New York City Scope and Sequence for CMP3

The following pages contain a high-level scope and sequence for *Connected Mathematics 3* and incorporate the State's pre- and post-standards guidance (see http://www.p12.nysed.gov/assessment/math/math-ei.html). This scope and sequence is intended to give teachers an overview of where instructional time will be spent across the year through use of *CMP3*. It provides a suggested sequence of instruction and assessments, including where NYCDOE Periodic Assessments can be used to gauge students' understanding of concepts and skills taught at benchmark moments throughout the year.

For each Unit, you will see the following:

- **Essential Ideas** The key topics of the Unit; Units are built around achieving understanding and mastery of these topics.

- **Goals** The mathematical and problem-solving goals that students should achieve for the Unit

- **Main CC Standards** The standards listed show the main content standards covered throughout the Unit. Instruction is focused on achieving a thorough knowledge of these content standards. In the case of the Standards for Mathematical Practice, all eight standards are listed for each unit because the Mathematical Practices are the foundation of the *CMP* approach. In each Unit, all eight Mathematical Practices are thoroughly integrated into the content. *CMP* is a problem-centered curriculum. Thus, the mathematical tasks or problems are the primary vehicle for student engagement with the mathematical concepts to be learned in class and in homework. The Mathematical Practices are a natural part of each *CMP* lesson as students use them to solve problems and develop mathematical understandings.

- **Fluency Goals** The key fluency expectations or examples of culminating standards for the grade

- **Assessment Opportunities** This listing highlights the assessments that ensure teachers can gauge student success on mastering the standards covered in the Unit.

Grade 8: Suggested Sequence for CMP3[1]	Suggested Instructional Time
Unit 1 Thinking With Mathematical Models: Linear and Inverse Variation	25 days
Unit 2 Growing, Growing, Growing: Exponential Functions	21 days
NYCDOE Fall Benchmark Assessment	
Unit 3 Butterflies, Pinwheels, and Wallpaper: Symmetry and Transformations	22 days
Unit 4 Say It With Symbols: Making Sense of Symbols	24 days
Unit 5 It's in the System: Systems of Linear Equations and Inequalities	19 days
NYCDOE Spring Benchmark Assessment	
State Examination	
Unit 6 Looking for Pythagoras: The Pythagorean Theorem	28 days

[1]This Scope and Sequence represents one way a school may teach the full year's content and incorporates the state's pre-post test standards. As the transition to the PARCC assessments progresses, schools may choose to make decisions around the sequence and pacing of Units that address post-test concepts prior to the state examination in consideration of the state's testing program guidance (see http://www.p12.nysed.gov/assessment/math/math-ei.html).

New York City Scope and Sequence for CMP3 Grade 8

	THINKING WITH MATHEMATICAL MODELS Linear and Inverse Variation	
Instructional Time	25 days	
Essential Ideas	• When one variable is dependent on the other, a function can model the data pattern. Functions allow you to answer questions or make predictions about a relationship. Linear relationships are functions. • Data about two variables from real-world observations or experiments can be collected and represented in graphs and tables. These representations are useful for analyzing relationships among data, including the variability of the data.	• Data may show a pattern or association between the data. Sometimes you can fit a line to data, find the equation of the line, and measure how well the line fits the data pattern. This is useful for making predictions about data points not observed. • Categorical data must be analyzed in different ways than numerical data including using 2-way tables to analyze relative frequencies.
Main Common Core Standards	Common Core Content Standards **8.EE.B.5:** Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed. **8.F.B.4:** Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two *(x, y)* values, including reading these from a table or from a graph. 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. **8.SP.A.1:** Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association. **8.SP.A.2:** Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.	Common Core Standards for Mathematical Practice **MP.1:** Make sense of problems and persevere in solving them. **MP.2:** Reason abstractly and quantitatively. **MP.3:** Construct viable arguments and critique the reasoning of others. **MP.4:** Model with mathematics. **MP.5:** Use appropriate tools strategically. **MP.6:** Attend to precision. **MP.7:** Look for and make use of structure. **MP.8:** Look for and express regularity in repeated reasoning.
Goals	• Recognize and model linear and nonlinear relationships in bivariate data.	• Characterize the strength and variability of mathematical models.
Fluency Goals*	• Solve linear equations in one variable. • Solve multistep problems posed with positive and negative rational numbers.**	• Fluently add, subtract, multiply, and divide rational numbers.**
Assessments	Check-up 1 Partner Quiz Check-up 2 Self-Assessment Unit Test	

*CMP3 develops fluency in procedural skills from a foundation of conceptual understanding, an approach that leads to long-term retention of skills and ability to apply those skills in problem solving.

