

# 09-Rational Expressions

Content Area: **Math**  
Course(s):  
Time Period: **Full Year**  
Length: **3-4 weeks (12-14 blocks)**  
Status: **Published**

## **General Overview, Course Description or Course Philosophy**

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In this unit, students will connect and extend concepts about polynomial operations and functions to rational expressions, equations, and functions. Students will learn what arithmetic properties can be used when simplifying rational expressions and why excluded values arise. Students will be able to identify characteristics of simple rational function graphs, such as asymptotes, and how they relate to the function itself.

## **OBJECTIVES, ESSENTIAL QUESTIONS, ENDURING UNDERSTANDINGS**

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Students will understand that:

- Algebraic and numeric procedures are interconnected and build on one another to produce a coherent whole
- Proportionality involves a relationship in which the ratio of two quantities remains constant as the corresponding values of the quantities change

Essential Questions:

- Explain why some rational expressions have excluded values (restrictions). Give an example of a rational expression that does not have any excluded values.
- Why can you divide out an expression that appears in both the numerator and denominator of a fraction?
- Why does multiplying a rational equation by its lowest common denominator eliminate the fraction?

## **CONTENT AREA STANDARDS**

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### **A.CED**

**A. Create equations that describe numbers or relationships**

### **A.REI**

**A. Understand solving equations as a process of reasoning and explain the reasoning**

## B. Solve equations and inequalities in one variable

## C. Solve systems of equations

## D. Represent and solve equations and inequalities graphically

### A.SSE

#### A. Interpret the structure of expressions

#### B. Write expressions in equivalent forms to solve problems

MA.F-IF.A.2	Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
MA.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.
MA.A-APR.D.7	Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.
MA.A-CED.A.1	Create equations and inequalities in one variable and use them to solve problems.
MA.A-REI.A.2	Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

## **RELATED STANDARDS (Technology, 21st Century Life & Careers, ELA Companion Standards are Required)**

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9.1.8.PB.3: Explain how to create budget that aligns with financial goals.

LA.K-12.NJSLSA.R7	Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.
CS.K-12.3.a	Identify complex, interdisciplinary, real-world problems that can be solved computationally.
CS.K-12.3.b	Decompose complex real-world problems into manageable sub-problems that could integrate existing solutions or procedures.
TECH.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
TECH.K-12.P.8	Use technology to enhance productivity increase collaboration and communicate effectively.

## **STUDENT LEARNING TARGETS**

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### **Declarative Knowledge**

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Students will understand that:

- Excluded values (restrictions) are determined from the denominator(s) of the original expression prior to simplifying

## **Procedural Knowledge**

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Students will be able to:

- Simplify rational expressions
- Determine excluded values
- Perform operations with algebraic fractions
- Identify the lowest common denominator of algebraic fractions
- Solve rational equations
- Write and solve rational equations based on word problems (work, mixture, percents)

## **EVIDENCE OF LEARNING**

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### **Benchmark Assessments**

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Benchmark Assessments conducted three times per year, using Pear Assessment (Standards Based Assessments)

### **Alternate Assessments**

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- Portfolios
- Verbal Assessment (instead of written)
- Multiple choice
- Modified Rubrics
- Performance Based Assessments

## **Formative Assessments**

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- Class Discussion/Exit Cards
- Homework/practice problems (assigned from textbook or various web resources, such as Khan Academy, Albert, Quizizz, or Desmos)

## **Summative Assessments**

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- Lesson quizzes
- Teacher-generated unit test
- Performance tasks

## **RESOURCES (Instructional, Supplemental, Intervention Materials)**

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### **Core Instructional Resources**

- *Algebra 1: Common Core*, Chapter 11

### **Supplemental Instructional Resources**

- [Illustrative Math Tasks](#)
- [Arlington Algebra Project \(Polynomial & Rational Functions\)](#)

## **INTERDISCIPLINARY CONNECTIONS**

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Rational equations and functions can be used to represent many real-world situations, particularly when combining workers or machines to complete a job together.

## **ACCOMMODATIONS & MODIFICATIONS FOR SUBGROUPS**

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See link to Accommodations & Modifications document in course folder.

