Grades 6, 7, and 8

CPM: Core Connections, Course 1, 2, and 3

Lesson Structure and Support

The *Core Connections* courses, for grades six through eight, are built on rich, meaningful problems and investigations that develop conceptual understanding of the mathematics and establish connections among different concepts. The lesson problems are non-routine and team-worthy, requiring strategic problem solving and collaboration. Throughout the course, students are encouraged to justify their reasoning, communicate their thinking, and generalize patterns.

In each lesson students work collaboratively in study teams on challenging problems. The teacher is continuously providing structure and direction to teams by asking questions and giving clarifying instructions. The teacher gives targeted lectures or holds whole-class discussions when appropriate. The teacher has the freedom to decide the level of structure or open-endedness of each lesson. While students are in teams, the teacher checks for understanding by questioning students' thinking and asking students to justify their solutions. Questioning is informative to both the teacher and the student as it guides the students to the learning target. At the close of each lesson, the teacher ensures that the students understand the big mathematical ideas of the lesson.

The homework in the "Review & Preview" section of each lesson includes mixed, spaced practice, and prepares students for new topics. The homework problems give students the opportunity to apply previously-learned concepts to new contexts. By solving the same types of problems in different ways, students deepen their understanding. CPM offers open access homework support at homework.cpm.org.

Course Structure

Chapters are divided into sections that are organized around core topics. Within each section, lessons include activities, challenging problems, investigations and practice problems. Teacher notes for each lesson include a "suggested lesson activity" section with ideas for lesson introduction, specific tips and strategies for lesson implementation to clearly convey core ideas, and a means for bringing the lesson to closure.

Core ideas are synthesized in "Math Notes" boxes throughout the text. These notes are placed in a purposeful fashion, often falling one or more lessons after the initial introduction of a concept. This approach allows students time to explore and build conceptual understanding of an idea before they are presented with a formal definition or an algorithm or a summary of a mathematical concept. "Math Notes" boxes include specific vocabulary, definitions and instructions about notation, and occasionally interesting extensions or real-world applications of mathematical concepts.

Learning Log reflections appear periodically at the end of lessons to allow students to synthesize what they know and identify areas that need additional explanation. Toolkits are provided as working documents in which students write Learning Logs, interact with Math Notes and create other personal reference tools.

Each chapter offers review problems in the chapter closure: typical problems that students can expect on an assessment, answers, and support for where to get help with the problem. Chapter closure also includes lists of Math Notes and Learning Logs, key vocabulary in the chapter, and an opportunity to create structured graphic organizers.

The books include "Checkpoints" that indicate to students where fluency with a skill should occur. Checkpoints offer examples with detailed explanations, in addition to practice problems with answers.

In addition, CPM provides a *Parent Guide with Extra Practice* available for free download at [cpm.org](cpm.org) or in booklet form for purchase. In addition to practice problems with answers, the *Parent Guide with Extra Practice* provides examples with detailed explanations and guidance for parents and tutors.

Each chapter comes with an assessment plan to guide teachers into choosing appropriate assessment problems. CPM provides a secure online test generator and sample tests. The Assessment Handbook contains guidance for a wide variety of assessment strategies.

Technology is used in the course to allow students to see and explore concepts after they have developed some initial conceptual understanding. Ideally, classes have access to a computer lab with computers for pairs of students to use the dynamic tools that provide students with a deeper understanding of the concepts involved. A classroom computer equipped with projection technology suffices, but does not allow students to explore individually.

Introduction and Overview

On a daily basis, students in *Core Connections, Course 1, 2, and 3* use problem-solving strategies, questioning, investigating, analyzing critically, gathering and constructing evidence, and communicating rigorous arguments justifying their thinking. Students learn in collaboration with others while sharing information, expertise, and ideas. The course helps students to develop multiple strategies to solve problems and to recognize the connections between concepts. The lessons in the course meet all of the content standards and embed the "Mathematical Practices" of the Common Core State Standards released in June 2010.

Upon completion of <mark>Core Connections, Course I</mark> (Grade 6), students should be able to:

- Collect, organize, and display data in multiple ways.
- Analyze data using measures of central tendency.
- Represent data sets using various methods and analyze how changes in data impact the representation.
- Represent and compare quantities using manipulatives, diagrams, and number expressions.
- Represent multiplication using rectangular arrays.
- Represent integers on number lines and with manipulatives.
- Make sense of multiple representations of portions (decimal, fraction, percent) and convert from one form to the other.
- Compare fractions and generate equivalent fractions.
- Recognize ratios in tables and graphs and solve corresponding problems.
- Use ratios to describe relationships with similar plane figures and other situations.
- Use models and standard algorithms for computations with fractions and decimals.
- Simplify variable expressions by combining like terms and using the Distributive Property.
- Evaluate variable expressions and solve simple equations and inequalities.
- Solve distance, rate, and time problems.

- Solve percent problems including those with discounts, interest, and tips.
- Compute area, surface area, and volume of rectangular solids.

- Represent solids using nets.

