

If $x > 3$, which of the following is equivalent

to $\frac{1}{\frac{1}{x+2} + \frac{1}{x+3}}$?

A) $\frac{2x+5}{x^2+5x+6}$

B) $\frac{x^2+5x+6}{2x+5}$

C) $2x+5$

D) x^2+5x+6

Two ways to solve: algebraically or make up #'s.

Algebraically

In order to add fractions, they need to have a common denominator.

It looks like the common denom is going to be $(x+2)(x+3)$. So multiply the whole thing by $\frac{(x+2)(x+3)}{(x+2)(x+3)}$

$$\left(\frac{1}{x+2} + \frac{1}{x+3}\right) \cdot \frac{(x+2)(x+3)}{(x+2)(x+3)}$$

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

FOIL the top

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

OR Make up numbers

Let's say $x=4$

$$\frac{1}{4+2} + \frac{1}{4+3}$$

$$= \frac{1}{6} + \frac{1}{7}$$

create common denominator of $7 \times 6 = 42$

$$= \frac{7}{42} + \frac{6}{42}$$

$$= \frac{13}{42} = 1 \cdot \frac{42}{13} = \frac{42}{13}$$

Now which answer matches $\frac{42}{13}$ when $x=4$?

$$A. \frac{2(4)+5}{(4)^2+5(4)+6} = \frac{13}{42}$$

I don't need to keep going b/c I'm looking for 42 in the numerator, not 13. So I know this isn't the right answer

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$$B. \frac{(4)^2 + 5(4) + 6}{2(4) + 5} = \frac{16 + 20 + 6}{8 + 5} = \frac{42}{13} \quad \checkmark$$

(just for completeness, here are the other answers choices worked out)

$$C. 2(4) + 5 = 8 + 5 = 13 \quad \text{nope}$$

$$D. (4)^2 + 5(4) + 6 = 16 + 20 + 6 = 42 \quad \text{nope}$$