Unit #07: Rational Expressions

Content Area: **Mathematics**
Course(s): **Algebra II**
Time Period: **April**
Length: **5 weeks**
Status: **Published**

Unit Overview

Simplifying, adding, subtracting, multiplying, and dividing rational expressions are all studied in this unit. Once these skills are learned, they are used to solve equations with fractional coefficients and fractional equations

Enduring Understandings

Regardless of the method used, the answer will always come out the same.

There are three possible variations on solutions to a quadratic equation as it applies to the real number system and the complex number system.

Essential Questions

- In what situations do we find it necessary to invent something?
- Why is using a radical important instead of an approximation in real-life situations?

Standards/Indicators/Student Learning Objectives (SLOs)

Student Learning Objectives:

- SWBAT add and subtract rational expressions.
- SWBAT multiply and divide rational expressions.
- SWBAT simplify complex fractions.
- SWBAT simplify expressions involving the exponent zero and negative integral exponents.
- SWBAT simplify quotients using the laws of exponents.
- SWBAT simplify rational algebraic expressions.
- SWBAT solve equations having fractional coefficients.
- SWBAT solve rational equations.
- SWBAT use scientific notation and significant digits.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.

MA.N-RN.B	Use properties of rational and irrational numbers.
MA.N-RN.B.3	Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.
MA.N-Q.A	Reason quantitatively and use units to solve problems.
MA.N-Q.A.1	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
MA.N-Q.A.2	Define appropriate quantities for the purpose of descriptive modeling.
MA.K-12.6	Attend to precision.
MA.N-Q.A.3	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
MA.A-APR	Arithmetic with Polynomials and Rational Expressions
MA.A-APR.A	Perform arithmetic operations on polynomials
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.

Indicators

	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.
	Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.
MA.A-SSE.B.3c	Use the properties of exponents to transform expressions for exponential functions.
	Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and

	appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.
MA.F-IF.C.8b	Use the properties of exponents to interpret expressions for exponential functions.

Lesson Titles

- Complex Fractions
- Fractional Coefficients
- Operations on Rational Expressions
- Scientific Notation and Significant Digits
- Simplify Quotients Using the Laws of Exponents
- Simplify Rational Algebraic Expressions
- Solve Rational Equations
- Zero and Negative Exponents

Career Readiness, Life Literacies & Key Skills

TECH.9.4.2.CI.1	Demonstrate openness to new ideas and perspectives (e.g., 1.1.2.CR1a, 2.1.2.EH.1, 6.1.2.CivicsCM.2).
TECH.9.4.2.CI.2	Demonstrate originality and inventiveness in work (e.g., 1.3A.2CR1a).
TECH.9.4.2.CT.2	Identify possible approaches and resources to execute a plan (e.g., 1.2.2.CR1b, 8.2.2.ED.3).
TECH.9.4.2.DC.1	Explain differences between ownership and sharing of information.
TECH.9.4.2.TL.2	Create a document using a word processing application.
TECH.9.4.2.TL.3	Enter information into a spreadsheet and sort the information.

Inter-Disciplinary Connections

LA.RST.9-10.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
LA.RST.9-10.7	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
LA.WHST.9-10.1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant sufficient textual and non-textual evidence.
LA.WHST.9-10.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
LA.SL.11-12.1	Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on grades 11–12 topics, texts, and issues, building on

	others' ideas and expressing their own clearly and persuasively.
LA.SL.11-12.1.C	Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.
LA.SL.11-12.4	Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience.
LA.L.11-12.6	Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.
12.9.3.ST-SM.1	Apply science and mathematics to provide results, answers and algorithms for engineering and technological activities.
12.9.3.ST-SM.2	Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems.
STEM.9-12.9.4.12.O.2	Demonstrate mathematics knowledge and skills required to pursue the full range of postsecondary education and career opportunities.
STEM.9-12.9.4.12.O.48	Employ teamwork skills to achieve collective goals and use team members' talents effectively.

