

Saucon Valley School District Math Pathways

In order to align students for mathematical success, it is imperative to have an effective process for placing students on the appropriate trajectory for mathematics instruction through the middle school level. In concert with the placement process, is the requirement for all students to master key concepts and practices in order to develop and utilize their mathematical competence. This thinking provides the foundation for the necessary confidence and academic prowess our students will need as they continue in future mathematics study. Therefore, our goal is to find the mathematical “sweet spot” for our learners including the provision for students to move fluidly and flexibly between courses when appropriate.

It is understood that the learning needs of Saucon Valley students are varied, yet unique. To support these needs, Mathematical Pathways have been created for the following five purposes:

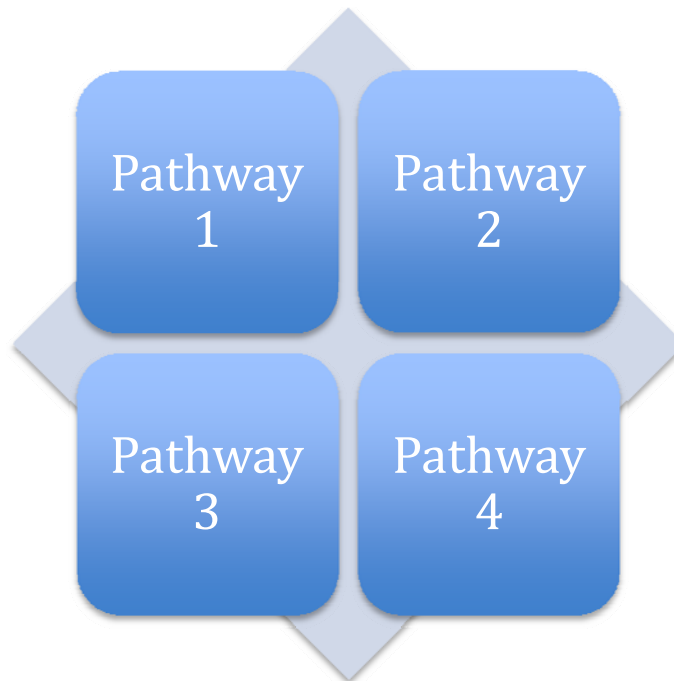
1. To clearly define data driven benchmarks and criteria for placement into math courses that will maximize foundational learning and decrease potential learning gaps.
2. To provide clear and transparent communication to teachers, students and parents regarding best instructional placement options for students.
3. To support and monitor student transitions into appropriate pathways enhancing the achievement of mathematical standards.
4. To utilize cross-grade placement options for elementary to middle and middle to high school level classes when appropriate and necessary to meet student needs.
5. To emphasize mathematical enrichment and remediation at all levels to the maximum extent possible for all students.

The Development of the Middle School Math Pathways

The Math Curriculum Renewal Team, including Middle School math teachers, the math instructional coach and building and central office administrators met during Phase 1 of the Curriculum Renewal Process to analyze the current curriculum and instructional pathways. The team carefully designed new pathways for Middle School students and these recommendations were presented to all Middle School Math teachers for their feedback. After gathering input from stakeholders, the new math pathways were presented to Dr. Butler, Superintendent of Schools and the Board of School Directors. The development of the new math pathways was handled with care to ensure the needs of all students would be met through the continuity of the Pennsylvania Department of Education mathematics learning progression.

Four Mathematical Pathways

1. *Pathway 1*----Algebra 1 in 9th grade
2. *Pathway 2*----Algebra 1 in 8th grade
3. *Pathway 3*----Option for Algebra 1 in 7th grade for students who have been identified based upon mathematical and academic need.
4. *Pathway 4*----Option for Algebra 2 in 8th grade for students who have been identified based upon mathematical and academic need.



