

**Learning Target(s):** I am able to add and subtract rational expressions by finding the common denominator.  
I am able to simplify a complex fraction.

**Notes: 8.5 Add and Subtract Rational Expressions**

**Add or Subtract:**

1.  $\frac{1}{2} + \frac{1}{3} \rightarrow \frac{3}{6} + \frac{2}{6} \rightarrow \frac{5}{6}$  2.  $\frac{2}{3} + \frac{5}{9} \rightarrow \frac{6}{9} + \frac{5}{9} \rightarrow \frac{11}{9}$  3.  $\frac{7}{8} + \frac{7}{12} \rightarrow \frac{21}{24} + \frac{14}{24} = \frac{35}{24}$

2: 6, 4, 6, 8, 10, 12  
3: 6, 9, 12  
LCD

3: 3, 9  
9: 9

8: 8, 16, 24, 32  
12: 12, 24

**Complex Fraction** – a fraction that contains a fraction in its numerator or denominator

Ex 1.  $\frac{9}{6x} + \frac{2}{6x} \rightarrow \frac{11}{6x}$

same denominator  $\rightarrow$  add or subtract numerator (top)  
(bottom)

\*\*Note: factor the denominator first!! (if possible)

Ex 2. Find the least common denominator (LCD)

a.  $\frac{2x}{7x^2-7x} + \frac{4}{3x^2}$

$7x^2-7x = 7x(x-1)$   
 $3x^2 = 3 \cdot x \cdot x$

LCD:  $2|x \cdot x \cdot (x-1)$   
 $2|x^2(x-1)$

b.  $\frac{-x+1}{x^2-3x+2} + \frac{x+3}{3x-6}$

LCD:  $(x-2)(x-1)3$

$x^2-3x+2 = (x-2)(x-1)$   
 $3x-6 = 3(x-2)$

Ex 3. Subtract  $\frac{7}{3x-9} - \frac{x+4}{x^2-9}$

① Find LCD:

$3x-9 = 3(x-3)$

$x^2-9 = (x-3)(x+3)$

LCD:  $3(x-3)(x+3)$

② multiply by what's missing

$\frac{7(x+3)}{3(x-3)(x+3)} - \frac{(x+4)3}{3(x-3)(x+3)}$

$\frac{7x+21 - (3x+12)}{3(x-3)(x+3)} = \frac{4x+9}{3(x-3)(x+3)}$

Ex 4. Add  $\frac{5}{4x^2} + \frac{x+1}{2x^2+4x}$

①  $4x^2 = 4x^2$

$2x^2+4x = 2x(x+2)$

LCD:  $4x^2(x+2)$

②  $\frac{5(x+2)}{4x^2(x+2)} + \frac{(x+1)2x}{4x^2(x+2)}$

$\frac{5x+10 + 2x^2+2x}{4x^2(x+2)}$

$\frac{2x^2+7x+10}{4x^2(x+2)}$

Try it! Add or subtract.

LCD:  $3+x$

1.  $\frac{8x}{3+x} - \frac{7}{3+x}$

$$\frac{8x-7}{3+x}$$

LCD:  $(x+3)(x+3)(x-3)$

2.  $\frac{x+1}{x^2+6x+9} + \frac{6}{x^2-9}$

①  $x^2+6x+9 = (x+3)(x+3)$   
 $x^2-9 = (x+3)(x-3)$

②  $\frac{(x+1)(x-3)}{(x+3)(x+3)(x-3)} + \frac{6(x+3)}{(x+3)(x+3)(x-3)}$   
 $\frac{x^2-2x-3 + 6x+18}{(x+3)(x+3)(x-3)} = \frac{x^2+4x+15}{(x+3)(x+3)(x-3)}$

Ex 5. Simplify:  $\frac{\frac{8}{5x}}{\frac{x+1}{15} + \frac{4}{15}} \rightarrow \frac{x+1+4}{15} = \frac{x+5}{15}$

Ex 6. Simplify:  $\frac{\frac{2x}{x+1}}{\frac{1}{3x} + \frac{2}{x+1}} \rightarrow \frac{1+7x}{3x(x+1)}$

$\frac{8}{5x} \div \frac{x+5}{15}$  division: 8.4 multiply by reciprocal

$\frac{8}{5x} \cdot \frac{15}{x+5} = \frac{24}{x(x+5)}$

LCD:  $3x(x+1)$   
 $\frac{(x+1)1}{3x(x+1)} + \frac{2(3x)}{3x(x+1)}$

$\frac{x+1 + 6x}{3x(x+1)} = \frac{1+7x}{3x(x+1)}$

$\frac{2x}{x+1} \cdot \frac{3x(x+1)}{1+7x} = \frac{6x^2}{1+7x}$

Try it! Simplify.

3.  $\frac{\frac{6x}{4} - \frac{x}{4}}{\frac{8}{2} + \frac{3x}{2}} = \frac{6x-x}{4} = \frac{5x}{4}$

$\frac{8+3x}{2}$

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