# U1D7_T Adding and Subtracting Rational Expressions II 

U1D7_T
Adding an...

## U1D7 MCR 3UI

## Adding \& Subtracting Rational Expressions Part II

Warm Up: a) Simplify and state restrictions.

$$
\begin{aligned}
& \frac{2 x-3}{6}-\frac{5 x-2}{5} \\
= & \frac{5(2 x-3)-6(5 x-2)}{30} \\
= & \frac{10 x-15-30 x+12}{30} \\
= & \frac{-20 x-3}{30} \quad \text { no restrictions. }
\end{aligned}
$$

b) Determine the LCD of $\frac{?}{12 x y^{2}}$ and $\frac{?}{4 x^{2} y}$

$$
\begin{array}{ll} 
& 12,4 \quad \operatorname{LCD} 4 \\
& x, x^{2} \operatorname{LCD} x^{2} \\
y^{2}, y \quad \operatorname{LCD} y^{2} \\
\therefore & 12 x y^{2}, 4 x^{2} y \operatorname{LCD} 12 x^{2} y^{2}
\end{array}
$$

Recall: The Steps.....

1. Factor the denominator (if possible).
2. Get a common - denominator .
3. Factor the numerator. (You may need to expand , add/subtract like terms, and then refactor ).
4. Divide out any common factors if possible.
5. Simplify , if possible.
6. State restrictions on the variable(s).

Examples: For each of the following, state restrictions and simplify.

$$
\begin{aligned}
& \text { a) } \frac{7}{2 y}+\frac{3}{y}-\frac{1}{6 y} \quad \text { LCD } 6 y \\
& \times 3 \times 1 \\
& =\frac{21+18-1}{6 y} \\
& =\frac{38}{6 y} \\
& =\frac{19}{3 y_{3 x+1}}, y \neq 0
\end{aligned}
$$

b)

$$
\begin{aligned}
& \frac{3 x+1}{6 x}-\frac{1}{2}+\frac{x+6}{3 x^{2}} \\
& \times x \times 3 x^{2} \times 2 \\
&= \frac{x(3 x+1)-3 x^{2}(1)+2(x+6)}{6 x^{2}} \\
&= \frac{3 x^{2}+x-3 x^{2}+2 x+12}{6 x^{2}} \\
&= \frac{3 x+12}{6 x^{2}} \\
&= \frac{3(x+4)}{6 x^{2}} \\
&= \frac{x+4}{2 x^{2}}, x \neq 0
\end{aligned}
$$

c) $\frac{m}{m-3}-\frac{5}{m+2}$

$$
\begin{aligned}
& =\frac{m(m+2)-5(m-3)}{(m-3)(m+2)} \quad \begin{array}{l}
\text { expand numerator } \\
=\frac{m^{2}+2 m-5 m+15}{(m-3)(m+2)} \quad \text { leave denominator } \\
\text { factored }
\end{array} \\
& =\frac{m^{2}-3 m+15}{(m-3)(m+2)}<m_{\text {Al }} 15 \\
& m \neq 3,-2
\end{aligned}
$$

$$
\begin{aligned}
& \text { d) } \frac{a+2}{a^{2}-1}-\frac{a-1}{a^{2}+2 a+1} \\
& =\frac{a+2}{(a-1)(a+1)}-\frac{a-1}{(a+1)^{2}} \quad \text { LCD } \\
& =\frac{(a+1)(a+1)^{2}}{(a-1)(a+1)^{2}} \\
& =\frac{a^{2}+3 a+2-\left(a^{2}-2 a+1\right)}{(a-1)(a+1)^{2}} \\
& =\frac{a^{2}+3 a+2-a^{2}+2 a-1}{(a-1)(a+1)^{2}} \\
& =\frac{5 a+1}{(a-1)(a+1)^{2}}, a \neq \pm 1
\end{aligned}
$$

$$
\begin{aligned}
& \text { e) } \frac{2 x-6}{x^{2}-2 x-3}+\frac{15 x+75}{x^{2}+6 x+5}, \\
& =\frac{2(x-3)}{(x-3)(x+1)}+\frac{15(x, 45)}{(x+15)(x+1)} \\
& =\frac{2}{x+1}+\frac{15}{x+1} \\
& =\frac{17}{x+1}, x \neq 3,-1,-5
\end{aligned}
$$

* if you do not reduce before looking for

TOUGHER WAY

$$
\begin{aligned}
& \frac{2 x-6}{(x-3)(x+1)}+\frac{15 x+75}{(x+5)(x+1)} \\
&= \frac{(2 x-6)(x+5)+(15 x+75)(x-3)}{(x-3)(x+1)(x+5)} \\
&= \frac{2 x^{2}+4 x-30+15 x^{2}+30 x-225}{(x-3)(x+1)(x+5)} \\
&= \frac{17 x^{2}+34 x-255}{(x-3)(x+1)(x+5)}= \\
&= \frac{17\left(x^{2}+2 x-15\right)}{(x-3)(x+1)(x+5)}= \\
& \text { Ps. 67-68 H3ace, Face, 6acegi, 8ace, face, 10acagi }
\end{aligned}=
$$ common denominator thequestion is much tougher and requires factoring to reduce at the end.

$\operatorname{LCD}(x+1)$

d
,

$$
=\frac{2 x^{2}+4 x-30+15 x^{2}+30 x-225}{(x-3)(x+1)(x+5)}
$$

$$
T=\frac{17(x+5)(x-3)}{\frac{(x-3)(x+1)(x+5)}{17}}
$$

$$
=\frac{17}{x+1}, x \neq 3,-1,-5
$$

* same answer BuT much uglier!

