College-Ready Lesson Plan

_____	_____Algebra II/10th grade_____	_____
Name	Course/Grade Level	Date

DOMAIN 1

Standard 1.1

Standard(s) from Instructional Guide. (List only what you plan to assess.)

Algebra II CA Standards 7.0: Students add, subtract, multiply, reduce and evaluate rational expressions with monomial and polynomial denominators and simplify complicated rational expressions, including those with negative exponents in the denominator. **

Algebra I CA Standard 13.0: Students add, subtract, multiply and divide rational expressions and functions. Students solve computationally and conceptually challenging problems by using these techniques.

College-Ready Learning Objective(s)

-Students will <u>analyze</u> rational expressions to determine common factors and simplify before <u>applying</u> mathematical operations (multiplying or dividing).

-Students will be able to <u>evaluate</u> the rational expression and <u>determine</u> the proper math skill (factoring rules, rules for multiplying/dividing fractions, exponent rules, common factors, reducing to lowest terms) needed in order to simplify/reduce complex rational expressions with monomial and polynomial denominators.

Vocabulary**

Rational Expression: an expression that can be written as a ratio (fraction) of two polynomials

where the denominator is not zero. EX) $\dfrac{x-4}{2x+5}$ Ex) $\dfrac{x^2+5x+6}{x^2-9}$

Lowest terms: A rational expression that has been simplified and has no common factors

other than 1.   EX) $\dfrac{x^2+5x+6}{x^2-9} = \dfrac{(x+3)(x+2)}{(x-3)(x+3)} = \dfrac{x+2}{x-3}$

The rational expression $\dfrac{x+2}{x-3}$ is in the **lowest terms** (simplified completely).

What makes this lesson rigorous?
- Students are being asked to <u>apply</u> multiple previously-learned skills—exponent rules, rules of multiplying and dividing fractions, extracting common factors, factoring rules, exponent rules, knowledge on simplifying and reducing to lowest terms— from previous math courses to <u>evaluate</u> and further simplify, factor, multiply and divide more complex rational numbers with monomials and polynomials denominators.
- A student who reaches mastery on this particular standard will demonstrate their mastery on the aforementioned math skills which is what is expected in higher level math courses such as Trigonometry, Pre-Calculus and Calculus but also in SAT and ACT exams.

Measurability
- Students will be assessed formatively cold calling and during gallery walk (independent practice)
- Students also know that they will be given an exit slip that will measure their mastery of the day's objective. The exit slip will be scored against a 4-point rubric scale that is used department wide. This rubric will measure students explanations- whether it demonstrates understanding of inductive reasoning as well as mathematical errors.

Exit Slip Rubric

	Advanced/ Proficient	Basic	Below Basic	Far Below Basic
Explanation (demonstrates understanding of inductive reasoning)	4 Accurately captures key ideas using all relevant content vocabulary and visuals and/or applications/connections accurately	3 Explanation mostly captures the key ideas using some content vocabulary and/or visuals and/or applications/connections accurately	2 Explanation somewhat captures the ideas and may or may not use some content vocabulary and/or visuals and/or applications/connections accurately	1 Explanation does not capture the ideas
Mathematical Errors (demonstrates correct process of what comes next)	4 All or almost all (90-100%) of the steps and solutions have no mathematical errors	3 Most (75-89%) of the steps and solutions have no mathematical errors	2 Some (60-74%) of the steps and solutions have no mathematical errors	1 More than 60% of the steps and solutions have mathematical errors

How will the students be *cognitively* engaged?
Students will be cognizant that they will evaluate rational expression and determine the proper prior math skills (factoring rules, rules for multiplying/dividing fractions, exponent rules, common factors, reducing to lowest terms) needed in order to simplify/reduce complex rational expressions with monomial and polynomial denominators.

There has been a classroom environment establish where students engage attention to a task that requires mental effort, students tend to like challenges and working together to solve those challenges. The error analysis problem given to students during the lesson will have students actively think about the lesson at hand, analyze the result and determine where the error is and reflect on why that individual might have done that error.

How will the key cognitive strategies and/or how will Bloom's higher levels of cognitions and/or the college ready academic knowledge and skills and/or academic behaviors be incorporated into the lesson?
• Students must be accurately be able to identify and determine the different skill sets learned prior to this lesson in order to accurately and simplify the rational expression

Connections to prior learning:
Students learned the computational and conceptual knowledge outlined in Standard 12 and 13 from Algebra I
Students should know how to:
• Use the properties of exponents
• Add, subtract, divide, multiply and simplify rational expressions
• Add, subtract, divide, multiply polynomials
• Factor polynomials
• Simplify rational expressions by canceling common factors in the numerator and the denominator
• Multiply and divide rational expressions with monomial and polynomial denominators
• Multiply and Divide Fractions

This standard is an extension of Standard. 12 and 13 in Algebra I. The following knowledge reflects the extension in this particular standard.
New Knowledge: ** will be seen in this particular lesson

Students will need to learn to:
- Simplify a complex rational expression by writing its numerator and its denominator as single fractions and then dividing by multiplying with the reciprocal of the denominator. **
- Simplify complex rational expressions by multiplying the numerator and the denominator by the LCD of the numerator and the denominator.
- Simplify rational expressions involving variables with negative exponents. **

Briefly explain the steps of the lesson.

