

## Warm Up

1.  $\frac{1}{2} + \frac{1}{3}$

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

3.  $\frac{1}{2} \cdot \frac{1}{3}$

4.  $\frac{1}{2} \div \frac{1}{3}$

# Noelle

$$\frac{3x}{3} + \frac{2x}{8} - \frac{1}{2}$$

To add and subtract fractions, I need a common denominator. To determine one, I multiply all the denominators together:  $3 \cdot 8 \cdot 2 = 48$

$$\begin{aligned} \frac{3x(16)}{3(16)} + \frac{2x(6)}{8(6)} - \frac{1(24)}{2(24)} &= \frac{48x}{48} + \frac{12x}{48} - \frac{24}{48} \\ &= \frac{60x - 24}{48} \\ &= \frac{5x - 2}{4} \end{aligned}$$

### 3. Calculate each sum and difference.

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a.  $\frac{3}{6} + \frac{5x}{4} - \frac{y}{8}$

b.  $\frac{x - 2y}{3} + \frac{x}{12} - \frac{z}{4}$

c.  $\frac{4x}{6} - \frac{2x}{9} - \frac{x}{18}$



2. Ruth and Samir determine the LCD for the expression

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

Ruth

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

$$(x^2 - 1)(x + 1)$$

$$\text{LCD: } x^3 + x^2 - x - 1$$

Samir

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

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

$$(x - 1)(x + 1)$$

$$\text{LCD: } x^2 - 1$$

Who is correct? Explain your reasoning.

3. Determine the least common denominator for each set of rational expressions.

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

b.  $\frac{-2}{3x-2}, \frac{4x}{3x^2+7x-6}$

c.  $\frac{-11}{x}, \frac{7}{x-4}, \frac{x}{x^2-16}$

d.  $\frac{2x}{x^2-5x+6}, \frac{7x+11}{x^2-6x+9}$

## Worked Example

You can determine the difference of two rational expressions with binomials in the denominator.

$$\begin{aligned}\frac{1}{x^2 - 1} - \frac{1}{x^2 + 2x + 1} &= \frac{1}{(x + 1)(x - 1)} - \frac{1}{(x + 1)(x + 1)} \\ &= \frac{1(x + 1)}{(x + 1)(x - 1)(x + 1)} - \frac{1(x - 1)}{(x + 1)(x + 1)(x - 1)} \\ &= \frac{(x + 1) - (x - 1)}{(x + 1)(x + 1)(x - 1)} \\ &= \frac{2}{(x + 1)(x + 1)(x - 1)}, x \neq -1, 1\end{aligned}$$

5. Anthony and Marissa add  $\frac{2x+2}{x+1} + \frac{1}{x}$ .

Anthony



$$\begin{aligned} \frac{2x+2}{x+1} + \frac{1}{x} &= \frac{(2x+2)(x)}{(x+1)(x)} + \frac{1(x+1)}{x(x+1)} \\ &= \frac{2x^2+2x}{(x+1)(x)} + \frac{x+1}{x(x+1)} \\ &= \frac{2x^2+2x+x+1}{x(x+1)} \\ &= \frac{2x^2+3x+1}{x(x+1)} \\ &= \frac{(2x+1)\cancel{(x+1)}}{x\cancel{(x+1)}} \\ &= \frac{2x+1}{x} \end{aligned}$$

Marissa



$$\begin{aligned} \frac{2x+2}{x+1} + \frac{1}{x} &= \frac{2\cancel{(x+1)}}{\cancel{(x+1)}} + \frac{1}{x} \\ &= 2 + \frac{1}{x} \\ &= \frac{2(x)}{(x)} + \frac{1}{x} \\ &= \frac{2x+1}{x} \end{aligned}$$