8th Grade Math Curriculum Map 2013-2014

Focus Topic 1 — Graphing Proportional Relationships Including Similar Triangles & Unit Rates
(3 Weeks)

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.*

Learning Target(s):
- I can graph proportional relationships.
- I can compare two different proportional relationships represented in different ways.
- I can interpret the unit rate of a proportional relationship as the slope of a graph.

8.EE.B.6 – Use similar triangles to explain why the slope *m* is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at *b*.

Learning Target(s):
- I can write an equation of the form $y=mx$ for a line through the origin.
- I can write an equation of the form $y=mx + b$ for a line intercepting the vertical axis at b.
- I can use similar triangles to explain why the slope is the same between two distinct points on a non-vertical line in the coordinate plane.

Vocabulary: constant of proportionality (unit rate), percent error, percent of decrease, percent of increase, proportion, proportional relationship, similar triangles, simple interest

Instructional Notes:
- In order to meet this standard students will need to understand that a proportional relationship is when a graph is linear and goes through the origin. Teachers need to be intentional about graphing proportional relationships. (8.EE.B.5)

Instructional Resources:
- Formative Assessment Lessons for Mathematics: http://map.mathshell.org/materials/lessons.php
- Formative Assessment Tasks for Mathematics: http://map.mathshell.org/materials/tasks.php
- Illustrative Mathematics: http://www.illustrativemathematics.org/standards/k8
- NCTM Illuminations: http://illuminations.nctm.org/
- PARCC: http://www.parcconline.org/mcf/mathematics/parcc-model-content-frameworks-browser
- Inside Mathematics: http://insidemathematics.org/index.php/mathematical-content-standards
- New York State: http://www.engageny.org/mathematics.

Assessment Notes:

- The Focus Topic will have 3 multiple choice questions on the proficiency assessment.
- The Foundation Topic will have 3 multiple choice questions on the proficiency assessment.
- Foundational standards should be formatively assessed early in the cycle to identify foundational gaps of students.

Focus Topic 2 — Solving Linear Equations in 1 Variable
(3 Weeks)

8.EE.C.7 – Solve linear equations in one variable.

a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$, $a = a$, or $a = b$ results (where a and b are different numbers).

Learning Target(s):

● I can give an example of a linear equation which has one solution by transforming into an equivalent equation of the form $x = a$.
● I can give an example of a linear equation which has no solution by transforming into an equivalent equation of the form $a = b$.
● I can give an example of a linear equation which has infinitely many solutions by transforming into an equivalent equation of the form $a = a$.

b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

Learning Target(s):

● I can solve linear equations with rational number coefficients.
● I can solve linear equations whose solutions require expanding expressions using the distributive property.
● I can analyze and solve pairs of simultaneous linear equations.
● I can solve linear equations whose solutions require collecting like terms.

Instructional Resources:

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Assessment Notes:

● The Focus Topic will have 3 multiple choice questions on the proficiency assessment.
●The Focus Topic will have 1 short answer on the proficiency assessment, and it will be on the no-calculator portion of the assessment.
● The Foundation Topic will have 3 multiple choice questions on the proficiency assessment, and some of the multiple choice questions will be on the no-calculator portion of the assessment.
● Foundational standards should be formatively assessed early in the cycle to identify foundational gaps of students.

Focus Topic 3 — Define, Compare, Evaluate, and Construct Linear Functions
(2 Weeks)

8.F.A.1 – Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.
Learning Target(s):
● I can define a function as a rule that assigns to each input exactly one output.
● I can identify a graph of a function with a set of ordered pairs consisting of an input and the corresponding output.

8.F.A.2 – Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.*
Learning Target(s):
● I can compare properties of two functions represented in different ways (algebraically, graphically, numerically, and verbally).

Vocabulary: function, input, output, rule
Instructional Notes:
● Function notation is not required in Grade 8. (8.F.A.1)

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Assessment Notes:
● The Focus Topic will have 3 multiple choice questions and 1 extended response on the proficiency assessment.

