as more than just procedures to memorize and replicate on a test. To reach a deep understanding, students learn to work collaboratively and to express their understanding in multiple ways. The CCSS *Standards for Mathematical Practice (SMP)*, represented below, are the definition of deep understanding in Curriculum 2.0 mathematics. Students who have a deep understanding of mathematics content—

- make sense of problems and persevere in solving them;
- reason abstractly and quantitatively;
- construct viable arguments and critique the reasoning of others;
- represent real-world situations with mathematical modeling;
- use appropriate tools strategically (manipulatives, calculators, etc.);
- use definitions, calculations, and estimations with the appropriate level of precision;
- look for and make use of patterns and structure; and
- look for and express generalities within mathematics.



■ How Do We Measure Deep Understanding of Math?

MANY OF US RECALL MATH TESTS in school when we memorized procedures and appeared to understand what we learned by completing the procedure on a test. Tests that measure the CCSS will continue to measure student understanding of procedures and computation, but also will measure problem solving and conceptual understanding. More important, teachers will be measuring student understanding from a broad spectrum of interactions with students, conversations, tests, projects, and observations. Students who deeply understand a mathematical concept are referred to as proficient in that concept. Proficiency is defined in the five intertwined strands of UCARE.

- **Understanding**—comprehending concepts, operations, and relations
- **Computing**—carrying out procedures
- **Applying**—formulating and solving mathematical problems
- **Reasoning**—using logic to explain a solution or justify why the mathematics works
- **Engaging**—seeing math as useful, sensible, and doable



In addition, integration of the SMP with the mathematics content will aid in representing depth of mathematical understanding. Students will need to demonstrate their understanding in multiple ways so the teacher can determine if they have reached proficiency.

■ How Will We Ensure that All Children are Challenged?

THE DEEPER UNDERSTANDING and higher expectations of the grade-level CCSS, and the ways of measuring that deep understanding, will challenge students and help prepare them for college and careers. Many students will need more than this. For these students, MCPS developed additional *enrichment* and *acceleration*. When a student demonstrates consistent understanding of a mathematical concept, there are enrichment and acceleration opportunities designed within the curriculum that extend students' understanding. There also will be a few students who consistently demonstrate a deep understanding of all the mathematical concepts of their grade level, and may need to be advanced. Beginning in Grade 4, there will be access to a *compacted curriculum* for students who demonstrate this need.

COURSES THAT LEAD TO COLLEGE AND CAREER READINESS

THE CURRICULUM 2.0 (C2.0) MATHEMATICS program develops a deep understanding of mathematics by building a strong foundation of number sense at the elementary level before moving into more advanced content. The chart below shows the course options available to students that will prepare them for success in college and careers. Students who are successful in the grade-level content, as represented in the main series in the chart, will be able to reach Algebra 1 by Grade 8 and an Advanced Placement course, such as AP Calculus, in high school. The kindergarten through Grade 6 mathematics program contains acceleration and enrichment options that challenge students beyond the CCSS. The few students who demonstrate exceptional proficiency, as defined by UCARE (understanding, computing, applying, reasoning, and engaging),

may be ready to work in a compacted course, starting in Grade 4 (second line in graphic below). Students who need support in the grade-level course may need to work in other courses in middle school, such as C2.0 Math 7 and C2.0 Math 8 (third line in graphic below). Students taking these classes will still be on a trajectory for Algebra 2 and higher-level math that prepares them for college. It is anticipated that these courses will phase out over time as more students reach proficiency in grade-level standards.

New minimum qualifications for admission to University System of Maryland colleges and universities include completion of Algebra 2 or a significant mathematics course with advanced content during senior year.

