4 Adding and Subtracting Rationals

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PRE-CALCULUS 11 Ch 6 – Day 4: ADDING AND SUBTRACTING RATIONAL EXPRESSIONS (Part 1)

ADDING AND SUBTRACTING RATIONAL EXPRESSIONS

Adding and subtracting rational expressions uses the same methods as when adding and subtracting fractions; i.e., find a **common denominator**.

Example 1: Evaluate $\frac{8}{15} - \frac{7}{10}$; simplify your answer.

Need common denominator!

(1) Look at multiples of 15: 15, 30, 45, 60, ...
Look at multiples of 10: 10, 20, 30, 40, ...

(2) Lowest Common Denominator (LCD) = 30

(3) Multiply each term to get LCD: $\frac{8}{15} \times \frac{2}{2} - \frac{7}{10} \times \frac{3}{3} = \frac{16}{30} - \frac{21}{30} = \frac{-5}{30} = \frac{-1}{6}$

Example 2: Simplify.

$$\frac{4}{3x} - \frac{7x}{6}$$

$3x$: 3, x $\quad$ 6: 2, 3 $\quad$ $6x$

(1) Find LCD = $6x$

(2) Multiply to get LCD

$$\frac{4}{3x} \times \frac{2}{2} - \frac{7x}{6} \times \frac{x}{x}$$

$$\frac{8}{6x} - \frac{7x^2}{6x}$$

$$\boxed{\frac{8-7x^2}{6x}} \quad x \neq 0$$

Don't kill kitten! $\cancel{\frac{8-7x^2}{6x}}$

Example 3: Simplify

$$\frac{1}{3} + \frac{2x-3}{6x^2} - \frac{x-5}{5x}$$

3, 6, 9, 12, 15, 18, ..., 30, ..
6, 12, 18, 24, 30, ...
5, 10, 15, 20, 25, 30, ...

LCD: $30x^2$

$$\frac{1}{3} \times \frac{10x^2}{10x^2} + \frac{(2x-3)}{6x^2} \times \frac{5}{5} - \frac{(x-5)}{5x} \times \frac{6x}{6x}$$

$$\frac{10x^2 + 10x - 15 - 6x^2 + -1(-5)(6x)}{30x^2}$$

$$\frac{10x^2 - 6x^2 + 10x + 30x - 15}{30x^2}$$

$$\boxed{\frac{4x^2 + 40x - 15}{30x^2}} \quad x \neq 0$$

Example 4:Simplify.

$$\cancel{\frac{2}{m} - \frac{2m}{m-5}}$$

$$\vdots$$

$$\frac{-2m^2+2m-10}{m(m-5)}$$

OR $\frac{2(-m^2+m-5)}{m(m-5)}$

Example 5: Simplify

$$\frac{2x}{x-2} - \frac{x-1}{x+7}$$

Say $\frac{x}{2} - \frac{x}{7}$

LCD = 14

LCD: $(x-2)(x+7)$

$$\frac{2x}{(x-2)} \times \frac{(x+7)}{(x+7)} - \left(\frac{x-1}{x+7}\right)\left(\frac{x-2}{x-2}\right)$$

$$\frac{2x^2+14x-[x^2-2x-x+2]}{(x-2)(x+7)}$$

$-3x$

$$\frac{2x^2+14x-x^2+3x-2}{(x-2)(x+7)}$$

$$\boxed{\frac{x^2+17x-2}{(x-2)(x+7)}}$$

$x \neq 2$
$x \neq -7$

Example 6: Simplify $\frac{2}{x-4} - \frac{x-8}{x^2-10x+24}$

$-6 \times -4 = 24$
$-6 + -4 = -10$

$$\frac{2}{x-4} - \frac{x-8}{(x-6)(x-4)}$$

LCD = $(x-4)(x-6)$

$$\frac{2}{(x-4)} \times \frac{(x-6)}{(x-6)} - \frac{x-8}{(x-6)(x-4)}$$

$$\frac{2x-12-x+8}{(x-4)(x-6)} = \frac{\cancel{x-4}}{\cancel{(x-4)}(x-6)} = \frac{1}{x-6}$$

$x \neq 6, 4$

Assignment: "What pet makes the loudest noise?" worksheet, "What happens when the smog lifts in Los Angeles" (do at least 1 from #2-6) worksheet. Optional: Sec 6.3, p. 336 #8, 18

example: Simplify.

$$\frac{t-1}{t^2+5t+4} - \frac{t-2}{t^2+t}$$

exercise: Simplify

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

[Answers: $\frac{-3t+8}{t(t+1)(t+4)}$, $\frac{x-3}{(x-1)(x+1)(x+2)}$]

solution $\dfrac{t-1}{(t+1)(t+4)} - \dfrac{t-2}{t(t+1)}$

LCD = $t(t+1)(t+4)$

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

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

$$\frac{t^2 - t - (t^2 + 2t - 8)}{t(t+1)(t+4)}$$

$$\frac{t^2 - t - t^2 - 2t + 8}{t(t+1)(t+4)}$$

$$\frac{-3t + 8}{t(t+1)(t+4)}$$

[Answer: $\dfrac{x-3}{(x-1)(x+1)(x+2)}$]

Do Not Print: Additional Examples:

$$\frac{2a-3b}{10a} - \frac{3a-2b}{25b}$$

solution LCD = $50ab$

$$\frac{(2a-3b)(5b)}{(10a)(5b)} - \frac{(3a-2b)(2a)}{(25b)(2a)}$$

$$\frac{5b(2a-3b)}{50ab} - \frac{2a(3a-2b)}{50ab}$$

$$\frac{5b(2a-3b)-2a(3a-2b)}{50ab}$$

$$\frac{10ab-15b^2-6a^2+4ab}{50ab}$$

$$\frac{-6a^2+14ab-15b^2}{50ab}$$

solution LCD = $m(m-5)$

$$\frac{2(m-5)}{m(m-5)} - \frac{2m(m)}{m(m-5)}$$

$$\frac{2(m-5) - 2m^2}{m(m-5)}$$

$$\frac{2m-10-2m^2}{m(m-5)}$$

$$\frac{-2m^2+2m-10}{m(m-5)}$$