

PA Core Standards Instructional Framework for Math

The Pennsylvania Core Standards in Mathematics in grades K–5 lay a solid foundation in whole numbers, addition, subtraction, multiplication, division, fractions, and decimals. Taken together, these elements support a student’s ability to learn and apply more demanding math concepts and procedures. The middle school and high school standards call on students to practice applying mathematical ways of thinking to real-world issues and challenges; they prepare students to think and reason mathematically. Additionally, they set a rigorous definition of college and career readiness by demanding that students develop a depth of understanding and ability to apply mathematics to novel situations, as college students and employees regularly do. Although the standards are not a curriculum or a prescribed series of activities, the district entities uses them to develop each grade's curriculum. Each grade's curriculum addresses the PA Core Standards for Mathematical Content and Mathematical Practice. The mathematics standards define what students should understand and be able to do. Mathematical Practice Standards describe the habits of mind required to reach a level of mathematical proficiency.

Grade Level Summaries

Grade PK

Pre-Kindergarten mathematics is about (1) developing an understanding of whole numbers using concrete materials, including concepts of correspondence, counting, cardinality, and comparison; and (2) describing shapes in their environment. More learning time in Pre-Kindergarten should be devoted to developing the concept of number than to other topics.

Grade K

In Kindergarten, instructional time should focus on two critical areas: (1) representing, relating, and operating on whole numbers, initially with sets of objects; (2) describing shapes and space. More learning time in Kindergarten should be devoted to number than to other mathematical topics.

Grade 1

In Grade 1, instructional time should focus on four critical areas: (1) developing understanding of addition, subtraction, and strategies for addition and subtraction within 20; (2) developing understanding of whole number relationships and place value, including grouping in tens and ones; (3) developing understanding of linear measurement and measuring lengths as iterating length units; and (4) reasoning about attributes of, and composing and decomposing geometric shapes.

Grade 2

In Grade 2, instructional time should focus on four critical areas: (1) extending understanding of base-ten notation; (2) building fluency with addition and subtraction; (3) using standard units of measure; and (4) describing and analyzing shapes and partitioning them into equal-sized pieces (halves, quarters and thirds) while developing an understanding that the more pieces in the whole, the smaller the piece.

Grade 3

In Grade 3, instructional time should focus on five critical areas: (1) developing understanding of multiplication and division and strategies for multiplication and division within 100 (2) developing understanding of fractions, especially unit fractions (fractions with numerator 1); (3) developing understanding of the structure of rectangular arrays and of area; (4) describing and analyzing two-dimensional shapes; and (5) solving problems involving measurement and estimation of intervals of time, money, liquid volumes, masses, and lengths of objects.

Grade 4

In Grade 4, instructional time should focus on four critical areas: (1) developing understanding and fluency with multi-digit multiplication including familiarity with patterns, factors and

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multiples, and developing understanding of dividing to find quotients involving multi-digit dividends; (2) developing an understanding of fraction/decimal equivalence, addition and subtraction of fractions with like denominators, and multiplication of fractions by whole numbers; (3) understanding that geometric figures can be analyzed and classified on their properties, such as having parallel sides, perpendicular sides, particular angle measures, and symmetry; and (4) solving problems involving length, weight, liquid, mass, volume, time, area, and perimeter.

Grade 5

In grade 5, mathematics is about (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 two-digit divisors, integrating decimal fractions into the place value system and developing understanding of operations with decimals to hundredths, and developing fluency with whole number and decimal operations; and (3) developing understanding of volume.

Grade 6

In Grade 6, instructional time should focus on four critical areas: (1) connecting ratio and rate to whole number multiplication and division and using concepts of ratio and rate to solve problems; (2) completing understanding of division of fractions and extending the notion of number to the system of rational numbers, which includes negative numbers; (3) writing, interpreting, and using expressions and equations; and (4) developing understanding of statistical thinking.

Grade 7

In Grade 7, instructional time should focus on four critical areas: (1) developing understanding of and applying proportional relationships; (2) developing understanding of operations with rational numbers and working with expressions and linear equations; (3) solving problems involving scale drawings and informal geometric constructions, and working with two- and three-dimensional shapes to solve problems involving area, surface area, and volume; and (4) drawing inferences about populations based on samples.

Grade 8

In Grade 8, instructional time should focus on three critical areas: (1) formulating and reasoning about expressions and equations, including modeling an association in bivariate data with a linear equation, and solving linear equations and systems of linear equations; (2) grasping the concept of a function and using functions to describe quantitative relationships; (3) analyzing two- and three-dimensional space and figures using distance, angle, similarity, and congruence, and understanding and applying the Pythagorean Theorem.

Algebra 1

At this level it is expected that students will formalize and expand on Algebraic concepts established in previous coursework. Students will deepen and extend their understanding of linear and exponential relationships by contrasting them with each other and by applying linear models to data that exhibit a linear trend. Students will engage in methods for analyzing, and using functions. Students will fluently move between multiple representations of functions including but not limited to linear, exponential and quadratics.

Algebra 2

Students extend their repertoire of functions to include polynomial, rational, trigonometric, and radical functions. Working closely with families of functions, students will apply their understanding of transformations. Students will model situations and solve equations including quadratics over the set of complex numbers and exponential equations using the properties of logarithms. Students will use descriptive statistics and probability as a tool for making inferences about?

Geometry

The purpose of the course is to formalize, deepen and extend students' geometric and algebraic experiences. Students will continue their work with similarity and congruence. Students explore more complex geometric concepts, and relationships, including: formal mathematical arguments, transformations, the coordinate system, right triangle trigonometry, circles and probability.