College Preparatory Mathematics (CPM) – Integrated Math Program

Alignment to Standards and District Initiatives
Program Change

Traditional Sequence to Integrated Sequence

Former Program
- Algebra 1
- Grade 8 Adv. Algebra 1
- Geometry
- Honors Geometry
- Algebra 2
- Honors Algebra 2
- Pre-Calculus
- AP Calculus

Current Program
- Integrated Math 1
- Grade 8 Adv. Integrated Math 1
- Integrated Math 2
- Honors Integrated Math 2
- Integrated Math 3
- Honors Integrated Math 3
- Pre-Calculus
- AP Calculus
Our Mission

By ensuring educational excellence, we challenge and inspire all learners to positively impact their world.
Effective teaching and learning of mathematics engages ALL students in meaningful learning through individual and collaborative experiences that emphasize both procedural fluency and conceptual understanding. These experiences engage ALL students in ways that promote their ability to make sense and reason mathematically.

We believe that there is no math “gene” and that ALL students can achieve high levels of mathematical learning. Coherent learning progressions that develop and leverage connections between mathematics and the real world are essential experiences for ALL students.
Mathematics Standards for High School

The high school standards specify the mathematics that all students should study in order to be college and career ready.

The high school standards are listed in conceptual categories:

- Number and Quantity
- Algebra
- Functions
- Modeling
- Geometry
- Statistics and Probability

Mathematical Practices

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.
Number and Quantity Overview

The Real Number System
- Extend the properties of exponents to rational exponents
- Use properties of rational and irrational numbers.

Quantities
- Reason quantitatively and use units to solve problems

The Complex Number System
- Perform arithmetic operations with complex numbers
- Represent complex numbers and their operations on the complex plane
- Use complex numbers in polynomial identities and equations

Vector and Matrix Quantities
- Represent and model with vector quantities.
- Perform operations on vectors.
- Perform operations on matrices and use matrices in applications.

Algebra Overview

Seeing Structure in Expressions
- Interpret the structure of expressions
- Write expressions in equivalent forms to solve problems

Arithmetic with Polynomials and Rational Expressions
- Perform arithmetic operations on polynomials
- Understand the relationship between zeros and factors of polynomials
- Use polynomial identities to solve problems
- Rewrite rational expressions

Creating Equations
- Create equations that describe numbers or relationships

Reasoning with Equations and Inequalities
- Understand solving equations as a process of reasoning and explain the reasoning
- Solve equations and inequalities in one variable
- Solve systems of equations
- Represent and solve equations and inequalities graphically

Functions Overview

Interpreting Functions
- Understand the concept of a function and use function notation
- Interpret functions that arise in applications in terms of the context
- Analyze functions using different representations

Building Functions
- Build a function that models a relationship between two quantities
- Build new functions from existing functions

Linear, Quadratic, and Exponential Models
- Construct and compare linear, quadratic, and exponential models and solve problems
- Interpret expressions for functions in terms of the situation they model

Trigonometric Functions
- Extend the domain of trigonometric functions using the unit circle
- Model periodic phenomena with trigonometric functions
- Prove and apply trigonometric identities
Mathematics | High School—Modeling

Modeling links classroom mathematics and statistics to everyday life, work, and decision-making. Modeling is the process of choosing and using appropriate mathematics and statistics to analyze empirical situations, to understand them better, and to improve decisions. Quantities and their relationships in physical, economic, public policy, social, and everyday situations can be modeled using mathematical and statistical methods. When making mathematical models, technology is valuable for varying assumptions, exploring consequences, and comparing predictions with data.
Construct and compare linear, quadratic, and exponential models and solve problems

1. Distinguish between situations that can be modeled with linear functions and with exponential functions.
   a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.
   b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.
   c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.

2. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).

3. Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.

4. For exponential models, express as a logarithm the solution to \( ab^c = d \) where \( a, c, \) and \( d \) are numbers and the base \( b \) is 2, 10, or \( e \); evaluate the logarithm using technology.

Interpret expressions for functions in terms of the situation they model

5. Interpret the parameters in a linear or exponential function in terms of a context.
Emerging research shows quality instructional materials impact student achievement as much as quality instruction, and are almost 40 times more cost-effective than class size reduction. However, schools, districts, and states often lack information about the quality of materials they use to guide instruction.

**EdReports.org** is an independent nonprofit that publishes free reviews of instructional materials, using an educator-designed tool that measures standards alignment, usability, and other quality criteria. The reports help districts make informed purchasing and instructional decisions that support improved student outcomes.