Upon completion of Core Connections, Course 2 (Grade 7), students should be able to:

- Use integers and complete operations with integers and rational numbers, including using the Order of Operations.
- Use diagrams and equal ratios to represent part-whole relationships.
- Use percents and scale factors to determine percent increase or decrease, discounts, and markups.
- Use variable expressions to represent quantities in contextual problems.
- Simplify variable expressions by combining like terms and using the Distributive Property.
- Solve linear equations, including those with fractional coefficients and those with no solutions or infinitely many solutions.
- Solve and graph one-variable inequalities.
- Compare experimental and theoretical probabilities.
- Distinguish between dependent and independent events and calculate the probability of compound independent events.
- Represent probabilities of multiple events using systemic lists, area models, or tree diagrams.
- Design, conduct, and analyze surveys.
- Collect and compare data and describe the distribution of sets of data.
- Solve distance, rate, and time problems.
- Compare ratios and calculate unit rates.
- Recognize and solve problems involving proportional relationships.
- Recognize and use the properties of similar figures and scale factors to solve problems.
- Describe angles, angle pairs, and their measures.
- Compute area and perimeter of standard and compound shapes.
- Compute the volume of a variety of solids

Upon completion of Core Connections, Course 3 (Grade 8), students should be able to:

- Represent a linear function with a graph, table, rule, and context and create any representation when provided one of the others.
- Solve systems of equations by using tables and graphs.
- Symbolically manipulate expressions to solve problems including those with fractional coefficients.
- Solve contextual word problems using multiple strategies, including making tables, looking for patterns, drawing diagrams, and creating a table of guesses to assist with writing and solving a variable equation.
- Describe various geometric transformations on a coordinate grid.
- Represent data using scatterplots and describe associations.
- Collect and analyze data and make predictions based on the trend of the data.
- Compare ratios and calculate unit rates and slope ratios.
- Analyze the slope of a line graphically, numerically, and contextually.
- Recognize and solve problems involving proportional relationships.
- Graph and analyze non-linear functions.
- Recognize and use the properties of similar figures to solve problems.
- Use the Pythagorean Theorem and its converse to solve problems in two and three dimensions.
- Use square roots and cube roots.
- Represent and simplify expressions using positive and negative exponents.
- Represent and compare large and small numbers using standard and scientific notation.
- *Perform operations with numbers represented in scientific notation.*Use the relationships between angles created by parallel lines with transversals and the Triangle Angle Sum Theorem to solve problems.
- Compute the volume of a variety of solids.

Introduction and Overview

Core Connections Integrated I is the first course in a five-year sequence of college preparatory mathematics courses that starts with Integrated I and continues through Calculus. It aims to deepen and extend student understanding built in previous courses by focusing on developing fluency with solving linear equations, inequalities, and systems. These skills are extended to solving simple exponential equations, exploring linear and exponential functions graphically, numerically, symbolically, and as sequences, and by using regression techniques to analyze the fit of models to distributions of data.

On a daily basis, students in *Core Connections Integrated I* use problem-solving strategies, questioning, investigating, analyzing critically, gathering and constructing evidence, and communicating rigorous arguments justifying their thinking. Students learn in collaboration with others while sharing information, expertise, and ideas.

The course is well balanced among procedural fluency (algorithms and basic skills), deep conceptual understanding, strategic competence (problem solving), and adaptive reasoning (extension and application). The lessons in the course meet all of the content standards, of Appendix A of the *Common Core State Standards for Mathematics.* The course embeds the CCSS Standards for Mathematical Practice as an integral part of the lessons in the course.

Key concepts addressed in Core Connections, Integrated I:

- Representations of linear, quadratic, and exponential relationships using graphs, tables, equations, and contexts.
- Symbolic manipulation of expressions in order to solve problems, such as factoring, distributing, multiplying polynomials, expanding exponential expressions, etc.
- Analysis of the slope of a line multiple ways, including graphically, numerically, contextually (as a rate of change), and algebraically.
- Solving equations and inequalities using a variety of strategies, including rewriting (such as factoring, distributing, or completing the square), undoing (such as extracting the square root or subtracting a term from both sides of an equation), and looking inside (such as determining the possible values of the argument of an absolute value expression).
- Solving systems of two equations and inequalities with two variables using a variety of strategies, both graphically and algebraically.
- Use of rigid transformations (reflection, rotation, translation) and symmetry to demonstrate congruence and develop triangle congruence theorems.
- Using coordinates to prove geometric theorems.
- Geometric constructions (with compass and straightedge).
- Simple geometric proofs (investigate patterns to make conjectures, and formally prove them).
- Representations of arithmetic and geometric sequences, including using tables, graphs, and explicit or recursive formulas.
- Use of exponential models to solve problems, and to compare to linear models.
- Use of function notation.
- Statistical analysis of two-variable data, including determining regression lines, correlation coefficients, and creating residual plots.
- The differences between association and causation, and interpretation of correlation in context.
- Comparison of distributions of one-variable data.

NOTE: Accelerated compacted course offerings are:

<u>Math 6A</u>: This course covers all of math 6 standards and the first half of grade 7 standards.

<u>Math 7A</u>: This course covers the second half of 7th grade standards and all 8th grade standards.

<u>Integrated 1</u>: Students who successfully complete these courses may be recommended for Integrated 1 in grade 8.

**This accelerated track is not for everyone. Students <u>must</u> meet all district and site requirements to be placed in an accelerated class.