12.7 Rational Expressions with Unlike Denominators

Essential Question: How do I make common denominators in order to combine the fractions?

REVIEW: Find the LCM (Least Common Multiple)

1) 24 & 36

$\cdot 3 = 72 \qquad \cdot 2 = 72 \qquad \boxed{72}$

$12 \cdot 2 \qquad 12 \cdot 3$

$12 \cdot 2 \cdot 3 = \boxed{72}$

2) $6x^2y$ & $3xy^2$

$\cancel{18x^3y^3}$

$2 \cdot 3xxy \qquad 3xyy$

$2 \cdot 3xxyy = \boxed{6x^2y^2}$

3) $12b^4c^5$ & $32bc^2$

$4 \cdot 3b^4c^5 \qquad 4 \cdot 8bc^2$

$4 \cdot 3 \cdot 8b^4c^5 = \boxed{96b^4c^5}$

4) $x^2 - 3x - 28$ & $x^2 - 8x + 7$

$(x-7)(x+4) \qquad (x-1)(x-7)$

$\boxed{(x-7)(x+4)(x-1)}$

Now let's use the review to get common denominators so we can add/subtract fractions.

Examples: Find the sum without using a calculator.

a) $\frac{3}{3}\left(\frac{11}{24}\right) + \left(\frac{5}{36}\right)\left(\frac{2}{2}\right)$

$12 \cdot 2 \qquad 12 \cdot 3$

LCM: $12 \cdot 2 \cdot 3 = 72$

LCD

$\frac{33}{72} + \frac{10}{72} = \boxed{\frac{43}{72}}$

b) $\frac{y}{y}\,\frac{7}{6x^2y} + \frac{10}{3xy^2} \cdot \frac{2x}{2x}$

$2 \cdot 3xxy \qquad 3xyy$

LCM: $6x^2y^2$

$\frac{7y}{6x^2y^2} + \frac{20x}{6x^2y^2}$

$\boxed{\frac{20x + 7y}{6x^2y^2}}$

Algorithm for Adding Rational Expressions

1) Find the LCD. LCM

2) Convert each rational expression to an equivalent expression with LCD as the denominator. fraction

3) Combine numerators over the LCD. + −

4) Simplify the expression to lowest terms, if necessary. GCF, cancel, factor

Examples: Find each sum using the 4 step algorithm.

c) $\frac{1}{1}\cdot\frac{z+2}{5z}+\frac{z-6}{z}\cdot\frac{5}{5}$

LCD: $5z$

$=\frac{z+2+5(z-6)}{5z}$

$=\frac{z+2+5z-30}{5z}$

$\boxed{=\frac{6z-28}{5z}=\frac{2(3z-14)}{5z}}$

d) $\frac{(n-6)}{(n-6)}\cdot\frac{n}{(n+2)}+\frac{7}{(n-6)}\cdot\frac{(n+2)}{(n+2)}$

LCD: $(n+2)(n-6)$

$=\frac{n(n-6)+7(n+2)}{(n+2)(n-6)}$

$=\frac{n^2-6n+7n+14}{(n+2)(n-6)}$

$=\boxed{\frac{n^2+n+14}{(n+2)(n-6)}}$

e) $\frac{s+1}{s^2-9} - \frac{2s+3}{4s+12} \cdot \frac{(s-3)}{(s-3)}$

$(s+3)(s-3) \qquad 4(s+3)$

LCD: $4(s+3)(s-3)$

$= \frac{4(s+1) - (2s+3)(s-3)}{4(s+3)(s-3)}$

$= \frac{(4s+4) + (-2s^2+6s-3s+9)}{LCD}$

$= \boxed{\frac{-2s^2+7s+13}{4(s+3)(s-3)}}$

f) $\frac{(a+2)}{(a+2)} \cdot \frac{3a+2}{6-3a} - \frac{a+2}{a^2-4} \cdot \frac{-3}{-3}$

$-3(-2+a) \qquad (a+2)(a-2)$

LCD: $-3(a+2)(a-2)$

$= \frac{(a+2)(3a+2) - (-3)(a+2)}{LCD}$

$= \frac{3a^2+2a+6a+4+3a+6}{LCD}$

$= \frac{3a^2+11a+10}{-3(a+2)(a-2)}$

30: 5, 6; 11

$(3a^2+6a)+(5a+10)$

$3a(a+2)+5(a+2)$

$\frac{(3a+5)(a+2)}{-3(a+2)(a-2)} = \boxed{\frac{3a+5}{-3(a-2)}}$

On a slip of paper write down why we need common denominators. Then summarize the 4 step algorithm in your own words.

12.7 WS 1 & WS 2

A) first column & 2, 3, 5 - 11 (o)

B) 1, 2, 4, 5 - 15 (o) & evens

C) 1, 2, 4, 5, 8, 9, 12, 13, 15 & 2, 4, 6, 10, 11