

Warm-Up

Simplify $\frac{20}{225}$

Factor

$$1. \frac{5}{9} \times \frac{4}{25} = \frac{4}{45}$$

$$3. 4x^2 + 20x + 21 = (2x+7)(2x+3)$$

$$2. \frac{16}{3} \div \frac{4}{9} = \frac{16}{3} \cdot \frac{9}{4} = 12$$

Objective

Today we will...

- Simplify Rational Expressions
- Multiply Rational Expressions
- Divide Rational Expressions

What is a Rational Expression?

A fraction whose numerator and denominator are polynomials

What can we simplify?

$$\frac{32x^4}{16x^3} \quad \cancel{2x} \quad \frac{(18a^2 - 48)}{5a} \quad \frac{x^2 + 13x + 36}{x^2 + 15x + 54}$$

$$\frac{x+2}{9x^2 + 18x}$$

$$\frac{10k^2}{4k^3 + 6k}$$

Simplifying Rational Expressions

- Factor Everything Possible
- Cross out common Terms
- Reduce if necessary

Ex.1

$$\frac{a^2 + 13a + 30}{4a^2 + 40a}$$

$$\frac{(a+10)(a+3)}{4a(a+10)} = \frac{a+3}{4a}$$

Ex. 2

$$\frac{3a^2 + 11a + 8}{7a^2 + 7a}$$

$$\frac{(3a+8)(a+1)}{7a(a+1)}$$

$$\boxed{\frac{3a+8}{7a}}$$

²⁴
^ } ||

Multiplying Rational Expressions

- Factor Everything Possible
- Multiply Straight Across
- Cross out and Simplify

*No Cross Multiplying!!

Ex. 1 Simplify.

$$\frac{k+2}{8k+16} \cdot \frac{k^2 - 7k - 8}{4k^2 + 4k}$$

$$\frac{\cancel{k+2}}{8(\cancel{k+2})} \cdot \frac{(k-8)(\cancel{k+1})}{4k(\cancel{k+1})}$$
$$\boxed{\frac{k-8}{32k}}$$

$$\text{Ex. 2} \quad \frac{4v^2}{2v-5} \cdot \frac{6v^2 - 23v + 20}{16 - 12v} \quad -(-3v+4)$$

$$\begin{array}{c} \cancel{4v^2} \\ \cancel{2v-5} \end{array} \quad \begin{array}{c} \cancel{(2v-5)(3v-4)} \\ \cancel{4(4-3v)} \end{array}$$

opposite
binomials
reduce
to
 -1

$-v^2$

Ex.3

$$\frac{(5n+1)}{1} \cdot \frac{4n}{5n^2 + 6n + 1}$$

~~$(5n+1)(n+1)$~~

$$\left[\frac{4n}{n+1} \right]$$

Dividing Rational Expressions

- Flip the second expression and switch the sign to multiplication

Ex. 1 $\frac{10n^2}{50n^2 - 10n^3} \div \frac{5}{n^2 - 3n - 10}$

$$\frac{10n^2}{50n^2 - 10n^3} \cdot \frac{n^2 - 3n - 10}{5}$$

$$\frac{\cancel{10n^2}}{\cancel{10n^2(5-n)}} \cdot \frac{(n+2)(n-5)}{5}$$

- $\frac{n+2}{5}$ or
 5 $\frac{n+2}{-5}$ or
 $\frac{-(n+2)}{5}$

Not $\frac{-n+2}{5}$

Ex. 2

$$\begin{array}{r} m^2 + 11m + 18 \\ \hline 6m^2 + 12m \\ \hline m + 9 \\ \hline 3m^2 \end{array}$$

$$\frac{m^2 + 11m + 18}{6m^2 + 12m} \cdot \frac{m+9}{3m^2}$$

$$\frac{m^2 + 11m + 18}{6m^2 + 12m} \cdot \frac{3m^2}{m+9}$$

$$\frac{(m+9)(m+2)}{2m(m+2)} \cdot \frac{m}{m+9}$$

$$\boxed{\frac{m}{2}}$$

