

Lesson 34: Multiply and Divide Rational Expressions

By the end of the lesson, you will be able to:

→ fractions

~ Multiply Rational Expressions

~ Divide Rational Expressions

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The strategies for multiplying and dividing rational expressions are similar to the strategies you learned about multiplying and dividing fractions.

The main difference is that when you have a polynomial expression, you must first factor.

Lesson 34: Multiply and Divide Rational Expressions

Multiplying Rational Expressions:

1. Write all polynomials in factored form.
2. Use parentheses and write everything as one problem. (mult. straight across)
3. Check to see if any factors can be canceled before multiplying.
4. Multiply remaining factors straight across.
5. Answers may be left in factored form.

Lesson 34: Multiply and Divide Rational Expressions

Dividing Rational Expressions:

1. Write all polynomials in factored form.
2. "KFC": Keep the first fraction the same, flip the second fraction, change divide to multiply.
3. *Use parentheses and write everything as one problem.*
4. Cancel factors if possible. (This can **ONLY** be done AFTER you flip the second fraction.)
5. Multiply remaining factors straight across.
6. Answers may be left in factored form.

Lesson 34: Multiply and Divide Rational Expressions

Examples: Multiply or Divide.

$$\begin{aligned} \text{a.) } \frac{2a^4+8a^2}{a-2} \cdot \frac{b-3}{8a^3b^2+32ab^2} &= \frac{2a^2(a^2+4)}{a-2} \cdot \frac{b-3}{8ab^2(a^2+4)} \\ &= \frac{\cancel{2}a^{\cancel{2}}(\cancel{a^2+4})(b-3)}{\cancel{4}\cancel{8}a\cancel{b^2}(a-2)(\cancel{a^2+4})} = \frac{a(b-3)}{4b^2(a-2)} \end{aligned}$$

Lesson 34: Multiply and Divide Rational Expressions

Examples: Multiply or Divide.

$$\text{b.) } \frac{7a}{9b} \cdot \frac{63b^3}{35a^2} = \frac{(\cancel{7}^1 \cancel{a}^1) (\cancel{63}^7 \cancel{b}^3 \cancel{b}^2)}{(\cancel{9}^3 \cancel{b}^1) (\cancel{35}^5 \cancel{a}^2)}$$

$$= \boxed{\frac{7b^2}{5a}}$$

Lesson 34: Multiply and Divide Rational Expressions

Examples: Multiply or Divide.

$$c.) \frac{y+2}{y^2+5y} \div \frac{y^2-2y}{y^2-25} = \frac{y+2}{y(y+5)} \cdot \frac{y(y-2)}{(y-5)(y+5)}$$

$$= \frac{(y+2)}{y \cancel{(y+5)}} \cdot \frac{(y-5) \cancel{(y+5)}}{y(y-2)} = \boxed{\frac{(y+2)(y-5)}{y^2(y-2)}}$$

Lesson 34: Multiply and Divide Rational Expressions

Examples: Multiply or Divide.

$$\begin{aligned} \text{d.) } \left(\frac{2xy}{w^2}\right)^3 \div \frac{24x^2}{w^5} &= \frac{8x^3y^3}{w^6} \div \frac{24x^2}{w^5} \\ &= \frac{\cancel{8}x^{\cancel{3}}y^3}{\cancel{w^6}} \cdot \frac{\cancel{w^5}}{\cancel{24}x^{\cancel{2}}} = \boxed{\frac{xy^3}{3w}} \end{aligned}$$

Lesson 34: Multiply and Divide Rational Expressions

Examples: Multiply or Divide.

$$e.) \frac{\frac{8x^2-72}{5x+10}}{\frac{5x+10}{4x-12}} = \frac{8x^2-72}{5x+10} \cdot \frac{4x-12}{5x}$$

$$= \frac{8(x^2-9)}{5(x+2)} \cdot \frac{4(x-3)}{5x} = \frac{8(x-3)(x+3)}{5(x+2)} \cdot \frac{4(x-3)}{5x}$$

$$= \frac{\cancel{8}^2(x-3)(x+3)}{\cancel{5}(x+2)} \cdot \frac{\cancel{4}_1(x-3)}{\cancel{5}_1x} = \boxed{\frac{2x(x+3)}{(x+2)}}$$

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By the end of the lesson, you will be able to:

- ~ Multiply Rational Expressions
- ~ Divide Rational Expressions

Can you?

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Homework:

(Write out the problem and show work!)

Assignment 34