



## Topic C:

# Solving and Applying Equations—Polynomial, Rational, and Radical

A-APR.D.6, A-REI.A.1, A-REI.A.2, A-REI.B.4b, A-REI.C.6, A-REI.C.7, G-GPE.A.2

<b>Focus Standard:</b>	A-APR.D.6	Rewrite simple rational expressions in different forms; write $a(x)/b(x)$ in the form $q(x) + r(x)/b(x)$ , where $a(x)$ , $b(x)$ , $q(x)$ , and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$ , using inspection, long division, or, for the more complicated examples, a computer algebra system.
	A-REI.A.1	Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.
	A-REI.A.2	Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.
	A-REI.B.4	Solve quadratic equations in one variable. <ul style="list-style-type: none"> <li>b. Solve quadratic equations by inspection (e.g., for <math>x^2 = 49</math>), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as <math>a \pm bi</math> for real numbers <math>a</math> and <math>b</math>.</li> </ul>
	A-REI.C.6	Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.
	A-REI.C.7	Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. For example, find the points of intersection between the line $y = -3x$ and the circle $x^2 + y^2 = 3$ .
	G-GPE.A.2	Derive the equation of a parabola given a focus and directrix.

**Instructional Days:** 14

- Lesson 22:** Equivalent Rational Expressions (S)<sup>1</sup>
- Lesson 23:** Comparing Rational Expressions (S)
- Lesson 24:** Multiplying and Dividing Rational Expressions (P)
- Lesson 25:** Adding and Subtracting Rational Expressions (P)
- Lesson 26:** Solving Rational Equations (P)
- Lesson 27:** Word Problems Leading to Rational Equations (P)
- Lesson 28:** A Focus on Square Roots (P)
- Lesson 29:** Solving Radical Equations (P)
- Lesson 30:** Linear Systems in Three Variables (P)
- Lesson 31:** Systems of Equations (E)
- Lesson 32:** Graphing Systems of Equations (S)
- Lesson 33:** The Definition of a Parabola (S)
- Lesson 34:** Are all Parabolas Congruent? (P)
- Lesson 35:** Are all Parabolas Similar? (S)

In Topic C, students continue to build upon the reasoning used to solve equations and their fluency in factoring polynomial expressions. In Lesson 22, students expand their understanding of the division of polynomial expressions to rewriting simple rational expressions (**A-APR.D.6**) in equivalent forms. In Lesson 23, students learn techniques for comparing rational expressions numerically, graphically, and algebraically. In Lessons 24–25, students learn to rewrite simple rational expressions by multiplying, dividing, adding, or subtracting two or more expressions. They begin to connect operations with rational numbers to operations on rational expressions. The practice of rewriting rational expressions in equivalent forms in Lessons 22–25 is carried over to solving rational equations in Lessons 26 and 27. Lesson 27 also includes working with word problems that require the use of rational equations. In Lessons 28–29, we turn to radical equations. Students learn to look for extraneous solutions to these equations as they did for rational equations.

In Lessons 30–32, students solve and graph systems of equations including systems of one linear equation and one quadratic equation and systems of two quadratic equations. Next, in Lessons 33–35, students study the definition of a parabola as they first learn to derive the equation of a parabola given a focus and a directrix and later to create the equation of the parabola in vertex form from the coordinates of the vertex and the location of either the focus or directrix. Students build upon their understanding of rotations and translations from Geometry as they learn that any given parabola is congruent to the one given by the equation  $y = ax^2$  for some value of  $a$  and that all parabolas are similar.

<sup>1</sup> Lesson Structure Key: **P**-Problem Set Lesson, **M**-Modeling Cycle Lesson, **E**-Exploration Lesson, **S**-Socratic Lesson