NATIONAL COUNCIL OF TEACHERS OF MATHEMATICS

Algebra: What, When, and for Whom

A Position of the National Council of Teachers of Mathematics

Question

What is algebra, when should it be taught, and to whom?

Algebra is a way of thinking and a set of concepts and skills that enable students to generalize, model, and analyze mathematical situations. Algebra provides a systematic way to investigate relationships, helping to describe, organize, and understand the world. Although learning to use algebra makes students powerful problem solvers, these important concepts and skills take time to develop. Its development begins early and should be a focus of mathematics instruction from pre-K through grade 12. Knowing algebra opens doors and expands opportunities, instilling a broad range of mathematical ideas that are useful in many professions and careers. *All* students should have access to algebra and support for learning it.

Algebra is more than a set of procedures for manipulating symbols.

Algebra provides a way to explore, analyze, and represent mathematical concepts and ideas. It can describe relationships that are purely mathematical or ones that arise in real-world phenomena and are modeled by algebraic expressions. Learning algebra helps students make connections in varied mathematical representations, mathematics topics, and disciplines that rely on mathematical relationships. Algebra offers a way to generalize mathematical ideas and relationships, which can then be applied in a wide variety of mathematical and nonmathematical settings.

Algebraic concepts and skills should be a focus across the pre-K–12 curriculum.

The development of algebraic concepts and skills does not occur within a single course or academic year. An understanding of algebra as a topic, a course of study, and a collection of mathematical understandings develops over time, and students must encounter algebraic ideas across the pre-K–12 curriculum. At the elementary level, teachers should help students develop fluency with numbers, identify relationships, and use a variety of representations to describe and generalize patterns and solve equations. Secondary school teachers should help students move from verbal descriptions of relationships to proficiency in the language of functions and skill in generalizing numerical relationships expressed by symbolic representations. Teachers should also help students develop skills in the strategic use of a range of technological tools, including graphing calculators, spreadsheets, statistical software, and computer algebra systems. Because knowing algebra is essential in a wide variety of careers and professions, students should have the guidance of highly qualified teachers as they learn algebra.

Algebra When Ready

Only when students exhibit demonstrable success with prerequisite skills—not at a prescribed grade level—should they focus explicitly and extensively on algebra, whether in a course titled Algebra 1 or within an integrated mathematics curriculum. Exposing students to such coursework before they are ready often leads to frustration, failure, and negative attitudes toward mathematics and learning.

All students should have opportunities to develop algebraic reasoning.

Algebra is an important gateway to expanded opportunities. Because of the importance and power of algebra, *all* students should have opportunities to learn it. With high-quality teaching and suitable support, all students can be successful in their development and use of algebra.