This lesson is designed for a class that last 2 hour.

Teacher Action	Student Action	Time
Teacher will communicate to students today's lesson objective.		2 minutes
Lesson will begin with a 5 question warm-up. After reviewing answers to warm up, teacher will discuss that we will be incorporating the previous day's lesson on factoring and prior CAHSEE lessons on multiplying and dividing fractions and exponent rules into today's lesson. **multiplying binomials	Students will complete the warm-up written on the board. Students will recall prior knowledge from prior lessons about exponent rules, multiplying/dividing fractions, reducing to lowest terms.	5-7 minutes
I Do (Introduction to New Material) Teacher will pass out the guided notes for today's lesson. ** See guided Notes (make sure to address common misconceptions) We Do- Teacher and Students both work together in the process of simplifying rational expressions using think-aloud and modeling.	Students will actively engage in helping teacher fill out the guided notes. Notes are scaffolded. Students with the help of the teacher will begin analyzing rational expressions (identifying all prior skills necessary to simplify rational expressions). 8-10 problems	20 minutes 30 minutes
Teacher will have sample problem (common misconception) on the document reader.	Students will do a think-write-share; Think about the error and jot down on their notes what the error is and write why the individual might have done that error (Analyze, Determine and Reflect). Then pair up with partner to share their thoughts, whether they agree with one another or not. Lastly, go over it as a class.	5 mins
You Do Teachers will sit with individual students who are still struggling with factoring or on how to simplify, reduce rational expressions to lowest terms. As the teacher circulates the room, she will jot down notes on what students seem to still be struggling with and make sure to address individual student and/or entire class depending on any	Students will actively practice today's objective/lesson with gallery walk and stations. Differentiation of instruction: 1) factoring station in order to help students who are still struggling with factoring 2) exponent rules station to help students who are struggling with rules of exponents 3) Gallery walk on simplifying by multiplying and dividing rational expressions.	35 minutes

patterns that Teacher may notice.		
Review Gallery Walk/Stations- Common mistakes. Teacher will address any common pitfalls-	Students will ask questions on what they are still unclear on. Review the answers to gallery walk.	10 minutes
Exit Slip/Review of Answers after collected exit slips	Students will take exit slip (5 questions) to gauge student level of mastery of today's objective.	10 minutes

≈3 minutes of flex time

How has student data informed your selection of these objectives?
This particular standard is a high priority standard in both Algebra I and Algebra II; in Algebra I students are given 9 questions where students must show mastery of this particular standard. If students reach mastery of this standard in particular, they in turn, demonstrate mastery in previous standards such as exponent rules, factoring, simplify rational expressions, multiplying/dividing/add/subtracting fractions and rational expressions).
On Benchmark 2 for Algebra II, less than 50% of students answered Algebra II Standard 7.0 correctly. Currently, in Algebra II 72% of students are NOT proficient in Algebra II Standard 7.0 and in terms, of factoring, 43% are NOT proficient in Algebra II Standard 4.0. Given that this is a high priority standard, Algebra II teachers and I have collaboratively worked on a plan to help students reach mastery in these standards.

How will the lesson be differentiated to meet the needs of advanced learners, struggling learners, and English Learners?
During independent practice students will go on to do stations and/or gallery walk. The Gallery walk is divided by levels. Higher performing students can challenge themselves by doing Level 3 or 4 questions. Student who may still be struggling with factoring can get more practice on factoring problems first before then going on to gallery walk.
Students in the class are also paired by performance level, higher or middle performing students are paired with lower performing students in order to assist during lesson with peer tutoring. I will sit with struggling students

English Language Learners: Out of 24 students enrolled in this class, 8 students are designated ELLs (33%). Of those 8 students, 1 students is designated Early Intermediate Level (12%), 3 are Intermediate level (38%), 1 Early Advance (12%), and 3 Advance (38%).

Special Ed: Out of 24 students enrolled, 2 students have IEPs (8%). Both of these students are both ELLs and SpeD.
I will be working closely with both of these students when we break out to stations and gallery walk.

