

Adding and Subtracting

Friday, April 22, 2016 9:43 AM

Adding and Subtracting

Just remember what these guys taught you!

Remember when multiplying was hard, and adding was easy?



We'll do a quick example to see how much you remember / know about adding fractions.

$$\frac{3}{x^3} \left(\frac{4}{x^3} \right) = \frac{12}{x^6}$$

$$\frac{3}{x^3} + \frac{8}{x^3} - \frac{4}{x^3}$$

$$\rightarrow \frac{3 + 8 - 4}{x^3} = \frac{7}{x^3} \quad x \neq 0$$

Here's your algorithm. (The steps you need to take every time: I'll wait for you to write it down, Devon)

1. State the restrictions.
 - Always. Every question. Every time. You can not divide by zero. It is nonsensical.
2. Find a common denominator.
 - This is the step that makes adding difficult. ←
3. Write an equivalent fraction
 - Be able to write one denominator with all the numerator stuff above one line.
4. Add and subtract like terms in the numerator.
5. Make sure your final answer is simplified.

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

$$= \frac{2x - x + 2}{3} = \frac{x+2}{3}$$

You try these two. Follow the algorithm:

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

$$\begin{aligned} & \frac{\quad}{x-3} \\ & = \frac{(x-3)(x+4)}{x-3} = x+4 \end{aligned}$$

Ok, all those were "best case scenario" you will not have questions that already have a common denominator. Getting one will be your job. Expect to do this every question.

$$\begin{array}{ccc} \times 4 & \times 4 & \times 3 \\ \downarrow & \downarrow & \downarrow \\ \frac{5m}{6} - \frac{3m}{4} + \frac{m}{8} \leftarrow \end{array}$$

There are 2 ways to get your common denominator. The best way is to see that $6(3)=4(4)=8(2)=\cancel{24}$.

However, if you can't see the lowest common denominator like that you can always multiply all the bottom terms together to get a common denominator. $6(4)(8)=192$... big numbers usually do not make the question easier though...

$$\begin{aligned} 8 & \rightarrow 24 \\ 4 & \rightarrow 24 \\ 6 & \rightarrow 24 \\ \uparrow & \end{aligned}$$

$$\begin{aligned} & \frac{5(4)m - 3(6)m + 3m}{24} \\ & \frac{20m - 18m + 3m}{24} = \frac{5m}{24} \end{aligned}$$

$$\begin{aligned} & \begin{array}{ccc} \times 3 & & \times 4 \\ \downarrow & & \downarrow \\ \frac{(2n-7)}{8n} - \frac{3n-4}{6n} \end{array} \\ & \text{common denominator } 8, 6 \\ & \text{(24)} \\ & \frac{3(2n-7) - 4(3n-4)}{24n} \\ & = \frac{6n - 21 - 12n + 16}{24n} = \frac{-6n - 5}{24n} = -\frac{6n+5}{24n} \end{aligned}$$

$$n \neq 0$$

$$n \neq 0$$

$$27n$$

$$x \neq 0$$

$$\frac{\overset{6x}{\cancel{2y}}}{\cancel{5x^2}} + \frac{\overset{3x^2}{\cancel{1}}}{\cancel{10x}} - \frac{\overset{2}{\cancel{6}}}{\cancel{5x}} = \frac{6x(2y) + 3x^2 - 2(6)}{30x^3}$$

$$= \frac{12xy + 3x^2 - 12}{30x^3} = \frac{3(4xy + x^2 - 4)}{3(10)x^3}$$

Let's kick it up a notch!



$$\frac{1}{a} + \frac{1}{b} = \frac{1}{ab}$$

$$x \neq -5, 3$$

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

$$= \frac{2x^2 - 6x + 3x^2 + 15x}{(x+5)(x-3)}$$

$$= \frac{5x^2 + 9x}{(x+5)(x-3)} = \frac{x(5x+9)}{(x+5)(x-3)}$$

$$\textcircled{b} \quad \frac{x}{2x-4} - \frac{3}{3x-6}$$

$$= \frac{x(3x-6) - 3(2x-4)}{(2x-4)(3x-6)} = \frac{3x^2 - 6x - 6x + 12}{2(x-2)3(x-2)}$$

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

$x \neq 2$

$$\frac{x-1}{x^2+x-6} - \frac{5}{x^2-x-12}$$

$$x^2+x-6 \rightarrow (x+3)(x-2)$$

$$x^2-x-12 \rightarrow (x+3)(x-4)$$

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

$$= \frac{(x-1)(x-4) - 5(x-2)}{(x+3)(x-2)(x-4)} = \frac{x^2 - 4x - x + 4 - 5x + 10}{(x+3)(x-2)(x-4)}$$

$$= \frac{x^2 - 10x + 14}{(x+3)(x-2)(x-4)}$$

$$x = -3, 2, 4$$

$$\frac{x-1}{x^2+x-6} - \frac{x-2}{x^2+4x+3}$$

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

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

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

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

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

$$x \neq -3, 2, -1$$

Homework (the easy stuff):
 Pg: 336: #1, 2, 4ab, 5, 12
 Next Level: (to be handed in)
 Pg: 336: 6, 7, 8, 15ac