

# UNIT 1: RATIONAL EXPRESSIONS

## DAY 3: FACTORING REVIEW

(DAY 1 & 2 - Handouts)

Factoring is the opposite of **expanding**.

**Expanding:**

**Factoring:**

### FACTORING METHODS

#### 1. *Common Factoring*

Steps:

*Examples:*

1.  $ax + ay$

2.  $3y^2 - 6y$

3.  $7t^2 - 14t$

4.  $12x^3 - 9x^2 + 3x$

5.  $3x^2y^3 - 6xy + 9x^3y^2$

6.  $2x^2 + 4x + 3xy + 6b$

7.  $x^2(x+1) + 3x(x+1) + 5(x+1)$

## 2. Factoring by Grouping

Steps:

Examples:

1.  $ax+ay+bx+by$

2.  $6x^2+2xy-15x-5y$

3.  $3ny+2mx-2my-3nx$

4.  $6m^2n-12mn+20n^2-10mn$

## DAY 4: FACTORING REVIEW (CONTINUED)

### 3. Easy Trinomials

Factor:

Steps:

Examples:

P =

S =

1.  $x^2+7x+12$

2.  $x^2-x-6$

3.  $x^2-8x+12$

4.  $3x^2-6x-45$

5.  $4x^2-12xy-160y^2$

#### 4. *Tricky Trinomials*

Factor:

Steps:

*Examples:*

1.  $12x^2+23x+5$

2.  $6m^2+7m-3$

3.  $3y^2+22y-16$

4.  $6y^2+11r+6$

5.  $4s^2+21st+27t^2$

6.  $5x^3+11x^2+2x$

## DAY 5: FACTORING REVIEW (CONTINUED)

### 5. Difference of Squares

This method only applies when:

- 
- 
- 

Factor:  $a^2 - b^2$

Steps:

1. Square root first term
2. Square root second term
3. Put different signs in each bracket

Examples:

1.  $4x^2 - 9$

2.  $9x^2 - 25$

3.  $32x^2 - 200y^2$

4.  $81x^4 - 1$

5.  $(x+2)^2 - (y-5)^2$

6.  $25a^2 - b^2 - 4b - 4$

7.  $\frac{x^2}{16} - \frac{y^2}{36}$

## DAY 6: Simplifying Rational Expressions

Steps:

1. Factor numerator and denominator
2. State restrictions
3. Cancel, if possible

Restrictions become very important in senior math because they help to graph a function. RESTRICTIONS create **holes** or **asymptotes**.

- Restrictions only occur in the **denominator**
- Restrictions are the value of a variable that would make the denominator **zero**

Examples:

1.  $\frac{x+2}{x}$

2.  $\frac{3}{y-2}$

3.  $\frac{k}{(k-2)(k+1)}$

4.  $\frac{x}{x^2+x}$

5.  $\frac{x-4}{x^2-7x+12}$

6.  $\frac{a+b}{a-b}$

7.  $\frac{a+b}{b+a}$

8.  $\frac{a-b}{b-a}$

9.  $\frac{8x-16}{x^2-16}$

## DAY 7: Simplifying Rational Expressions (Continued)

**Rational Number:** is a number that can be written as a fraction. It is defined as any number that can be written in the form  $\frac{m}{n}$ , where **m** and **n** are integers (+ or -) and  $n \neq 0$ .

**Rational Expression:** is an algebraic expression that can be written as a quotient of two polynomials.

Recall:

1. Factor numerator and denominator
2. State restrictions
3. Cancel, if possible

Examples:

1.  $\frac{3x^2-3x^3}{x^3-x}$

2.  $\frac{x^2-x-20}{15+2x-x^2}$

3.  $\frac{m^2-n^2}{m^2+2mn+n^2}$

4.  $\frac{12x^4-8x^3-4x^2}{x^2-1}$

5.  $\frac{(p+5)+(p+1)(p+5)}{(p+5)(p+2)(2p+1)}$

6. Simplify:  $\frac{24x^2}{32x}$  State the value(s) of the variable for which the results are true.

## DAY 8: Multiplying and Dividing Rational Expressions

Recall:

1. Factor ALL numerators and denominators
2. State restrictions
3. Cancel, if possible

Examples: Calculate each **product** and write it in the simplest form.

a)  $\frac{4}{10}x \cdot \frac{7}{2}$

b)  $\frac{15}{10}x \cdot \frac{2}{6}$

c)  $\frac{5}{6}x \cdot \frac{12}{25}$

d)  $\frac{12a^2b}{15}x \cdot \frac{5ab}{8b^2}$

e)  $\frac{x+3}{5x}x \cdot \frac{10x^2}{x+3}$

Examples: Calculate the **quotient** of each and write in simplest form.

(When multiplying rational expressions you can only cancel terms if they appear in the numerator **and** the denominator).

a)  $\frac{x^2-4}{x^2-x-2}x \cdot \frac{4x+8}{(x+1)^2}$

b)  $\frac{1-3y}{2y+1}x \cdot \frac{4y^2-1}{1-9y^2}$

c)  $\frac{8x^2(y-2)}{4(y+2)}x \cdot \frac{3(y+2)}{xy}$

d)  $\frac{2x^2+5x-3}{4x^2-12x+5} \div \frac{3x^2+13x+12}{6x^2-7x-20}$



## DAY 9: Adding & Subtracting Rational Expressions

**Rational expressions** are added and subtracted the same way a rational number (fraction) is. Find a common denominator.

Steps:

1. Factor ALL numerators and denominators
2. State restrictions
3. Cancel, if possible
4. Find a common denominator
5. Add/Subtract numerator

Examples:

1. Write an expression equivalent to \_\_\_\_\_ with the following denominators.

a)  $4x$

b)  $x^2y$

c)  $x(x-3)$

2. Simplify the expression and state restrictions.

a)  $\frac{3}{x^2} + \frac{5}{x^2} - \frac{2}{x^2}$

b)  $\frac{4x-1}{x+2} - \frac{x-3}{x+2}$

c)  $\frac{3}{4x} + \frac{5}{6x^2}$

d)  $\frac{3x+2}{4} + \frac{x-4}{8} - \frac{2x-1}{6}$

e)  $\frac{5}{(x-5)} - \frac{2}{x^2-4x-5}$

## DAY 10: Adding & Subtracting Rational Expressions (Continued)

Examples: Simplify.

1.  $\frac{3}{(t-3)} - \frac{4}{3-t}$

2.  $\frac{x-5}{x-3} - \frac{x-6}{x-3}$

3.  $\frac{m}{2m-4} - \frac{3}{3m-6} + 1$

4.  $\frac{x}{x^2+2x-8} - \frac{x+2}{x^2+x-20}$