Focus Topic 4 —Define, Compare, and Evaluate Non-Linear Functions
(2 Weeks)

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. *For example, the function $A = s^2$ giving the area of a square as a function of its side length is not linear because its graph contains the points (1, 1), (2, 4) and (3, 9), which are not on a straight line.*

Learning Target(s):
- I can identify that a linear function, when graphed, is a straight line.
- I can interpret $y = mx + b$ as the equation of a linear function.
- I can give examples of functions that are not linear functions.

Vocabulary: linear function, non-linear

Instructional Notes:
- In giving examples of functions that are not linear, types of functions other than quadratic ones should be discussed, especially exponential. (8.F.A.3)

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Assessment Notes:
- The Focus Topic will have 3 multiple choice questions on the proficiency assessment.

Focus Topic 5 — Model and Analyze Function Relationships
(4 Weeks)

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.
Learning Target(s):
● I can determine the rate of change and initial value from two (*x, y*) values.
● I can determine the rate of change and initial value from a description of a relationship.
● I can determine the rate of change and initial value from values in a table and a graph.
● I can construct a function to model a linear relationship between two quantities.
● I can interpret the rate of change and initial value of a linear function in terms of the situation, graph or 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.
Learning Target(s):
● I can analyze a graph and describe in words the functional relationship between two quantities.
● I can sketch a graph given a verbal description of its qualitative features.

8.SP.A.1 (Supporting Standard) – 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.
Learning Target(s):
● I can describe clusters and outliers in patterns of data.
● I can describe positive or negative associations in patterns of data.
● I can describe linear and non linear associations in patterns of data.
● I can construct scatter plots for bivariate measurement data.
● I can interpret scatter plots for bivariate measurement data for patterns between two quantities.

8.SP.A.2 (Supporting Standard) – 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.
Learning Target(s):
● I can use a straight line to model relationships between two quantitative variables.
● I can informally fit a straight line within the plotted data that suggests a linear association.
● I can informally assess the closeness of the data points to the straight line.

8.SP.A.3 (Supporting Standard) – Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. *For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.*

Learning Target(s):
● I can use a linear model to interpret the slope and y-intercept.
● I can solve problems using the equation of a linear model.

8.SP.A.4 (Supporting Standard) – Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two- way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. *For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?*
Learning Target(s):
● I can identify patterns of association in bivariate categorical data using frequencies and relative frequencies.
● I can construct display bivariate categorical data in a two-way table.
● I can interpret and summarize data represented in a two-way table using relative frequencies.

Vocabulary: association, bivariate categorical data, bivariate measurement data, cluster, frequency, function, initial value, linear, non-linear, model fit, outlier, rate of change, relative frequency, scatter plot
Instructional Notes:
● Supporting standards do not have to be directly incorporated into instruction for all students, but for students that have mastered the focus and foundational standards, supporting standards should be incorporated.
● For students in the Advanced Program, supporting standards are to be incorporated into instruction within the time frame allowed for the Focus Topic.

Instructional Resources:
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Assessment Notes:
● The Focus Topic will have 3 multiple choice questions on the proficiency assessment.
● The Focus Topic will have 1 short answer on the proficiency assessment, and it will be on the no-calculator portion of the assessment.
● Supporting standards will not be directly assessed on proficiency assessments.

Focus Topic 6 — Solving Systems of Equations
(2 Weeks)

8.EE.C.7 – Solve linear equations in one variable.
a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$, $a = a$, or $a = b$ results (where a and b are different numbers).

Learning Target(s):
● I can give an example of a linear equation which has one solution by transforming into an equivalent equation of the form $x = a$.
● I can give an example of a linear equation which has no solution by transforming into an equivalent equation of the form $a = b$.
● I can give an example of a linear equation which has infinitely many solutions by transforming into an equivalent equation of the form $a = a$.

b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

Learning Target(s):
● I can solve linear equations with rational number coefficients.
● I can solve linear equations whose solutions require expanding expressions using the distributive property.
● I can analyze and solve pairs of simultaneous linear equations.
● I can solve linear equations whose solutions require collecting like terms.