Instructional Strategies, Learning Activities, and Levels of Blooms/DOK

- Bloom's Analysis: Break the concept into parts to understand how each is related to one another
- Bloom's Application: Use knowledge gained in new ways
- Bloom's Comprehension: Make sense of what has been learned
- Bloom's Evaluation: Put new information together in an innovative way
- Bloom's Knowledge: Recall relevant knowledge from prior lessons and long-term memory
- Bloom's Synthesis: Make judgements based on a set of guidelines to create new meaning
- Intro lesson on simplifying complex fractions
- Intro lesson on simplifying rational expressions
- Intro lesson on simplifying rational expressions by adding and subtracting
- Intro lesson on simplifying rational expressions by multiplying and dividing
- Intro lesson on solving fractional equations
- Notes will be taken using Smart Notebook
- Review homework
- Review warm up
- Students will present solutions on the board
- Students will work independently on examples
- Students will work together on a worksheet
- Tutoring during Delsea One

Modifications

ELL Modifications

- Focus on domain specific vocabulary and keywords
- Offer alternate/or modify assessments
- Offer resources for specific topics in primary language (Youtube web resources)
- Provide formal and informal verbal interaction to provide practice, increase motivation, and self-monitoring
- Tutoring during Delsea One

IEP & 504 Modifications

- Allow student to correct mistakes or answer wrong questions correctly for additional credit if failed the first test (another way to re-teach material)
- Allow student to take notes in class for reinforcement but also provide a copy of completed/correct notes to study from
- Model and show lots of examples
- Reduce homework length to just those most important for review
- Tutoring during Delsea One

G & T Modifications

- Provide additional rigorous challenge problems for advanced students
- Provide rationale for thinking
- Use effective questioning techniques (focus on what's important, provide processing time, require higher order thinking)
- Utilize inquiry based learning

At Risk Modifications

- more resources/supports
- retesting
- speaking to students privately when redirecting behaviors

- testing modifications
- tutoring during Delsea One

Formative Assessment

- Exit Ticket
- Group Work
- Guided Practice
- Individual Practice
- Journal Entry
- Kahoot!
- Observation
- Oral Responses
- Poll the class to self-analyze their comfort level of the lesson
- Socrative
- Teacher Observation
- Vocabulary Review

Alternate Assessment

Performance tasks

Project-based assignments

Problem-based assignments

Presentations

Benchmark Assessment

Skills-based assessment- math practice

Summative Assessment

- Alternative Assessment
- Marking Period Assessment

- Quiz on Laws of Exponents
- Quiz on Simplifying Complex Fractions
- Quiz on Simplifying Rational Expressions
- Quiz on Solving Fractional Equations
- Unit Test on Solving Rational Expressions Using Operations

Resources & Materials

- Chromebook
- Graphing Calculator
- Promethean Board
- Smart Notebook
- Teacher generated worksheets
- Textbooks: Algebra and Trigonometry Structure and Method Book 2 (McDougal Littell), Algebra II Common Core (Pearson)

Technology

- google classroom
- http://kutasoftware.com/
- http://mathxlforschool.com/home_school.htm
- http://study.com/academy/lesson/how-to-add-and-subtract-rational-expressions.html
- http://www.tutapoint.com/resources/math/videoDetail/81
- http://www.virtualnerd.com/algebra-1/rational-expressions-functions/add-subtract/add-subtract-unlike-denominators/find-least-common-denominator-example
- https://create.kahoot.it
- https://njctl.org/
- https://quizizz.com/
- https://socrative.com/
- https://worldatlas.randmcnally.com/map
- https://www.desmos.com/
- https://www.resourceaholic.com/
- https://www.youtube.com/watch?v=g4bKGsC2IoY&feature=youtu.be
- https://www.youtube.com/watch?v=mfjRfoXt1M0&feature=youtu.be
- https://youtu.be/ehLti9Ejydo
- https://youtu.be/Q8cTFmPrSUg
- https://youtu.be/qcGQIMRCvsM
- https://youtu.be/ss1zQmLlMDk
- https://youtu.be/WbvLjmK4Kmc
- https://youtu.be/zCC5Ry1miMk

- Student 1-1 Device (chromebook)
- TI Graphing Calculator

TECH.8.1.12	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
TECH.8.1.12.A.CS1	Understand and use technology systems.
TECH.8.1.12.A.CS2	Select and use applications effectively and productively.
TECH.8.1.12.B	Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.
TECH.8.1.12.C.CS4	Contribute to project teams to produce original works or solve problems.
TECH.8.1.12.E.CS1	Plan strategies to guide inquiry.
TECH.8.1.12.E.CS4	Process data and report results.