

Notes 4.6

Warmup – Simplify by performing the indicated operation

1. $\frac{3}{14} + \frac{5}{6}$

$$\frac{9}{42} + \frac{35}{42}$$

$$\frac{44}{42} \rightarrow \boxed{\frac{22}{21}}$$

2. $\frac{11}{12} - \frac{7}{15}$

$$\frac{55}{60} - \frac{28}{60}$$

$$\frac{27}{60} \rightarrow \boxed{\frac{9}{20}}$$

3. $\frac{3}{8} + \frac{2}{9}$

$$\frac{27}{72} + \frac{16}{72}$$

$$\boxed{\frac{43}{72}}$$

Investigation

To add or subtract rational expressions, you must find the common denominator, rewrite with equivalent fractions, add or subtract the numerators, reduce if possible.

Find the common denominator for each set of rational expressions

a. $\frac{1}{4x} + \frac{1}{x+1}$

$$\begin{matrix} \downarrow & \downarrow \\ 4 \cdot x & (x+1) \end{matrix}$$

no common factor

$$\boxed{4x(x+1)}$$

b. $\frac{1}{(x+2)(x+3)} + \frac{1}{(x+2)(x+5)}$

x+2 is common factor

$$\boxed{(x+2)(x+3)(x+5)}$$

Rewrite each set of rational expressions after finding the common denominator

c. $\frac{1}{x+3} + \frac{1}{x-2}$

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

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

what denominator is missing

d. $\frac{2}{x^2-2x-8} + \frac{1}{x^2-x-6}$

$$(x-4)(x+2) \quad (x-3)(x+2)$$

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

$$\frac{2x-6}{(x-3)(x-4)(x+2)} + \frac{x-4}{(x-3)(x-4)(x+2)}$$

Add or subtract the rational expressions

e. $\frac{3x}{x+7} + \frac{4}{x-8}$ CD: $(x+7)(x-8)$

$$\frac{3x(x-8)}{(x+7)(x-8)} + \frac{4(x+7)}{(x+7)(x-8)}$$

$$\frac{3x^2 - 24x}{(x+7)(x-8)} + \frac{4x + 28}{(x+7)(x-8)}$$

$$\boxed{\frac{3x^2 - 20x + 28}{(x+7)(x-8)}}$$

g. $\frac{8}{7x-6} + \frac{4}{3x^2}$

CD: $3x^2(7x-6)$

$$\frac{8(3x^2)}{3x^2(7x-6)} + \frac{4(7x-6)}{3x^2(7x-6)}$$

$$\frac{24x^2 + 28x - 24}{3x^2(7x-6)} \quad \boxed{\frac{24x^2 + 28x - 24}{3x^2(7x-6)}}$$

f. $\frac{\cancel{x+1} \cdot 5x+5}{5x^2+35x-40} - \frac{7x}{x-1}$ CD: $(x+8)(x-1)$

$$\frac{\cancel{x+1}(x^2+7x-8)}{(x+8)(x-1)}$$

$$\frac{(x+1)}{(x+8)(x-1)} - \frac{7x(x+8)}{(x+8)(x-1)}$$

$$\frac{x+1}{(x+8)(x-1)} - \frac{7x^2 + 56x}{(x+8)(x-1)}$$

$$\boxed{\frac{-7x^2 - 55x + 1}{(x+8)(x-1)}}$$

h. $\frac{7}{3x^2+24x} - \frac{7}{2x}$ CD: $6x(x+8)$

$$\frac{7(2)}{6x(x+8)} - \frac{(7)(3)(x+8)}{6x(x+8)}$$

$$\frac{14}{6x(x+8)} - \frac{21x + 168}{6x(x+8)} \quad \boxed{\frac{-21x - 154}{6x(x+8)}}$$

i. $\frac{5x}{x-3} + \frac{5}{x+6}$ CD: $(x-3)(x+6)$

$$\frac{5x(x+6)}{(x-3)(x+6)} + \frac{5(x-3)}{(x-3)(x+6)}$$

$$\frac{5x^2 + 30x}{(x-3)(x+6)} + \frac{5x - 15}{(x-3)(x+6)}$$

$$\boxed{\frac{5x^2 + 35x - 15}{(x-3)(x+6)}}$$

j. $\frac{x-2}{x^2+7x-18} + \frac{3x}{x+9}$ CD: $(x+9)(x-2)$

$$\frac{1}{x+9} + \frac{3x}{x+9}$$

$$\boxed{\frac{3x+1}{x+9}}$$

k. $\frac{2x}{3x+3} - \frac{2}{5x+5}$

CD: $15(x+1)$

$$\frac{5(2x)}{15(x+1)} - \frac{2(3)}{15(x+1)}$$

$$\frac{10x}{15(x+1)} - \frac{6}{15(x+1)}$$

$$\boxed{\frac{10x-6}{15(x+1)}}$$

l. $\frac{4x}{x+3} - \frac{4x}{x+6}$ CD: $(x+3)(x+6)$

$$\frac{4x(x+6)}{(x+3)(x+6)} - \frac{4x(x+3)}{(x+3)(x+6)}$$

$$\frac{4x^2 + 24x}{(x+3)(x+6)} - \frac{4x^2 + 12x}{(x+3)(x+6)}$$

$$\boxed{\frac{12x}{(x+3)(x+6)}}$$