8.EE.C.8 – Analyze and solve pairs of simultaneous linear equations.
a. Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.

Learning Target(s):
● I can identify the solution(s) to a system of two linear equations in two variables as the point(s) of intersection of their graphs.
● I can describe the point(s) of intersection between two linear equations as points which satisfy both equations simultaneously.

b. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. *For example, $3x + 2y = 5$ and $3x + 2y = 6$ have no solution because $3x + 2y$ cannot simultaneously be 5 and 6.*

Learning Target(s):
● I can solve a system of two linear equations with two variables algebraically.
● I can solve simple cases of systems of two linear equations in two variables by inspection.
● I can estimate the points of intersection for a system of two equations with two variables by graphing the equations.

c. Solve real-world and mathematical problems leading to two linear equations in two variables. *For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.*

Learning Target(s):
● I can solve real-world problems which result in two linear equations with two variables.

Vocabulary: simultaneous equations, system of equations
Instructional Notes:
● With this Focus Topic, instruction should focus on 8.EE.C.8, and review of 8.EE.C.7 is in support of solving systems of equations.

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Assessment Notes:
● The Focus Topic will have 3 multiple choice questions and 1 extended response on the proficiency

Focus Topic 7 — Pythagorean Theorem
(3 Weeks)

8.G.B.6 – Explain a proof of the Pythagorean Theorem and its converse.
Learning Target(s):
● I can define the Pythagorean Theorem.
● I can explain a proof of the Pythagorean Theorem.
● I can explain a proof of the converse of the Pythagorean Theorem.

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.
Learning Target(s):
● I can apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two dimensions.
● I can apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in three dimensions.

8.G.B.8 – Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.
Learning Target(s):
● I can determine how to create a right triangle from two points on a coordinate graph.
● I can apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

Vocabulary: converse, coordinate system, proof, Pythagorean Theorem

Instructional Notes:
● For 8.G.B.6, instruction should include a typical theorem proof and a converse proof with students explaining why these two proofs are mathematically sound.

Instructional Resources:
● Formative Assessment Lessons for Mathematics: http://map.mathshell.org/materials/lessons.php
● Formative Assessment Tasks for Mathematics: http://map.mathshell.org/materials/tasks.php
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Assessment Notes:
● The Focus Topic will have 3 multiple choice questions and 1 short answer on the proficiency assessment.

Focus Topic 8 — Transformations: Describe the Effect Using Coordinates

(3 Weeks)

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.

Learning Target(s):

● I can justify that a two-dimensional figure is congruent to another if the second can be obtained by a sequence of transformations.
● I can describe the sequence of rotations, reflections, and translations that exhibits the congruence between two two-dimensional figures.

8.G.A.3 – Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.

Learning Target(s):

● I can describe the effects of dilations on two-dimensional figures using coordinates.
● I can describe the effects of translations on two-dimensional figures using coordinates.
● I can describe the effects of rotations on two-dimensional figures using coordinates.
● I can describe the effects of reflections on two-dimensional figures using coordinates.

8.G.A.1 (Supporting Standard) – Verify experimentally the properties of rotations, reflections, and translations:

a. Lines are taken to lines, and line segments to line segments of the same length.

Learning Target(s):

● I can use physical models, transparencies or geometry software to verify properties of lines and line segments in transformations (rotation, reflections, or translations).
● I can describe and explain how lines are mapped to lines in a transformation using definitions and properties of transformations.
● I can describe and explain how line segments are mapped to line segments in a transformation using definitions and properties of transformations.

b. Angles are taken to angles of the same measure.

Learning Target(s):

● I can use physical models, transparencies or geometry software to verify properties of angles in transformations (rotation, reflections, or translations).
● I can describe and explain how angles are mapped to angles of the same measure in a transformation using definitions and properties of transformations.

c. Parallel lines are taken to parallel lines.