**reinforcing fluency expectations from previous grades

	GROWING, GROWING, GROWING Exponential Functions	
Instructional Time	21 days	
Essential Ideas	• Situations that can be modeled by an exponential function show a multiplicative pattern in the table of data; the rate of change grows or decays by a constant factor. Tables and graphs can provide more information about a function and help solve problems. • There is often more than one way to write an equation. The ability to rewrite an equation as an equivalent relationship can be helpful when solving problems involving exponential functions and relationships.	• There are rules for working with exponential expressions. These properties of exponents are useful in writing equivalent expressions and particularly when working with values written in scientific notation.
Main Common Core Standards	Common Core Content Standards **8.EE.A.3:** Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. **8.EE.A.4:** Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology. **8.F.A.2:** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). **8.F.B.5:** Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.	Common Core Standards for Mathematical Practice **MP.1:** Make sense of problems and persevere in solving them. **MP.2:** Reason abstractly and quantitatively. **MP.3:** Construct viable arguments and critique the reasoning of others. **MP.4:** Model with mathematics. **MP.5:** Use appropriate tools strategically. **MP.6:** Attend to precision. **MP.7:** Look for and make use of structure. **MP.8:** Look for and express regularity in repeated reasoning.
Goals	• Explore problem situations in which two or more variables have a exponential relationship to each other.	• Develop understanding of equivalent exponential expressions.
Fluency Goals*	• Solve linear equations in one variable. • Fluently add, subtract, multiply, and divide rational numbers.**	
Assessments	Partner Quiz A Check-up 1 Partner Quiz B Check-up 2 Unit Project Self-Assessment Unit Test	
NYCDOE Fall Benchmark Assessment		

*CMP3 develops fluency in procedural skills from a foundation of conceptual understanding, an approach that leads to long-term retention of skills and ability to apply those skills in problem solving.

**reinforcing fluency expectations from previous grades

New York City Scope and Sequence for CMP3 *continued* Grade 8

	BUTTERFLIES, PINWHEELS, AND WALLPAPER Symmetry and Transformations	
Instructional Time	22 days	
Essential Ideas	• Various transformations affect distances and angles of figures differently. These effects help you compare figures and determine the similarity or congruence between figures. • Two shapes are congruent if a specific sequence of rigid transformations will transform one shape to the other. Two figures are similar if a specific sequence of rigid transformations and dilation will transform one shape to the other.	• Properties of transformations, congruence, and similarity can be used to solve problems about shapes and measurements.
Main Common Core Standards	Common Core Content Standards **8.G.A.1:** Verify experimentally the properties of rotations, reflections, and translations. **8.G.A.2:** Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them. **8.G.A.3:** Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. **8.G.A.4:** Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.	Common Core Standards for Mathematical Practice **MP.1:** Make sense of problems and persevere in solving them. **MP.2:** Reason abstractly and quantitatively. **MP.3:** Construct viable arguments and critique the reasoning of others. **MP.4:** Model with mathematics. **MP.5:** Use appropriate tools strategically. **MP.6:** Attend to precision. **MP.7:** Look for and make use of structure. **MP.8:** Look for and express regularity in repeated reasoning.
Goals	• Explore symmetry and methods for identifying and creating symmetric plane figures. • Understand the necessary and sufficient conditions for establishing congruence of triangles.	• Understand the necessary and sufficient conditions for establishing similarity of triangles.
Fluency Goals*	• Solve linear equations in one variable. • Analyze proportional relationships and use them to solve problems.	
Assessments	Check-up 1 Partner Quiz Check-up 2 Self-Assessment Unit Test	

*CMP3 develops fluency in procedural skills from a foundation of conceptual understanding, an approach that leads to long-term retention of skills and ability to apply those skills in problem solving.

	SAY IT WITH SYMBOLS Making Sense of Symbols	
Instructional Time	24 days	
Essential Ideas	• Algebraic equations and expressions can be used to solve problems. • Equivalence is useful when solving equations and problems. Equivalent expressions can be generated using properties of operations. Examining equivalent forms of an expression can reveal new information about the context of a problem. • Equivalent expressions can be used to develop and relate formulas for geometric shapes including volumes of cones, spheres, and cylinders.	• Equations can have one solution, no solution, or an infinite number of solutions which can be identified by examining the equation or its graph. • The underlying pattern of change in a relationship or function can be represented by a symbolic representation or equation. Different types of functions, such as linear, inverse, exponential, or quadratic, have specific characteristics in their symbolic representations.
Main Common Core Standards	**Common Core Content Standards** **8.EE.C.7:** Solve linear equations in one variable. **8.F.A.3:** Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. **8.F.B.4:** Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. 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. **8.F.B.5:** Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally. **8.G.C.9:** Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.	**Common Core Standards for Mathematical Practice** **MP.1:** Make sense of problems and persevere in solving them. **MP.2:** Reason abstractly and quantitatively. **MP.3:** Construct viable arguments and critique the reasoning of others. **MP.4:** Model with mathematics. **MP.5:** Use appropriate tools strategically. **MP.6:** Attend to precision. **MP.7:** Look for and make use of structure. **MP.8:** Look for and express regularity in repeated reasoning.
Goals	• Develop understanding of equivalent expressions and equations.	• Develop understanding of specific functions such as linear, exponential and quadratic functions.
Fluency Goals*	• Solve linear equations in one variable. • Solve problems involving volume. • Fluently add, subtract, multiply, and divide rational numbers.**	
Assessments	Check-up 1 Partner Quiz Check-up 2 Unit Project Self-Assessment Unit Test	

*CMP3 develops fluency in procedural skills from a foundation of conceptual understanding, an approach that leads to long-term retention of skills and ability to apply those skills in problem solving.

