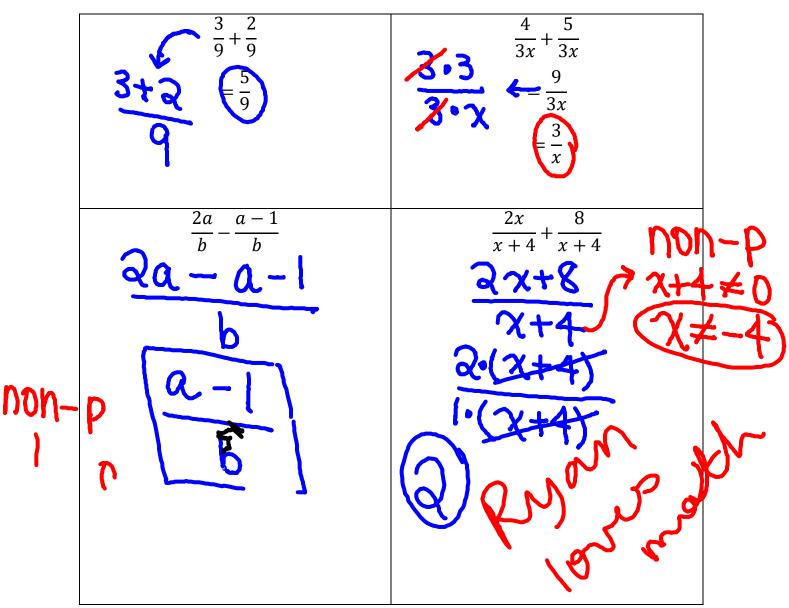# U4:L6 Adding + Subtracting Rational Expressions

Adding and subtracting rational expressions is somewhat similar to adding and subtracting radical expressions.

You will be faced with one of the following situations:

## a) Denominators are the Same

Just as with fractions, if the denominators are the same, then simply add the numerators and keep the common denominator.

*Examples:*

$$\frac{3}{9} + \frac{2}{9}$$

$$\frac{3+2}{9}$$

$$= \frac{5}{9}$$

$$\frac{4}{3x} + \frac{5}{3x}$$

$$\frac{3 \cdot 3}{3 \cdot x} \leftarrow = \frac{9}{3x}$$

$$= \frac{3}{x}$$

$$\frac{2a}{b} - \frac{a-1}{b}$$

$$\frac{2a - a - 1}{b}$$

$$\frac{a-1}{b}$$

non-p
1
r

$$\frac{2x}{x+4} + \frac{8}{x+4}$$

$$\frac{2x+8}{x+4}$$ → non-p  $x+4 \neq 0$

$$\frac{2 \cdot (x+4)}{1 \cdot (x+4)}$$  $x \neq -4$

(Q)   Ryan loves math

## b) Denominators are Different

When the denominators are different, you must re-write the fractions with equivalent common denominators before adding / subtracting.

$$\frac{3}{9} + \frac{2}{3} \quad \times 3 \quad \times 3$$

$$= \frac{3}{9} + \frac{6}{9}$$

$$= \frac{9}{9} = 1$$

$$\frac{10}{3x - 12} - \frac{3}{x - 4}$$

**factor**

$$= \frac{10}{3(x - 4)} - \frac{3}{x - 4}$$

**SAME DENO**

$$= \frac{10}{3(x - 4)} - \frac{3(3)}{x - 4(3)} \quad \times \frac{3}{3} \Rightarrow 1$$

**ADD NUM**

$$= \frac{10}{3(x - 4)} - \frac{9}{3(x - 4)}$$

$$= \frac{1}{3(x - 4)}$$

$$\frac{2x}{xy} + \frac{4}{x^2} - 3$$

**DENO**  $x^2y$

$$\frac{2x}{xy} + \frac{4}{x \cdot x} - \frac{3}{1}$$

$$\left[\frac{2x}{xy} \cdot \frac{x}{x}\right] + \left[\frac{4}{x \cdot x} \cdot \frac{y}{y}\right] - \left[\frac{3}{1} \cdot \frac{x^2y}{x^2y}\right]$$

$\sqrt{x^2} \neq \sqrt{0}$
$x \neq 0$

$$\frac{2x^2}{x^2y} + \frac{4y}{x^2y} - \frac{3x^2y}{x^2y}$$

**non-p?**

$$\frac{2x^2 + 4y - 3x^2y}{x^2y}$$

$x \neq 0$
$y \neq 0$

$$\frac{y^2-20}{y^2-4} + \frac{y-2}{y+2}$$

**DENO** $(y-2)(y+2)$

$$\frac{y^2-20}{(y-2)(y+2)} + \frac{y-2}{y+2} \times \frac{(y-2)}{(y-2)}$$

$$\frac{y^2-20}{(y-2)(y+2)} + \frac{(y-2)(y-2)}{(y-2)(y+2)}$$

$$\frac{y^2-20 + y^2-2y-2y+4}{(y-2)(y+2)}$$

$$\frac{2y^2-4y-16}{(y-2)(y+2)}$$

⊗ −8
⊕ −2

$2 \cdot -4$

$(y+2)(y-4)$

$$\frac{2(y^2-2y-8)}{(y-2)(y+2)}$$

$$\frac{2(y^2+2y-4y-8)}{(y-2)(y+2)} \Rightarrow \frac{2(y(y+2)-4(y+2))}{2(y-4)(y+2)}$$

$$\frac{2(y-4)(y+2)}{(y-2)(y+2)}$$

$$\boxed{\frac{2(y-4)}{(y-2)}}$$

non-p?
$y+2 \neq 0$
$y \neq -2$

$y-2 \neq 0$
$y \neq 2$

**PRACTICE:** Page 336 Questions 1, 3, 5(a,e), 6(b,d), 7 (a)