Learning Target(s):
● I can use physical models, transparencies or geometry software to verify properties of parallel lines in transformations (rotation, reflections, or translations).
● I can describe and explain how parallel lines are mapped to parallel lines in a transformation using definitions and properties of transformations.

Vocabulary: angle, congruent, dilation, line, line segment, parallel lines, reflection, rotation, transformation, translation, two-dimensional

Instructional Notes:
● For 8.G.A.1c, an example that could be included in instruction is how parallel lines stay parallel when a rectangle is transformed.
● Supporting standards do not have to be directly incorporated into instruction for all students, but for students that have mastered the focus and foundational standards, supporting standards should be incorporated.
● For students in the Advanced Program, supporting standards are to be incorporated into instruction within the time frame allowed for the Focus Topic.

Instructional Resources:
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Assessment Notes:
● The Focus Topic will have 3 multiple choice questions on the proficiency assessment.
● Supporting standards will not be directly assessed on proficiency assessments.

Focus Topic 9 — Transformations: Congruence/Similarity After a Sequence of Transformations

(2 Weeks)

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.

Learning Target(s):

● I can justify that a two-dimensional figure is similar to another if the second can be obtained by a sequence of transformations.

● I can describe the sequence of transformations that exhibit the similarity between two two-dimensional figures using words and/ or symbols.

8.G.A.5 – Use informal arguments to establish facts about the angle sum and exterior angles of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. *For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so*.

Learning Target(s):

● I can use informal arguments to establish facts about the interior angle sum of a triangle (i.e. the sum of the interior angles equals 180˚).

● I can use informal arguments to establish facts about the exterior angles of a triangle (i.e. they are equal to the sum of the two remote interior angles).

● I can use the Angle-Angle Criterion to prove similarity among triangles.

● I can use informal arguments to establish facts about angles (alternate interior, alternate exterior, corresponding, vertical, adjacent, etc.) created when parallel lines are cut by a transversal.

Vocabulary: adjacent, alternate exterior, alternate interior, congruence, corresponding, dilation, exterior angle, interior angle, reflection, rotation, transformation, translation, transversal, two-dimensional, vertical

Instructional Notes:

● For 8.G.A.4, instructional strategies should include an emphasis that congruent figures are also similar where there is a dilation between them with a scale factor of 1 (coherent connection to 8.G.A.2).

Instructional Resources:

● Formative Assessment Lessons for Mathematics: http://map.mathshell.org/materials/lessons.php

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Assessment Notes:

● The Focus Topic will have 3 multiple choice questions and 1 extended response on the proficiency assessment.

Focus Topic 10 — Generate Equivalent Expressions with Integer Exponents
(3 Weeks)

8.EE.A.1 – Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example, $3^2 \times 3^{-5} = 3^{-3} = (1/3)^3 = 1/27$.

Learning Target(s):
● I can explain the properties of integer exponents to generate equivalent numerical expressions.
● I can apply the properties of integer exponents to generate equivalent numerical expressions.

8.EE.A.3 (Supporting Standard) – 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. *For example, estimate the population of the United States as 3 times 10^8 and the population of the world as 7 times 10^9, and determine that the world population is more than 20 times larger*.

Learning Target(s):
● I can use numbers expressed as a single digit times an integer power of 10 to estimate very large and/or small quantities.
● I can use numbers expressed as a single digit times an integer power of 10 to express how many times more or less one number is than the other.

8.EE.A.4 (Supporting Standard) – 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.
Learning Target(s):
● I can perform operations using numbers expressed in both decimal and scientific notations.
● I can use scientific notation to express very large and very small quantities.
● I can interpret scientific notation that has been generated by a calculator.
● I can choose appropriate units of measure when using scientific notation.

