

PA Core Standards: Mathematics

The most effective and equitable way to support students in their learning is to ensure that the vast majority of time is spent engaging with grade-level content, remediating with precision and accelerating as needed. It is entirely possible to hold high expectations for all students while addressing unfinished learning in the context of grade-level work. Since time is a scarce commodity in classroom, strategic instructional and assessment choices are critical.¹

Instruction

It is vitally important that educators are supported to make deliberate instructional choices that allow all students to effectively engage with grade-level work. Instruction must be aligned to a coherent set of learning outcomes, indicating what students should know and be able to do. Dimensions for consideration when planning for instruction include the following:

- **Delivery** is differentiated relative to explicitness through modeling, systematic instruction with appropriate scaffolding and pacing, and provision of immediate corrective feedback to students with sufficient opportunities to respond.
- **Grouping** includes whole group, homogeneous small group, partners, heterogeneous mixed ability small group, independent, and one-to-one.
- **Time** varies relative to a particular area of content, small group instruction versus whole group instruction, and opportunities for students to interact or work independently.
- **Materials** should be evidence-based and adjusted to meet the needs of students and the purpose of the lesson/activity.
- **Learning Environment** must be positive and safe and have clearly defined consistent expectations.

Assessment

A highly developed assessment system includes a balanced approach to using formal and informal assessments, classroom-based evidence showing growth over time, and involving students in the evaluation of their own work. The adoption of a systemic approach enhances the use of assessment data to inform teaching and learning practices. This system should include assessment tools that are congruent with the district's goals and curriculum. Assessments can be done in sync with daily instruction through intentional activities that can collect data to support instructional goals.

This guidance document is designed to identify areas of focus in Mathematics instruction, grade by grade. Each grade level guidance document defines high level focus of instruction, supported by PA Academic Standards. Note that while all standards deserve a defined level of instruction, neglecting key concepts may result in learning gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade. Not all content in a given grade is emphasized equally in the standards. Some focus areas require greater emphasis than others based on the depth of the ideas, the time taken to master, and/or their importance to the future mathematics grade levels. More time in these areas is also necessary for students to meet the Standards for Mathematical Practice.

Highlights of Focus Work, K-12

Grade K-2: Addition and subtraction – concepts, skills, and problem solving; place value	Grade 7: Ratios and proportional relationships; arithmetic of rational numbers
Grade 3-5: Multiplication and division of whole numbers and fractions - concepts, skills, and problem solving	Grade 8: Linear Algebra and functions
Grade 6: Ratios and proportional relationships; early expressions and equations	Grade HS: Course specific content area work

For additional support and resources, contact PDE or your local Intermediate Unit.

The resources listed below are provided as options and examples. Pennsylvania does not require, recommend, or endorse any specific program or product. All curricular and instructional decisions are made at the local level.

¹ Adapted from 2020–21 Priority Instructional Content in English Language Arts/literacy and Mathematics, Student Achievement Partners/Achieve the Core. May 2020

GRADE 8 ACADEMIC STRATEGIES (2022)

This guidance document is designed to identify key strategies with focus on Mathematics instruction and assessment to support PA Academic Standards.
This document is in support of the PDE's [Accelerated Learning](#) information and PA Roadmap: [Focus on Effective Instruction](#).

<p>Focus of Instruction: Numbers and Operations</p> <p>Rational numbers and irrational numbers: Distinguish between rational and irrational numbers using their properties.</p>	<p>Instructional Resources</p> <p>SAS Online Resources for Instruction Mathematics Menu of Best Practices and Strategies SAS Search Standards (Assessment, Continuum of Activities, Materials & Resources) Research-Based Math Instructional Strategies Teaching Strategies for Improving Algebra Evidence-Based Specially Designed Instruction In Mathematics High School Teaching Strategies The Learning Classroom: Theory into Practice (video series)</p>
<p>Focus of Instruction: Algebraic Concepts</p> <p>Expressions: Apply concepts of integer exponents to generate equivalent expressions. Use and evaluate square roots and cube roots to represent solutions to equations. Linear equations: Analyze and describe linear relationships between two variables, using slope. Make connections between slope, lines, and linear equations. Analyze, model and solve linear equations. Analyze and solve pairs of simultaneous equations. Interpret solutions to a linear equation and systems of two linear equations. Functions: Define, interpret, and compare functions displayed algebraically, graphically, numerically in tables, or by verbal descriptions. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.</p>	
<p>Focus of Instruction: Geometry</p> <p>Geometric relationships: Use various tools to understand and apply geometric transformations to geometric figures. Apply the Pythagorean Theorem and its converse to solve mathematical problems in two and three dimensions.</p>	<p>Assessment Resources</p> <p>Pennsylvania Classroom Diagnostic Tools (CDT) Resources SAS Assessment Builder PDE's Assessment Data Protocol Process Basics on Assessments Systems FORMATIVE ASSESSMENT: 10 Key Questions Understanding Assessing Math (Short Videos) Depth of Knowledge with Karin Hess (video 23:16)</p>
<p>Focus of Instruction: Measurement, Data and Probability</p> <p>Data and distributions: Construct, analyze, and interpret bivariate data displayed in scatter plot. Identify and use linear models to describe bivariate measurement data. Use frequencies to analyze patterns of association seen in bivariate data.</p>	<p>Standards for Mathematics Practices</p> <p>PA Core Standards, Standards for Mathematical Practice Mathematical Practice Standards Implementing the Standards of Mathematical Practices</p>
<p>Classroom/Time Management</p> <p>Set high academic & behavioral expectations (students help establish guidelines). Set the tone, establish a positive environment, & build relationships. Establish procedures, routines, agenda, learning targets, & outcomes. Model ideal behavior and use humor, positive language, proximity & nonverbal communication. Encourage initiative, maintain student attention/engagement, & offer praise. Make positive phone calls and send positive notes. Rethink and arrange the class for maximum learning. Balance lecturing and facilitating and establish peer teaching/tutoring. Build classroom camaraderie with an activity, game, or tradition that is quirky, fun, and unique. Employ empathy and understand trauma-informed care.</p>	<p>Classroom/Time Management Resources</p> <p>Effective Lesson Planning, Delivery Techniques & Classroom Management Suggestions 5 Classroom Management Tips That Seem Counterintuitive Effective Classroom Management Strategies to Achieve Your Daily Goals 20 Classroom Management Strategies and Techniques 27 Classroom Management Strategies Classroom Management Strategies 5 Tips for Classroom Management in Middle and High School Classroom Management for Middle School and High School Teachers 8th Grade: Strategies to Keep Students Attentive During Class</p>