**SUPPLEMENTAL INSTRUCTION ACTIVITY**

**TOPIC: Multiplying and Dividing Rational Expressions**

**APPLICABLE COURSES:** All math courses starting from Math 060 and other courses in other disciplines.

**LEARNING OUTCOME:** (What will students be able to do by the end of the workshop?)

After completing this workshop, students should be able to multiply and divide rational expression.

**CONTENT:** (What do students need to know to accomplish the outcome?)

1. Definition of rational expression and their simplification.

2. Multiplication and division of rational expressions.

**METHOD:** (How will the instructor deliver content? Short lecture, handouts, Powerpoint, other audio-visual presentation)

Short lecture followed by active learning exercise and worksheet (40 minutes)

* Teach 1 and Practice 1 (10 minutes)
* Teach 2 and Practice 2 (30 minutes)

The lesson is divided into segments composed of lecture and examples followed by student practice and sharing.

* First, the instructor distributes the exercise worksheet and any supporting handouts.
* Then the instructor presents segments 1(5min). After this brief lecture with examples, students individually think about how they will solve the set of problems for these segments (2 min), and then complete them (5 min). Next, in pairs, students each take a turn to explain to their partner how they solved one of the problems (3 min). At the end of this 10 minute segment, the instructor posts the solutions/answers on the screen for students to check their work.
* Follow the same lecture/practice procedure for Segments 2 .

Note: If time is short, only one student explains his/her process to the partner for each segment of the lesson, taking turns for each segment.

Next students complete a quiz where they are asked to factor trinomials. After completing the quiz, the instructor posts the solutions/answers on the screen. Students check their results.

Then they complete the self-reflection activity. The instructor can also look over the quizzes while the students are completing the self-reflection activity to give feedback to students.

**ACTIVE LEARNING STRATEGIES:** (How will students apply their knowledge? Solve a problem, create a project, analyze a case, and explain a process)

Students reflect on the exercises and teach each other by verbalizing the steps they took to reach their conclusions.

**ASSESSMENT METHOD:** (How will the instructor know that the students met the outcome? Check for understanding. )

(20 minutes.)

Students complete a quiz where they are asked to multiply and divide rational expression. After completing the quiz, the instructor posts the solutions/answers on the screen. Students check their results. The instructor can also look over the quizzes while the students are completing the self-reflection activity to give feedback to students.  
If students do not successfully complete the worksheet quiz, they may be referred to individual tutoring or a guided learning activity.

**SELF-REFLECTION ACTIVITY:** (What will the instructor do to get students to reflect on how they learned the content? What they learned, how they learned it, how they will apply it in their coursework)

(5 minutes.)

-Which segment of the multiplying and dividing rational expressions was most challenging for you?

-What steps are you going to take to learn this subject?

|  |  |
| --- | --- |
| *Multiplication and Division of Rational Expressions*  **Handout** | **Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**  **Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** |

**Objective: To study multiplication and division of rational expressions.**

**Segment 1**: Definition of rational expression and their simplification.

A **rational expression**, or algebraic fraction, is a quotient of two polynomials. Can be written in the form, where *P*  and *Q*  are polynomials and .

A rational expression is in simplest terms if the numerator and denominator do not have any common factors other than 1.

To simplify a rational expression

1. Factor the numerator and denominator completely

2. Divide out all the common factors

**Complete each statement.**

A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ expression is the quotient of two polynomials.

A rational expression is in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ if the

numerator and denominator have 1 as their only common factor.

To put a rational expression in simplest form, follow these steps:

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the numerator and denominator.

2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, or divide out, common factors.

Example1: Simplify

(a)

(b)

**Segment 2**: Multiplication and division of rational expressions.

Finding the product or quotient of rational expressions is similar to finding the product of quotient of fractions.

**Multiplying Rational Expressions**

- Factor the numerator and denominator of each rational expression, if possible. Divide out, or cancel, common factors.

- Multiply the numerators to get the numerator of the solution.

-Multiply the denominators to get the denominator of the solution.

-Simplify. Remember, try to cross out the common factors before you multiply.

**Dividing Rational Expressions**

- To divide the rational expressions, invert the devisor and multiply.

i.e. Multiply the first rational expression by the reciprocal of the second rational expression.

Example 2: Multiply or divide as indicated.

(a) (b)

(c) (d)

|  |  |
| --- | --- |
| *Multiplication and Division of Rational Expressions*  **Handout-KEY** | **Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**  **Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** |

**Objective: To study multiplication and division of rational expressions.**

**Segment 1**: Definition of rational expression and their simplification.

A **rational expression**, or algebraic fraction, is a quotient of two polynomials. Can be written in the form, where *P*  and *Q*  are polynomials and .

A rational expression is in simplest terms if the numerator and denominator do not have any common factors other than 1.

To simplify a rational expression

1. Factor the numerator and denominator completely

2. Divide out all the common factors

**Complete each statement.**

A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ expression is the quotient of two polynomials. (Rational)

A rational expression is in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ if the

numerator and denominator have 1 as their only common factor. (Simplified form)

To put a rational expression in simplest form, follow these steps:

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the numerator and denominator. (Factor)

2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, or divide out, common factors. (Cancel)

Example1: Simplify

(a) Answer:

(b) Answer:

**Segment 2**: Multiplication and division of rational expressions.

Finding the product or quotient of rational expressions is similar to finding the product of quotient of fractions.

**Multiplying Rational Expressions**

- Factor the numerator and denominator of each rational expression, if possible. Divide out, or cancel, common factors.

- Multiply the numerators to get the numerator of the solution.

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-Simplify. Remember, try to cross out the common factors before you multiply.

**Dividing Rational Expressions**

- To divide the rational expressions, invert the devisor and multiply.

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Example 2: Multiply or divide as indicated.

(a) (b)

Answer: Answer:

(c) (d)

Answer:

Answer:

**Worksheet Quiz for Multiplication and Division of Rational Expressions**

Multiply or divide as indicated:

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Worksheet Quiz for Multiplication and Division of Rational Expressions-KEY**

Multiply or divide as indicated:

1. Answer:

2. Answer:

3. Answer:

**SELF-REFLECTION ACTIVITY**

- Which segment of the multiplying and dividing rational expressions was most challenging for you?

- What steps are you going to take to learn this subject?