Vocabulary: equivalent expressions, exponent, properties of exponents, scientific notation
Instructional Notes:
● Supporting standards do not have to be directly incorporated into instruction for all students, but for students that have mastered the focus and foundational standards, supporting standards should be incorporated.
● For students in the Advanced Program, supporting standards are to be incorporated into instruction within the time frame allowed for the Focus Topic.

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Assessment Notes:
- The Focus Topic will have 3 multiple choice questions and 1 short answer on the proficiency assessment.
- Supporting standards will not be directly assessed on proficiency assessments.

Focus Topic 11 — Evaluate Expressions with Square and Cube Root Symbols
(3 Weeks)

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 √2 is irrational.

Learning Target(s):
- I can use a square root symbol to represent solutions to equations of the form $x^2 = p$.
- I can use a cube root symbol to represent solutions to equations of the form $x^3 = p$.
- I can evaluate square roots of small perfect squares.
- I can evaluate cube roots of small perfect cubes.
- I can identify √2 as an irrational number.

8.NS.A.2 – Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π^2). *For example, by truncating the decimal expansion of √2, show that √2 is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations*.

Learning Target(s):
- I can approximate an irrational number with a rational approximation.
- I can approximately locate irrational numbers on a number line.
- I can estimate the value of expressions involving irrational numbers using rational approximations.
- I can compare the size of irrational numbers using rational approximations.

8.NS.A.1 (Supporting Standard) – 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.

Learning Target(s):
- I can define irrational numbers.
- I can demonstrate that the decimal expansion of rational numbers repeats eventually.
- I can convert a decimal expansion which repeats into a rational number.
- I can generalize that every number has a decimal expansion.

Vocabulary: cube root, decimal expansion, irrational number, number line diagram, perfect cube, perfect square, radical, rational number, repeating decimal, square root, terminating decimal

Instructional Notes:
- For 8.NS.A.1, instruction must intentionally include approximation of irrational numbers as rational numbers and, especially, make connections to repeating and terminating decimals.
- Supporting standards do not have to be directly incorporated into instruction for all students, but for

students that have mastered the focus and foundational standards, supporting standards should be incorporated.
● For students in the Advanced Program, supporting standards are to be incorporated into instruction within the time frame allowed for the Focus Topic.

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● PARCC: http://www.parcconline.org/mcf/mathematics/parcc-model-content-frameworks-browser
● Inside Mathematics: http://insidemathematics.org/index.php/mathematical-content-standards
● New York State: http://www.engageny.org/mathematics

Assessment Notes:
● The Focus Topic will have 3 multiple choice questions on the proficiency assessment.
● Supporting standards will not be directly assessed on proficiency assessments

Focus Topic 12 — Volume
(2 Weeks)

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.

Learning Target(s):
● I can recall and apply the formula for volume of cones to solve real-world and mathematical problems.
● I can recall and apply the formula for volume of cylinders to solve real-world and mathematical problems.
● I can recall and apply the formula for volume of spheres to solve real-world and mathematical problems.
● I can determine and apply the appropriate cone, cylinder, and sphere volume formula in order to solve real-world and mathematical problems.

Vocabulary: cone, cylinder, formula, sphere

Instructional Notes:
For 8.G.C.9 (and throughout the KCAS standards), mathematical problems refer to problems that do not have a context whereas real-world problems do have a context.

Instructional Resources:
● Formative Assessment Lessons for Mathematics: http://map.mathshell.org/materials/lessons.php
● Formative Assessment Tasks for Mathematics: http://map.mathshell.org/materials/tasks.php
● Illustrative Mathematics: http://www.illustrativemathematics.org/standards/k8
● NCTM Illuminations: http://illuminations.nctm.org/
● PARCC: http://www.parcconline.org/mcf/mathematics/parcc-model-content-frameworks-browser
● Inside Mathematics: http://insidemathematics.org/index.php/mathematical-content-standards
● New York State: http://www.engageny.org/mathematics

Assessment Notes:
● The Focus Topic will have 3 multiple choice questions and 1 extended response on the proficiency assessment.