

Unit # 6: Rational Expressions and Applications

Content Area: **Mathematics**
Course(s): **College Prep Math 2**
Time Period: **May**
Length: **15 days**
Status: **Published**

Unit Overview

Algebraic fractions and operations with fractions and mixed expressions are thoroughly addressed in this unit. Emphasis is placed on expressing fractions in simplest form . Special attention will be paid to solving equations with fractional coefficients, solving fractional equations, simplifying complex fractions, and problem solving involving these skills.

Enduring Understandings

- A complex fraction can very easily be simplified by multiplying the numerator and denominator by the least common denominator.
- A rational function is a ratio of polynomial functions.
- You can use much of what you know about adding, subtracting, multiplying and dividing fractions to perform the same operations on rational expressions.

Essential Questions

- How can you add and subtract rational expressions?
- How can you multiply and divide rational expressions?
- How can you simplify complex algebraic fractions?
- How can you simplify rational expressions?
- How can you solve applications involving rate of work and distance, rate, and time using rational equations?
- How can you solve rational equations?

Standards / Indicators / Student Learning Objectives (SLOs):

- SWBAT find the values of the variables for which is rational expression is undefined.
- SWBAT add rational expressions having the same and different denominators .
- SWBAT distinguish between operations with rational expressions and equations with terms that are rational expressions.
- SWBAT Find reciprocals and divide rational expressions.
- SWBAT find the least common denominator for a list of fractions..
- SWBAT find the numerical value of a rational expression

- SWBAT multiply rational expressions.
- SWBAT recognize equivalent forms of rational expressions.
- SWBAT simplify a complex fraction by multiplying the numerator and denominator by the least common denominator.
- SWBAT simplify a complex fraction by writing it as a division problem.
- SWBAT solve a formula for a specified variable.
- SWBAT solve equations with rational expressions.
- SWBAT solve problems about distance, rate, and time.
- SWBAT solve problems about numbers.
- SWBAT solve problems about work.
- SWBAT subtract rational expressions.
- SWBAT write equivalent forms of rational expressions.
- SWBAT write rational expressions in lowest terms.

MA.K-12.1

Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

MA.K-12.8

Look for and express regularity in repeated reasoning.

MA.A-APR

Arithmetic with Polynomials and Rational Expressions

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation $(y - 2)/(x - 1) = 3$. Noticing the regularity in the way terms cancel when expanding $(x - 1)(x + 1)$, $(x - 1)(x^2 + x + 1)$, and $(x - 1)(x^3 + x^2 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

MA.A-APR.A

Perform arithmetic operations on polynomials

MA.A-APR.A.1

Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.

MA.A-APR.D

Rewrite rational expressions

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.

Lesson Titles

- Adding and Subtracting Rational Expressions
- Applications of Rational Expressions
- Complex Fractions
- Least Common Denominators
- Multiplying and Dividing Rational Expressions
- Solving Equations with Rational Expressions
- The Fundamental Property of Rational Expressions

Career Readiness, Life Literacies & Key Skills

WRK.K-12.P.4

Demonstrate creativity and innovation.

WRK.K-12.P.5

Utilize critical thinking to make sense of problems and persevere in solving them.

Inter-Disciplinary Connections

LA.RH.11-12.4

Determine the meaning of words and phrases as they are used in a text, including analyzing how an author uses and refines the meaning of a key term over the course of a text (e.g., how Madison defines faction in Federalist No. 10).

LA.WHST.11-12.1

Write arguments focused on discipline-specific content.

LA.WHST.11-12.2.E

Provide a concluding paragraph or section that supports the argument presented.

LA.L.11-12.3

Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.

LA.L.11-12.4

Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 11–12 reading and content, choosing flexibly from a range of strategies.

Instructional Strategies, Learning Activities, and Blooms/DOK:

- Explanation , examples, and practice adding and subtracting rational expressions having different denominators.
- Explanation , examples, and practice adding and subtracting rational expressions having the same denominators.
- Explanation , examples, and practice dividing rational expressions

- Explanation , examples, and practice finding the least common denominator for a list of fractions.
- Explanation , examples, and practice finding values of the variable for which a rational expression is undefined.
- Explanation , examples, and practice multiplying rational expressions
- Explanation , examples, and practice simplifying complex fractions by multiplying the numerator and denominator by the least common denominator.
- Explanation , examples, and practice simplifying complex fractions by writing it as a division problem.
- Explanation , examples, and practice solving equations with rational expressions.
- Explanation , examples, and practice solving word problems involving distance, rate, and time.
- Explanation , examples, and practice solving word problems involving hours worked.
- Explanation , examples, and practice writing rational expressions in lowest terms.
- Tutoring during Delsea One

Modifications

IEP and 504 Modifications

- Allowing student to correct mistakes or answer wrong questions correctly for additional credit if failed the first test (another way to re-teach material)
- Modeling and showing lots of examples
- Rewording questions so that there are not higher level vocabulary within the question
- Rewording questions so that there are not higher level vocabulary within the question B.) Less questions per page (so not visually overwhelming)

G & T Modifications

- Additional reinforcement activities soliciting a deeper understanding of curriculum.
- Creation of technology-based assessments to address the higher levels of Bloom's
- Different test items.
- Provide additional rigorous challenge problems for advanced students

At Risk Modifications

- Review, restate, reword directions
- Additional help during tutoring/Delsea One/Academic Enrichment
- Guided notes
- Hands-on Instruction
- Modeling and showing lots of examples

- Study guides
- Tutoring during Delsea One
- Visuals

Formative Assessment

- Accuplacer practice problem
- Begin the homework assignment and periodically check answers together
- Class discussions
- Graded classwork
- Graded homework
- Guided practice
- Individual practice
- Oral questioning
- Oral response
- Teacher observation
- Warm up problems - adding and subtracting rational expressions having different denominators
- Warm up problems - adding rational expressions having the same denominator
- Warm up problems - finding the least common denominator for a list of fractions
- Warm up problems - finding the numerical value of a rational expression and writing the answer in lowest terms
- Warm up problems - finding the values of the variable for which a rational expression is undefined
- Warm up problems - multiplying and dividing rational expressions
- Warm up problems - simplifying complex fractions using different methods
- Warm up problems - writing equivalent rational expressions
- Written work

Resources & Materials

- Computer Generated Warm Ups (see formative assessment section for specific topics)
- Internet worksheets (see formative assessment section for specific topics)
- Teacher made worksheets (see formative assessment section for specific topics)
- Text: Introductory Algebra (2010) (Ninth Edition)
- Warm up problems (see formative assessment section)

Technology

- Chrome book
- Internet Sources: <http://accuplacer.collegeboard.org/students>

- Math XL
- Smart Board

TECH.8.1.12.C

Communication and Collaboration: Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.

TECH.8.2.12.E

Computational Thinking: Programming: Computational thinking builds and enhances problem solving, allowing students to move beyond using knowledge to creating knowledge.