# Critical Areas for COHERENCE in Mathematics in 8th Grade

In Grade 8, instructional time should focus on **three** critical areas:

1. **Formulating and reasoning about expressions, equations, and inequalities including modeling an association in bivariate data with a linear equation, and solving linear equations and inequalities.**

   Students use linear equations to represent, analyze, and solve a variety of problems. Students recognize equations for proportions ($\frac{y}{x} = m$ *or* $y = mx$) as special linear equations ($y = mx + b$), understanding that the constant of proportionality (m) is the slope, and the graphs are lines through the origin. They understand that the slope (m) of a line is a constant rate of change shifting from an informal approach of counting rise over run to the meaningful use of a formula for slope. . Students also use a linear equation to describe the association between two quantities in bivariate data (such as arm span vs. height for students in a classroom). At this grade, fitting the model, and assessing its fit to the data are done informally. Interpreting the model in the context of the data requires students to express a relationship between the two quantities in question and to interpret components of the relationship (such as slope and y-intercept) in terms of the situation.

   Students strategically choose and efficiently implement procedures to solve linear equations and inequalities in one variable, understanding that when they use the properties of equality and the concept of logical equivalence, they maintain the solutions of the original equation. Students use linear equations, linear inequalities, linear functions, and their understanding of slope of a line to analyze situations and solve problems.

2. **Grasping the concept of a function and using functions to describe quantitative relationships.**

   Students grasp the concept of a function as a rule that assigns to each input exactly one output. They understand that functions describe situations where one quantity determines another. They can translate among representations and partial representations of functions (noting that tabular and graphical representations may be partial representations), and they describe how aspects of the function are reflected in the different representations.

3. **Analyzing two- and three-dimensional space and figures using distance, angle, similarity, and congruence, and understanding and applying the Pythagorean Theorem.**

   Students use ideas about distance and angles, relationships about angles formed by intersecting lines, informal geometric constructions, and ideas about congruence and similarity to describe and analyze two-dimensional figures and to solve problems. Students learn to measure angles. They develop important ideas related to the concepts of angles, spanning a wide range of angle relationships and theorems (particularly when parallel lines are cut by a transversal), and use them to solve problems. Students understand the Pythagorean Theorem and its converse, and can explain why the Pythagorean Theorem holds true, for example, by decomposing a square in two different ways. They apply the Pythagorean Theorem to find distances between points on the coordinate plane, to find lengths, and to analyze polygons. Students complete their work on volume and surface area by exploring and generalizing volume and surface area for cone and pyramids and by solving problems involving pyramids, cones, and spheres.