Essential Learning from 8th Grade to 9th Grade

In grades six through eight, multiplication and division develop into powerful forms of ratio and proportional reasoning. The properties of operations take on prominence as arithmetic matures into algebra. The theme of quantitative relationships also becomes explicit in grades six through eight, developing into the formal notion of a function by grade eight. Meanwhile, the foundations for later courses in deductive geometry are laid in grades six through eight. The gradual development of data representations in kindergarten through grade five leads to statistics in middle school: the study of shape, center, and spread of data distributions; possible associations between two variables; and the use of sampling in making statistical decisions.

In higher mathematics courses, algebra, functions, geometry, and statistics develop with an emphasis on modeling. Students continue to take a thinking approach to algebra, learning to see and make use of structure in algebraic expressions of growing complexity (adapted from PARCC 2012). To be prepared for courses in higher mathematics, students should be able to demonstrate that they have acquired particular mathematical concepts and procedural skills by the end of grade eight. Prior to grade eight, some standards identify fluency for the grade level, but there are no explicit grade-level fluency expectations for grades seven and beyond. In grade eight, linear algebra is an instruction-al focus, and although the grade-eight standards do not specifically identify fluency expectations, students in grade eight who can fluently solve linear equations (8.EE.7) and pairs of simultaneous linear equations (8.EE.8) will be better prepared to complete courses in higher mathematics. These fluencies and the conceptual understandings that support them are foundational for work in higher mathematics. Many students have worked informally with one-variable linear equations since kindergarten. This important line of development culminates in grade eight with the solution of general one-variable linear equations, including cases with an infinite number of solutions or no solutions, as well as cases requiring algebraic manipulation using properties of operations.

It is particularly important for students in grade eight to obtain skills and understandings to work with radical and integer exponents (8.EE.1–4); understand connections between proportional relationships, lines, and linear equations (8.EE.5–6); analyze and solve linear equations and pairs of simultaneous linear equations (8.EE.7–8); and define, evaluate, and compare functions (8.F.1–3). In addition, the skills and understandings to use functions to model relationships between quantities (8.F.4–5) will better prepare students to use mathematics to model real-world problems in higher mathematics.