Elementary						Middle			High			
K	1	2	3	4	5	6	7	8	9	10	11	12
C2.0 Math K*	C2.0 Math 1*	C2.0 Math 2*	C2.0 Math 3*	C2.0 Math 4*	C2.0 Math 5*	C2.0 Math 6*	C2.0 I.M.**	C2.0 Algebra 1	C2.0 Geometry	C2.0 Algebra 2	C2.0 Pre-Calculus	AP***
				C2.0 4/5	C2.0 5/6	C2.0 I.M.**	C2.0 Alg. 1	C2.0 Geom.	C2.0 Alg. 2	C2.0 Pre-Cal.	AP***	AP***
							C2.0 Math 7	C2.0 Math 8	C2.0 Alg. 1	C2.0 Geom.	C2.0 Alg. 2	C2.0 Pre-Cal.

* Including MCPS enrichment and acceleration opportunities
 ** Investigations in Math

*** Advanced Placement Calculus, Advanced Placement Statistics, or other college-level courses

ROLL-OUT PLAN

	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017
C2.0 Kindergarten–Math 3					
C2.0 Math 4					
C2.0 Math 5					
C2.0 Math 6					
C2.0 Math 7 & C2.0 I.M.					
C2.0 Math 8					
C2.0 Algebra 1					
C2.0 Geometry					
C2.0 Algebra 2					
C2.0 Pre-Calculus					

Shading identifies years of implementation.

MCPS DESIGNED THE CURRICULUM 2.0 mathematics roll-out to provide a smooth transition for students and to ensure that they are ready for the CCSS. The shading in the chart to the left shows the year that new courses will be introduced. It is important to note that students who are currently in an accelerated pathway of previous courses will stay in that pathway until they reach Algebra 1. Once in Algebra 1, they will begin the C2.0 Algebra 1 course and continue forward from that point in Curriculum 2.0 courses. Students entering C2.0 Algebra 1 will be well prepared if they are successful in the previous course.

GLOSSARY OF TERMS

■ How Do I Support My Child in Math?

You can help your child do well in mathematics by establishing a positive attitude toward mathematics in your home. Be sure to communicate to your child that mathematics is simply another way to communicate about the world, just like another language. Looking for opportunities to talk about math in ways that make sense is important in the early years. As your child progresses through the grade levels, be sure to communicate with his or her teacher to see how you can help at home. Expect your child to solve problems in multiple ways, not just using the algorithm or procedure you may have learned. Clear communication between teachers and parents is an important part of ensuring your child's success in math.

MCPS provides parent resources for each grade level or course. To access these resources, contact your child's teacher or visit these sites:

www.montgomeryschoolsmd.org/curriculum/2.0/

www.montgomeryschoolsmd.org/curriculum/math/



ROCKVILLE, MARYLAND

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ACCELERATION

Moving a student more rapidly to the next appropriate concept when that student has already demonstrated consistently strong proficiency in all five strands of UCARE for previous concepts.

COMMON CORE STATE STANDARDS

Standards are the list of what students should know and be able to do. The Common Core State Standards (CCSS) are a set of standards developed by a consortium of 48 states to put the United States on a competitive footing with other nations. Maryland adopted the CCSS in 2010.

COMPACTED CURRICULUM

An entire curriculum taught in the same sequence, but in a shorter time span. For example, compacting Math 4, Math 5, and Math 6 into two years, as Math 4/5 in Grade 4 and Math 5/6 in Grade 5.

ENRICHMENT

Learning opportunities that provide greater depth, application, and complexity to better prepare students for the study of advanced mathematics.

PROFICIENCY

The MCPS standard for reaching a deep understanding of mathematics concepts, as defined by UCARE. For example, a student who is proficient in mathematics can complete a procedure, and explain how the procedure works and why the procedure is the most efficient way to solve a problem.

STANDARDS FOR MATHEMATICAL PRACTICE

The Standards for Mathematical Practice (SMP) are a set of eight processes that describe what a student who has a deep understanding of mathematics can do. The SMP are part of the CCSS and are included in MCPS Curriculum 2.0.

UCARE

The five intertwined strands that define mathematical proficiency are understanding, computing, applying, reasoning, and engaging in mathematics.