Day 5 Notes : Adding and Subtracting Rational Expressions:

Steps:
1) Find a lowest common denominator (may need to Factor First!)
2) Raise each fraction to the new denominator.
3) Combine like terms in numerator.
4) Factor and simplify if possible

NOTE: non-permissible value(s) must be considered before, during and after simplifying

e.g. 1

a) $\frac{1}{8}+\frac{5}{8}=\frac{1+5}{8}=\frac{6}{8}=\frac{3}{4}$

b) $\frac{4}{4}\cdot\frac{5}{6}-\frac{3}{8}=\frac{3}{3}\quad\frac{20-9}{24}=\frac{11}{24}$

e.g. 2

a $\frac{7x+1}{x}+\frac{5x-2}{x}=$

$\frac{7x+1+5x-2}{x}$

$\frac{12x-1}{x}$ $x\neq 0$

b $\frac{x}{x-3}-\frac{6-x}{x-3}=$

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

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

$x\neq 3$

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

$\frac{5(x+2)-[3(x-2)]}{(x-2)(x+2)}$

$\frac{5x+10-[3x-6]}{(x-2)(x+2)}$

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

$\frac{2x+16}{(x-2)(x+2)}=\frac{2(x+8)}{(x-2)(x+2)}$

e.g. 3 Simplify. Express your answers in simplest form

a) $\left(\frac{2x}{xy}+\frac{4}{x^2}\right),\ x\neq 0, y\neq 0$ LCD: x^2y

$\frac{X}{X}\quad\frac{Y}{Y}$

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

$\frac{2(x^2+2y)}{x^2y}$

b) $\frac{y^2-20}{y^2-4}+\frac{y-2}{y+2},\ y\neq\pm 2$

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

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

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

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

$2(y-2y-8)$

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

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

c) $\frac{x-1}{x^2+x-6} - \frac{x-2}{x^2+4x+3}$, $x \neq -3, -1, 2$

$(x+1)$ $(x+3)(x-2)$ $(x+3)(x+1)$ $(x-2)$

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

$\frac{[x^2-1] - [x^2-4x+4]}{D}$

$\frac{x^2-1-x^2+4x-4}{D}$

$\frac{4x-5}{(x+3)(x-2)(x+1)}$

d) $\frac{1+\frac{1}{x}}{1-\frac{1}{x}}$, $x \neq 0, x \neq \pm 1$ — divided

$\frac{x+1}{x} \div \frac{x-1}{x}$

$\frac{x+1}{x} \cdot \frac{x}{x-1} = \frac{x+1}{x-1}$

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Grade 7 $2\frac{1}{3}$ → $\frac{7}{3}$

$1 + \frac{1}{x} = \frac{x+1}{x}$

$1 \quad \frac{-1}{x} \quad \frac{x-1}{x}$

e) $\frac{2x}{3x^2-11x+6} - \frac{3x-12}{3x^2-14x+8}$

$(x-4)$ $(3x-2)(x-3)$ $(3x-2)(x-4)(x-3)$ $(x-3)$

FOIL

$\frac{2x(x-4) - [(3x-12)(x-3)]}{(3x-2)(x-4)(x-3)}$

$\frac{2x^2-8x - [3x^2-9x-12x+36]}{D}$

$\frac{2x^2-8x-3x^2+9x+12x-36}{D}$

$\frac{-x^2+13x-36}{D}$

$\frac{-(x^2-13x+36)}{D}$

$\frac{-(x-9)(x-4)}{(3x-2)(x-4)(x-3)}$

$\frac{-(x-9)}{(3x-2)(x-3)} \rightarrow \frac{9-x}{(3x-2)(x-3)}$