As initial course planning begins, a Core Math 5, 6, 7, or 8 Grade Course will be assigned to each student based on an internal staff review of assessment data including, but not limited to PSSA, PVAAS, NWEA MAP (Measures of Academic Progress), curriculum based assessments, student mathematical work samples as course appropriate, prior course grades and teacher recommendation. Students demonstrating a need for enrichment may complete additional content in one academic year, (PA Core 6/7 and PA Core 7/8), at the designated accelerator points. To be enrolled in an Algebra 1 course, students must demonstrate proficiency in PA Core Academic Standards and the Standards of Mathematical Practice as identified in the previous end of year assessments and readiness testing.
(Pre Algebra concepts are purposely embedded in **ALL** PA Core 5, 6, 7 and 8 courses.)

The Pathways Beyond Middle School

In order to serve all students, the Saucon Valley School District seeks to provide multiple pathways for students to complete mathematics courses preparing them for college and career options. These pathways allow for flexible, student movement based upon instructional needs.

Students who pursue Pathway 1 through Middle School and then continue through Algebra 1, Geometry and Algebra 2 will have the opportunity to complete Algebra 3 or Pre-Calculus in High School and be ready to pursue college-level math courses after graduation. Students on Pathway 1 are working at grade level. Separate interventions and classes are available to meet the needs of students who require further instruction.

Pathways 2 and 3 are for students who will continue through Algebra 1, Geometry and Algebra 2 with an eye on an Honors or an Advanced Placement course load in their High School years. For those students who meet requirements for and pursue Pathway 4 through Middle School and complete Pre-Calculus as freshmen or sophomores, there is an opportunity to take additional higher level math courses such as AP Calculus, AP Statistics and/or AP Computer Science in the junior and senior years of High School.

Pathway Requests/Acceleration Requests

Student placement into a course pathway for which they are not adequately prepared can have unsuccessful results. According to Wu, (2012), "Learning the mathematics prescribed by CCSS-M requires that all students including those most accomplished in mathematics, rise to the challenge by spending the time to learn each topic with diligence and dedication. Skimming over existing materials in order to rush ahead to more advanced topics will no longer be considered good practice." When accelerated pathways are considered, it is recommended that students be prepared to meet a supplemental requirement for PA Core Math 8 content. This requirement may call for students to work independently, outside of regularly scheduled classroom instruction to master content that may have been compacted during the acceleration process.

Students will continue with the next math course in their Pathway sequence when moving upward from grade 5. However, 6th grade students who earn consistently high scores on both classroom and standardized assessments, classroom performance and show strong proficiency with the Standards of Mathematical Practices may be good candidates to accelerate to an alternative Pathway including Algebra 1 for identified 7th grade students.

COMMON CORE AND PA COMMON CORE STATE STANDARDS FOR MATH

Pennsylvania is one of forty-three states that adopted the Common Core and subsequent PA Core State Standards to provide clarity and specificity to mathematics instruction, in terms of both content and practice. For Kindergarten through Eighth grade, there are standards defined around mathematical domains at each grade level. For High School mathematics, the standards are organized by conceptual themes (number and quantity, algebra, functions, modeling, geometry, and statistics and probability). To access the Common Core State Standards for Math visit: www.corestandards.org/Math/.

In addition to the content standards, there are Eight Mathematical Practice Standards that address “processes and proficiencies” tied to developing competencies in mathematics. These mathematical practices span all grade levels and emphasize proficiencies in problem solving, reasoning, communication and strategic competence that should be developed in all students.

The Standards for Mathematical Practice are as follows:

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

(Source: http://www.corestandards.org/wp-content/uploads/Math_Standards.pdf, retrieved 3/5/15)

Math Grades 5, 6, 7, 8 (sequence of courses)

Courses are assigned to students based on an internal staff review of assessment data including, but not limited to PSSA, PVAAS, NWEA MAP (Measures of Academic Progress), curriculum based assessments, student mathematical portfolios and work samples as course appropriate, prior course grades and teacher recommendation. Students demonstrating a need for further enrichment may complete additional content in one academic year at the designated accelerator points in 6th or 7th grade. This content may be combined and completed in one academic year (August-June). It is highly recommended students be proficient in PA Core Standards prior to enrollment during the subsequent school year in the Algebra 1 course.

