Title: Multiplying and Dividing Rational Expressions
Class: Math 100 or Math 107
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Instructions to tutor: Read instructions and follow all steps for each problem exactly as given. The answers are provided for you. Students will come to you to verify their answers and get assistance, after they have attempted all six problems.
Keywords/Tags: rational expressions, multiplying expressions, dividing expressions, multiply, divide

<u>**Multiplication and Division of Rational Expressions**</u>

<u>**Purpose:**</u>
This is intended to review and practice the skill of multiplying and dividing rational expressions

<u>**Activity:**</u> Work through the following activity/problems. You may use your book to help you, but do not consult a tutor until you have made valid attempts on all of the problems in this activity.

When multiplying rational expressions, remember to factor first. Then, multiply across the top and multiply across the bottom. Finally, divide out the common factors.

Example:

$$\frac{x^2-9}{2x^2-x-10} \cdot \frac{4x^2-25}{x^2+4x-21} = \frac{(x-3)(x+3)}{(2x-5)(x+2)} \cdot \frac{(2x-5)(2x+5)}{(x-3)(x+7)} \qquad \text{Factor.}$$

$$= \frac{(x-3)(2x-5)(x+3)(2x+5)}{(x-3)(2x-5)(x+2)(x+7)} \qquad \text{Multiply numerators and}$$

denominators.

$$= \frac{(x+3)(2x+5)}{(x+2)(x+7)} \qquad \text{Divide out common factors.}$$

When dividing rational expressions, we first factor. Then we must multiply by the reciprocal of the second number first. Finally, multiply and divide out common factors.

Recall: $\dfrac{2}{3} \div \dfrac{4}{5} = \dfrac{2}{3} \cdot \dfrac{5}{4} = \dfrac{10}{12} = \dfrac{2 \cdot 5}{2 \cdot 6} = \dfrac{5}{6}.$

Example 1:

$$\frac{x^2-4}{x^2+x-6} \div \frac{x^2+5x+6}{2x} = \frac{(x+2)(x-2)}{(x+3)(x-2)} \div \frac{(x+3)(x+2)}{2x} \qquad \text{Factor.}$$

$$= \frac{(x+2)(x-2)}{(x+3)(x-2)} \cdot \frac{2x}{(x+3)(x+2)} \qquad \text{Multiply by reciprocal of 2}^{\text{nd}} \text{ number.}$$

$$= \frac{(x+2)(x-2)2x}{(x+2)(x-2)(x+3)(x+3)} \qquad \text{Multiply numerators and}$$

denominators.

$$= \frac{2x}{(x+3)(x+3)} = \frac{2x}{(x+3)^2} \qquad \text{Divide out common factors.}$$

Do NOT show your work on these pages, since there is not enough room!
The tutor has the **answers**. **Check your work!**

Exercises. Perform the operations and simplify.

1. $\dfrac{-6x^4}{3x^5} \div \dfrac{(2x^2)^2}{-4}$

2. $\dfrac{3(x-1)}{y} \div \dfrac{5(x-1)^2}{2y}$

3. $\dfrac{12x+24}{36x-36} \div \dfrac{6x+12}{8x-8}$

4. $\dfrac{y^2-16}{y+3} \div \dfrac{y-4}{y^2-9}$

5. $\dfrac{4y+12}{2y-10} \div \dfrac{y^2-9}{y^2-y-20}$

6. $\dfrac{2m^2-5m-12}{m^2-10m+24} \div \dfrac{4m^2-9}{m^2-m+18}$

Review: Meet with a tutor to verify your work on this worksheet and discuss some of the areas that were more challenging for you. If necessary, choose more problems from the homework to practice and discuss with the tutor.

For tutor use: Please check the appropriate box.
- ☐ Student has completed worksheet but may need further assistance. Recommend a follow-up with instructor.
- ☐ Student has mastered topic.

Answers: For Tutor Use Only

1. $\dfrac{2}{x^5}$

2. $\dfrac{6}{5(x-1)}$

3. $\dfrac{4}{9}$

4. $(y+4)(y-3)$

5. $\dfrac{2(y+4)}{y-3}$

6. $\dfrac{m-3}{2m-3}$

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