

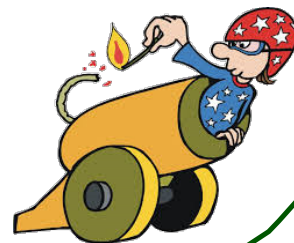
Warm Up

Express the following in simplest form:

$$\frac{3y+15}{25-y^2} \div \frac{2}{y-5}$$

$$\frac{3(\cancel{y+5})}{(\cancel{5-y})(\cancel{5+y})} \cdot \frac{\overset{(-1)}{\cancel{y-5}}}{2}$$

$$\boxed{\frac{-3}{2}}$$



## Adding/Subtracting Rational Expressions

What do we need in order to add or subtract fractions?

Common denominators

$$\frac{6x-6y}{x-y} - \frac{x+4y}{x-y} \quad \leftarrow \text{so this one is good to go}$$

$$\frac{6x-6y-x-4y}{x-y} \rightarrow \left( \frac{5x-10y}{x-y} \right) = \left( \frac{5(x-2y)}{x-y} \right)$$

... but if we don't have common denominators, then we have to find them first!

$$\frac{1}{2a+2} - \frac{1}{a^2-1}$$

$$\frac{1(a-1)}{2(a+1)(a-1)} - \frac{2 \cdot 1}{2(a+1)(a-1)}$$

$$\frac{a-1-2}{2(a+1)(a-1)}$$

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

### PROCEDURE:

- 1) **Factor**  
(\*\*HINT: its always the same!)
- 2) **Find LCD** (least common denom)
- 3) **Combine numerators over one common denom.**
- 4) **Simplify** (i.e. cancel...it's always the last step)

Examples Continued...

$$1) \frac{a+2}{a^2-5a+6} + \frac{a+2}{a^2-7a+12} + \frac{1}{a^2-6a+8}$$

$$\frac{(a+2)(a-4)}{(a-3)(a-2)(a-4)} + \frac{(a+2)(a-2)}{(a-3)(a-4)(a-2)} + \frac{1(a-3)}{(a-2)(a-4)(a-3)}$$

$$\frac{a^2-4a+2a-8 + a^2-2a+2a-4 + a-3}{(a-2)(a-3)(a-4)} = \frac{2a^2-a-15}{(a-2)(a-3)(a-4)}$$

$$2) \frac{m}{mn-n^2} - \frac{1}{m-n} - \frac{1}{n}$$

$$\frac{(a-3)(2a+5)}{(a-2)(a-3)(a-4)}$$

$$\frac{2a+5}{(a-2)(a-4)}$$

$$3) \frac{3x}{2x-6} + \frac{9}{6-2x}$$

$$\frac{3x}{2(x-3)} + \frac{9(-1)}{2(3-x)(-1)} = \frac{3x-9}{2(x-3)}$$

$$= \frac{3(x-3)}{2(x-3)} = \boxed{\frac{3}{2}}$$

$$4) \frac{a-1}{1-a} + \frac{a-b}{b-1}$$

$$5) \frac{1}{x} + \frac{1}{x+3}$$

$$\frac{1(x+3)}{x(x+3)} + \frac{x}{x(x+3)}$$

$$\frac{x+3+x}{x(x+3)} = \boxed{\frac{2x+3}{x(x+3)}}$$

When is a rational expression in simplest form?  
Why can we change numerators and denominators through multiplication but not through addition?  
Homework: p. 56 #17-20

**Developing Skills**

In 3–20, perform the indicated additions or subtractions and write the result in simplest form. In each case, list any values of the variables for which the fractions are not defined.

**17.**  $\frac{1}{2-x} + \frac{2}{x-2}$

**18.**  $\frac{1}{a^2 - a - 6} - \frac{1}{2a^2 - 7a + 3}$

**19.**  $\frac{2}{a^2 - 4} - \frac{1}{a^2 + 2a}$

**20.**  $\frac{1}{x} + \frac{1}{x-2} - \frac{2}{x^2 - 2x}$