What are the prerequisite knowledge and skills needed for this lesson?
Students should know how to:
- Use the properties of exponents
- Add, subtract, divide, multiply polynomials
- Factor polynomials
- Simplify rational expressions by canceling common factors in the numerator and the denominator
- Multiply and Divide Fractions

What misconceptions do you anticipate? What strategies will you use to avoid or correct these cognitive errors?

Exponent Rules *Students always have trouble with adding variables and multiplying variables such as $x + x \neq x^2$ vs. $x \cdot x = x^2$ often, student must be reminded of all the rules of exponents*

Multiplying/Product: $a^m \cdot a^n = a^{m+n}$ → keep the base and add the exponents

Dividing/Quotient: $\dfrac{a^m}{a^n} = a^{m-n}$ → Keep the base and subtract the exponents

Power to a Power: $\left(a^m\right)^n$ → Keep the base and multiply the exponents

Factoring: *Students must also have good grasp on rules of factoring*

very important to remind students that when multiplying and dividing rational expressions we DO NOT need to find the LCD, that is only the case when we are adding and subtracting rational expressions which is next week's lesson. This lesson, students must also remember that when dividing rational expressions, similarly to when we divide fractions, 1) change the ÷ sign to a · and 2) take the reciprocal of the second fraction 3) multiply across. Remind students, you CANNOT CANNOT simplify the rational expressions first, you must take the reciprocal "flip" second fraction first, factor then simplify. KFC- Keep Flip **Change (multiply by the reciprocal)

Integer Operations/Rules- positive and negative integers
Ex. When student are factoring $x^2 - 5x + 6 \rightarrow (x - 6)(x + 1)$

** keep a look out for students trying to cancel multiplication (both numerator or both denominator)
Ex.

$$\frac{\cancel{(x+3)}\cancel{(x+3)}}{2} \cdot \frac{2x+1}{(x+3)}$$

DOMAIN 4

How will student learning be assessed during the lesson?
Students will be randomly selected to help teacher fill in the guided notes. Teacher will circulate the room while students and teachers are filling in the guided notes.

-Ruth Reyes
-Chris Valencia
-Antonina Cesareo
-Sergio Alvarado
-Omar Contreras   ← These students in particular have struggled in the past with exponent rules and factoring. Teacher will make sure to circulate the room to assist these students and/or cold-called during I do, We do
-Noemi Hernandez,
-Luis Romero
-Darlie Romero
-Ana Flores
-Arthur Bautista
-Jocelyn Orozco
-Angel Villalobos

Students will also be assessed also while teacher circulates the room asking individual students how they would tackle the individual questions given.

What misconceptions do you anticipate? What strategies will you use to avoid or correct these cognitive errors?
I will make sure to address these misconceptions by explicitly reminding students of the exponent rules, quick check on integer rules, as well as with the error analysis problem. Teacher will put error analysis problem where students must identify the error in the problem- this problem presented to student will be a problem that is a common mistake for students. Also, while students are doing stations and gallery walk, Teacher will circulate the room and ask students probing questions that will lead to overall student patterns or trends. Teacher will then demonstrate an error she noticed through conversation or observations.

How will student learning and progress be assessed <u>after the lesson</u> or <u>at the end of the unit</u>?

Exit Slips always assesses students' mastery of the objective and helps teacher determine what the next steps will be. Student data provides teacher knowledge on whether to move on with the next objective, re-teach in a different manner or review on next day's warm-up. Students know immediately whether they reach mastery or not on the lesson. Students are given unit exams to test their knowledge on retaining mastery of the objective in long-term not just short-term (day of the lesson). Teacher will often do "quick checks" in order to keep our students on their toes on all standards most recently taught and previously taught.

What is the Bloom's level of assessment?

Knowledge, Comprehension, Analysis, Synthesis, Evaluation

What opportunities will students have to reflect on and assess their own work?

-Teacher has established a culture where students have learned to work effectively as a team to support one another. Students will support and help one another through the lesson, from the warm-up, I Do, We Do, and through their active practice. They will assess their knowledge by asking teacher or one another questions, as well as working in groups comparing answers during active practice (gallery walk and/or stations).

What opportunities will students have to revise and resubmit their work?

-Students are provided multiple opportunities to demonstrate mastery given our standards-based grading school policy. Students, if they did not reach mastery on the objective are required to attend tutoring in order to practice the standard. Students must do "test corrections" where they must analyze their work, determine where their mistake lied ad provide a reflection as to what they did incorrectly and then finally do the problem correctly. Once students have practiced that particular standard, they can retest on that particular standard, however, students are not able to retest the same day they came to tutoring, Students must come back at least a day later to retest in order to demonstrate mastery. Also, a common practice is that I often cycle standards. Students will often be given a unit exam with those past 2-3 weeks standards taught as well as a previous standard to make sure students are retaining new as well as old standards.