PA CORE 5

In Grade 5, instructional time will focus on three critical areas: (1) developing fluency with addition and subtraction of fractions, and developing understanding of the multiplication of fractions and of division of fractions in limited cases (unit fractions divided by whole numbers and whole numbers divided by unit fractions); (2) extending division to 2-digit divisors, integrating decimal fractions into the place value system, and developing understanding of whole number operations with decimals to hundredths, and developing fluency with whole number and decimal operations; and (3) developing understanding of volume.

PA CORE ENRICHED 5

This course focuses on five critical areas of mathematics: (1) Numbers and Operations in Base Ten; (2) Numbers and Operations- Fractions; (3) Operations and Algebraic Thinking; (4) Geometry; (5) Measurement and Data

Number and Operations in Base Ten

Students will demonstrate a depth of understanding of all operations involving multi-digit whole numbers and decimals through use of concrete models/drawings, understanding of place value, properties, and relationships. All operations will be applied to real world situations.

Number and Operations- Fractions

Students will develop fluency with addition and subtraction of fractions, develop an understanding of multiplication of fractions and mixed numbers, and divide fractions/ mixed numbers/ whole numbers by fractions/mixed numbers/ whole numbers. All operations will be applied to real world situations.

Operations and Algebraic Thinking

Students will write and interpret numerical expressions, which include parentheses, brackets, and/or braces, and apply the expressions to real-world situations. In addition, students will generate numerical patterns using given rules and analyze relationships between corresponding terms.

Geometry

Students will graph points on a coordinate plane (first quadrant) to solve mathematical and real world problems. Students will extend graphing to plotting ordered pairs in all four quadrants of the coordinate plane. In addition, students will analyze and classify 2-dimensional figures into categories based on their properties.

Measurement and Data

Students will convert units within a given measurement system (customary and metric). Students will interpret, analyze, and graph data resulting from measurement in order to solve multi-step real world problems. Finally, students will demonstrate understanding of volume of 3-dimensional figures.

Students will develop an in-depth understanding of all skills and will work extensively with real-world application.

PA CORE 6

Instruction will focus on five critical areas of mathematics: Number System, Algebraic Concepts, Ratios and Proportions, Geometry, Data Analysis. Students will be computing fluently with decimal values, following the order of operations, and applying greatest common factor and least common multiples to solve a variety of real-world and mathematical problems. Students will apply and extend their understanding of operations with fractions to include dividing fractions by fractions. Students expand their scope of numbers to include integers. They will locate rational numbers on a number line, compare and order integers and graph points in all four quadrants of the coordinate plane. They will write algebraic expressions with variables and apply the properties of operations to generate equivalent expressions. Students will solve one-step algebraic equations and inequalities, represent real world situations using equations and inequalities and represent and analyze quantitative relationships between dependent and independent variables. Sixth-grade students will develop an understanding of the concept of a ratio and use ratio reasoning to solve a variety of real-world problems, including those involving unit rate, percent problems and measurement conversions. They will build upon the foundation of area to determine area and volume of more complex shapes. Students begin to think statistically as they display, analyze and summarize numerical data sets by quantitative measures of center and variability. They will analyze data through multiple visual representations, including dot plots, box and whisker plots and histograms.

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histograms. Students will develop an in-depth understanding of the skills and will work extensively with real-world application.