Districts and schools can use the reports to inform the curriculum adoption process and the effective implementation of instructional materials.
“The instructional materials reviewed for the Pearson Traditional series do not meet expectations for alignment to the CCSSM for high school. The materials do meet the expectations for allowing students to spend the majority of their time on the content from the CCSSM widely applicable as prerequisites, but they do not meet the expectations for attending to the full intent of the modeling process when applied to the modeling standards and explicitly identifying and building on knowledge from Grades 6-8 to the High School Standards.”
“The materials attend to the full intent of the mathematical content standards and also attend fully to the modeling process when applied to the modeling standards. The materials also meet the expectations for rigor and the Mathematical Practices as they reflect the balances in the Standards and help students meet the Standards’ rigorous expectations and meaningfully connect the Standards for Mathematical Content and the Standards for Mathematical Practice.”
Alignment - Algebra Standards

Comparison of Programs

Former Program
- Minimal emphasis on Standards for Mathematical Practice
- Focus on skills practice, with a single strategy on simple routine problems
- Minimal connection between multiple representations of equations (tables, graphs, situations, equations)
- Mathematical modeling not emphasized
- Lack of data analysis, probability, statistics

New Program
- Standards for Mathematical Practice incorporated into every lesson
- Emphasis placed on multiple strategies to solve problems
- Multiple representation of functions used throughout to solve problems
- Mathematical modeling presented throughout
- Thorough treatment of data analysis, probability, statistics
Alignment - Learner Profile

Birmingham Public Schools students will develop the knowledge, skills, and attributes to be future-ready.

LEARNER PROFILE: Birmingham future-ready students are . . .

Critical Thinkers, Questioners and Problem Solvers

- Critical, analytical, divergent and deep thinkers
  - Reflect
  - Promote exchange of ideas
  - Critique the ideas of others in a positive way
  - Apply multiple strategies
  - Synthesize concepts

Questioners who inquire
- Are curious and open-minded
- Question the status quo
- Follow a line of thinking
- Seek understanding
- Ask questions with real-world applications
- Develop concepts across disciplines

Problem finders and solvers
- Persevere and persist
- Seek issues that require solutions
- Anticipate potential problems
- Apply creative solutions
- Support a position

Communicators and Collaborators

Communicators effectively
- Read, write and speak skillfully
- Access information
- Generate ideas
- Listen actively and openly
- Receive feedback
- Build common vision
- Use a variety of media and methods
- Convey ideas clearly
- Address diverse audiences

Collaborators who work cooperatively
- Develop personal learning networks
- Mediate and resolve conflict positively
- Know when to lead and when to follow
- Empower others
- Build and sustain relationships
- Assume personal responsibility in group settings
- Celebrate strengths and difference in others
Comparison of Programs

Prentice Hall Mathematics Algebra I

College Preparatory Mathematics (CPM) Integrated Math

Former Program
- Follow a line of thinking
- Support a position
- Convey ideas clearly
- Seek understanding

New Program
- Critique ideas of others
- Apply multiple strategies and synthesize concepts
- Read, write, and speak skillfully
- Support reasoning with evidence
- Persevere and persist
- Transfer knowledge to new concepts
- Solve real-world problems
Alignment - 5 Dimensions

5 Dimensions of Teaching and Learning™
Instructional Framework Version 4.0

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Student Engagement</th>
<th>Curriculum &amp; Pedagogy</th>
<th>Classroom Environment &amp; Culture</th>
<th>Assessment for Student Learning</th>
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<tbody>
<tr>
<td>Learning Target</td>
<td>Intellectual Work</td>
<td>Curriculum</td>
<td>Use of Physical Environment</td>
<td>Assessment</td>
</tr>
<tr>
<td>and Teaching</td>
<td>Engagement Strategies</td>
<td>Teaching Approaches</td>
<td>Classroom Routines and Rituals</td>
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<tr>
<td>Points</td>
<td>Talk</td>
<td>and/or Strategies</td>
<td>Classroom Culture</td>
<td>Adjustments</td>
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<td></td>
<td></td>
<td>Scaffolds for Learning</td>
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## Alignment - 5 Dimensions

<table>
<thead>
<tr>
<th>Student Engagement</th>
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</table>
| Intellectual Work          | • Students’ classroom work embodies substantive intellectual engagement (reading, thinking, writing, problem-solving and meaning-making).  
                           | • Students take ownership of their learning to develop, test and refine their thinking. |
| Engagement Strategies      | • Engagement strategies capitalize on and build upon students’ academic background, life experiences, culture and language to support rigorous and culturally relevant learning.  
                           | • Engagement strategies encourage equitable and purposeful student participation and ensure that all students have access to, and are expected to participate in, learning. |
| Talk                       | • Student talk reflects discipline-specific habits of thinking and ways of communicating.  
                           | • Student talk embodies substantive and intellectual thinking. |
## Alignment - 5 Dimensions