**reinforcing fluency expectations from previous grades

New York City Scope and Sequence for CMP3 *continued* Grade 8

	IT'S IN THE SYSTEM Systems of Linear Equations and Inequalities	
Instructional Time	19 days	
Essential Ideas	• A system of linear equations can be used to solve problems when two or more equations that represent constraints on the variables in a situation are identified. • The solution to a system of linear equations can be found graphically or algebraically. Analyzing the equations and the situation can help you to determine which strategy is most appropriate to apply.	• The strategies for solving linear equations, linear inequalities and systems of linear equations can be extended to solving systems of linear inequalities.
Main Common Core Standards	Common Core Content Standards **8.EE.C.8:** Analyze and solve pairs of simultaneous linear equations.	Common Core Standards for Mathematical Practice **MP.1:** Make sense of problems and persevere in solving them. **MP.2:** Reason abstractly and quantitatively. **MP.3:** Construct viable arguments and critique the reasoning of others. **MP.4:** Model with mathematics. **MP.5:** Use appropriate tools strategically. **MP.6:** Attend to precision. **MP.7:** Look for and make use of structure. **MP.8:** Look for and express regularity in repeated reasoning.
Goals	• Develop understanding of the ways that systems of equations and inequalities can be used to model problem situations with two independent variables.	• Develop skill in using graphic and algebraic methods to solve systems of equations and inequalities.
Fluency Goals*	• Solve linear equations in one variable. • Fluently add, subtract, multiply, and divide rational numbers.**	
Assessments	Check-up 1 Partner Quiz Check-up 2 Self-Assessment Unit Test	
NYCDOE Spring Benchmark Assessment		

*CMP3 develops fluency in procedural skills from a foundation of conceptual understanding, an approach that leads to long-term retention of skills and ability to apply those skills in problem solving.

**reinforcing fluency expectations from previous grades

	LOOKING FOR PYTHAGORAS The Pythagorean Theorem	
Instructional Time	28 days	
Essential Ideas	• The relationship between a number and its square root is the same as the relationship between the area of a square and the length of its side. The relationship between a number and its cube root is the same as the relationship between the volume of a cube and the length of one of its edges. • The Pythagorean Theorem relates the areas of the squares on the sides of a right triangle to the area of the square on the hypotenuse. As a result, the Pythagorean Theorem is useful for finding the length of an unknown side of a right triangle given the length of the other two sides, finding the length of a segment joining any two points on a coordinate grid, and for writing the equation of a circle centered at the origin.	• The converse of the Pythagorean Theorem can be used to determine whether a triangle is a right triangle. • The set of real numbers is comprised of the set of rational numbers and the set of irrational numbers. Decimals that neither repeat nor terminate are called irrational numbers. You can locate irrational numbers on a number line, and work with them in the same way as with rational numbers.
Main Common Core Standards	Common Core Content Standards **8.NS.A.1:** Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number. **8.EE.A.2:** Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ *and* $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational. **8.G.B.6:** Explain a proof of the Pythagorean Theorem and its converse. **8.G.B.7:** Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. **8.G.B.8:** Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.	Common Core Standards for Mathematical Practice **MP.1:** Make sense of problems and persevere in solving them. **MP.2:** Reason abstractly and quantitatively. **MP.3:** Construct viable arguments and critique the reasoning of others. **MP.4:** Model with mathematics. **MP.5:** Use appropriate tools strategically. **MP.6:** Attend to precision. **MP.7:** Look for and make use of structure. **MP.8:** Look for and express regularity in repeated reasoning.
Goals	• Interpret square roots and cube roots of numbers by making use of their related geometric representations. • Understand and apply the Pythagorean Theorem.	• Compare numbers that can be represented as a fraction to numbers that cannot be represented as fractions and develop understanding of irrational numbers.
Fluency Goals*	• Solve linear equations in one variable. • Solve multistep problems posed with positive and negative rational numbers.**	• Fluently add, subtract, multiply, and divide rational numbers.**
Assessments	Partner Quiz A Check-up 1 Partner Quiz B	Check-up 2 Self-Assessment Unit Test

*CMP3 develops fluency in procedural skills from a foundation of conceptual understanding, an approach that leads to long-term retention of skills and ability to apply those skills in problem solving.

**reinforcing fluency expectations from previous grades