PA CORE 6/7

Instruction will focus on five critical areas of mathematics: Number System, Algebraic Concepts, Ratios and Proportions, Geometry, Data Analysis. Students will be computing fluently with decimal values in real world situations, following the order of operations, understanding and using the properties of numbers, and applying greatest common factor and least common multiples to solve a variety of real-world and mathematical problems. Students expand their scope of numbers to include integers. They will locate rational numbers on a number line, compare and order integers, graph points in all four quadrants of the coordinate plane, and use integers to solve real-world application problems. They will write algebraic expressions with variables and apply the properties of operations to generate equivalent expressions. Students will solve multi-step algebraic equations and inequalities and represent and analyze quantitative relationships between dependent and independent variables. Students will develop an understanding of the concept of a ratio and use ratio reasoning to solve a variety of real-world problems, including those involving unit rate, percent problems and measurement conversions. They will be problem solving through the application of proportional relationships. Students will be calculating area of two-dimensional shapes and complex figures, working with scale drawings and informal geometric constructions, and solving problems involving measurement, surface area, and volume. Students begin to think statistically as they display, analyze and summarize numerical data sets by quantitative measures of center and variability. Students will analyze data through multiple visual representations, including dot plots, box and whisker plots, and histograms. They will be working with the statistical data as they draw inferences about populations based upon samples and make comparisons about different data sets.

PA CORE 7

The PA Core 7 course provides students with a challenging curriculum that is aligned to the Pennsylvania Core Standards for Mathematics. Within this course, the PA Core 7 will focus on four critical areas of mathematics: number and operations, algebraic concepts, geometry, and measurement, data and probability.

In the first area, students will apply and extend previous understandings of operations with fractions to operations with rational numbers, analyze proportional relationships and use them to model and solve real-world and mathematical problems.

In the second area, the students will apply properties of operations to generate equivalent expressions, and model/solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphic representations.

In the third area, students will visualize and represent geometric figures and describe the relationships between them, as well as solve real-world and

mathematical problems involving angle measures, area, surface area, circumference and volume.

In the final area of study, students will draw inferences about populations based on random sampling, draw informal comparative inferences about two populations, and investigate the change processes and develop, use, and evaluate probability models.

PA CORE 7/8

PA Core 7/8 provides students with a challenging curriculum that is aligned to the Pennsylvania Core Standards for Mathematics. At this accelerated level, students will engage in rigorous study of operations using: rational and real numbers; linear equations, functions and systems of linear equations; random sampling and data distributions; probability; real-world applications of area, perimeter and circumference of two-dimensional figures, and surface area and volume of three-dimensional figures. PA Core 7/8 is a compacted course, which means that all of the content of PA Core 7 will be augmented by the content of PA Core 8 as each area of content is presented. Therefore, the curriculum moves at an accelerated pace. Opportunities are provided for students to master mathematical content and skills; develop the ability to make sense of problem situations; and build conceptual understanding that serves as the foundation for Algebra I.

PA CORE 8

PA Core 8 focuses on four critical areas of mathematics. The first is Real Numbers, in which students will study two specific subsets of real numbers known as rational and irrational numbers. Rationals and irrationals are classified, estimated, computed to both exact and estimated values, and simplified. The Pythagorean Theorem is also presented within this unit as an application of estimation and simplification. This work is done largely without the aid of a calculator.

The second area is Expressions and Equations, where students master solving linear equations as well as systems of linear equations. Significant time is spent having students translate scenarios into the language of algebra, predict future outcomes, create and compare different representations of linear patterns, and evaluate values of one variable given a value for another.

The third area of study is Geometry. Students apply their new knowledge of substitution and evaluation to both compute the volume of circular solids and to describe how different 3-D objects relate to one another. Students also use spatial thinking and transformations to describe similarity and congruence of 2-D shapes.

The final area of study is Data Displays and Analysis. Students construct and evaluate different representations of bivariate data. Students also compare and contrast data while learning to organize and display sets of data using different displays.

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Students will develop an in-depth understanding of the skills and will work extensively with real-world problems.

ALGEBRA I (from the SVHS Program of Studies)

Students will learn to think logically as they study number systems and properties, signed numbers, variables and expressions, open sentences, solving linear equations/inequalities with one variable, absolute value, exponents, scientific notation, how to construct graphs using a number line and the coordinate plane. Students will also apply critical thinking skills as they learn to solve a variety of application problems. The Algebra 1 Keystone exam will be administered at the conclusion of this course. This is a year-long class.