<table>
<thead>
<tr>
<th>Subdimension</th>
<th>The Vision</th>
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</thead>
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<tr>
<td>Curriculum</td>
<td>• Instructional materials (e.g., texts, resources, etc.) and tasks are appropriately challenging and supportive for all students, are aligned with the learning target and content area standards, and are culturally and academically relevant.</td>
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<td></td>
<td>• The lesson materials and tasks are related to a larger unit and to the sequence and development of conceptual understanding over time.</td>
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<tr>
<td>Curriculum &amp; Pedagogy</td>
<td></td>
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<tr>
<td>Teaching Approaches and/or Strategies</td>
<td>• The teacher makes decisions and utilizes instructional approaches in ways that intentionally support his/her instructional purposes.</td>
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<tr>
<td></td>
<td>• Instruction reflects and is consistent with pedagogical content knowledge and is culturally responsive, in order to engage students in disciplinary habits of thinking.</td>
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<td></td>
<td>• The teacher uses different instructional strategies, based on planned and/or in-the-moment decisions, to address individual learning needs.</td>
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<tr>
<td>Scaffolds for Learning</td>
<td>• The teacher provides scaffolds for the learning task that support the development of the targeted concepts and skills and gradually releases responsibility, leading to student independence.</td>
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## Alignment - 5 Dimensions

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<th>Classroom Environment &amp; Culture</th>
<th>Use of Physical Environment</th>
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<td>• The physical arrangement of the room (e.g., meeting area, resources, student seating, etc.) is conducive to student learning.</td>
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<td>• The teacher uses the physical space of the classroom to assess student understanding and support learning (e.g., teacher moves around the room to observe and confer with students).</td>
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<td></td>
<td>• Students have access to resources in the physical environment to support learning and independence (e.g., libraries, materials, charts, technology, etc.).</td>
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<th>Classroom Routines and Rituals</th>
<th>Classroom systems and routines facilitate student responsibility, ownership and independence.</th>
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<td></td>
<td>• Available time is maximized in service of learning.</td>
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</table>

| Classroom Culture            | Classroom discourse and interactions reflect high expectations and beliefs about all students’ intellectual capabilities and create a culture of inclusivity, equity and accountability for learning. |
|-------------------------------|• Classroom norms encourage risk-taking, collaboration and respect for thinking. |
Comparison of Programs

Former Program
- Focuses on procedural understanding
- Supports learning targets/teaching points
- Teachers must substantially modify instructional approach to fit expectations:
  - Intellectual work
  - Student talk
  - Engagement strategies
  - Scaffolds for learning
  - Teaching approaches
  - Assessment for learning
  - Classroom culture/environment

New Program
- Engagement in rigorous, intellectual work
- Scaffolds for individual learning needs
- Promotes student talk between other students and with teacher
- Strong linkage between units and lessons
- Variety of real-world challenging problems
- Multiple ongoing assessment opportunities
- Research-based best instructional practice
- Student ownership of learning
Alignment - District SMART Goal

Birmingham Public Schools - District Level S.M.A.R.T Goal
Covering the 2017-2018, 2018-2019, and 2019-2020 School Years

Content Area: District Level
Results Goal: Close the Gap - Raise Achievement for All

SMART GOAL
Based on data
Specific + strategic, measurable, attainable, results-oriented, time bound

INDICATORS
Standards & objectives
Weak areas for students

MEASURE
Tools we’ll use to determine where students are now and whether they are improving

TARGET
The attainable performance level we would like to see

BPS Adopted Curriculum based on the Common Core State Standards for K-12 English Language Arts (Reading)

- Grades 3-8
- Grade 11 (Spring), Grade 9 (Spring)

NWEA MAP
- Grades K-8
- Beginning/End of Year Required

PSAT/SAT
- Grades 8-11
- Grade 8 (Spring), Grade 9 (Spring)
- Grade 10 (Spring), Grade 11 (Fall/Spring)

M-STEP
- Grades 3-8 (Spring)

BPS Adopted Curriculum based on the Common Core State Standards for K-12 Mathematics

NWEA MAP for Mathematics, PSAT/SAT, M-STEP

Grade 2: 70th Percentile NWEA
Grade 3-5: 70th Percentile NWEA, Proficient M-STEP
Grade 6-7: 70th Percentile NWEA, Proficient M-STEP
Grade 8: 70th Percentile NWEA, Proficient M-STEP, 380 PSAT
Grade 9: 410 PSAT
Grade 10: 490 PSAT
Grade 11: 510 SAT

Created: August 28, 2017 (NWEA 2015 Norms)
Alignment - District SMART Goal

Comparison of Programs

Prentice Hall Mathematics Algebra I

Former Program
- Focus on computation skills
- Not reflective of state and national assessments (PSAT, SAT, M-Step)
- Instructional approach not matched to all learner styles
- Limited capability for college and career readiness

College Preparatory Mathematics (CPM) Integrated Math

New Program
- Focus on problem solving skills
- Reflective of state and national assessments (PSAT, SAT, M-Step)
- Promotes growth and high achievement for all levels of learners
- Promotes college and career readiness
## Alignment - Former Algebra Program

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<th>Resource Match</th>
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<td>District Mission</td>
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<td>BPS Math Vision</td>
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<tr>
<td>State of Michigan Standards</td>
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<tr>
<td>Research</td>
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- = High Match
- = Some Match
- = Low/No Match
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