Why does \( \frac{a}{b} + \frac{c}{d} = \frac{ad + bc}{bd} \)

### Explaining the Math Behind the *Butterfly Method*

<table>
<thead>
<tr>
<th>STEPS</th>
<th>REASONS</th>
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<tbody>
<tr>
<td>( \frac{a}{b} + \frac{c}{d} )</td>
<td>Given</td>
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</table>
| \( \frac{a}{b} \left( \frac{d}{d} \right) + \frac{c}{d} \left( \frac{b}{b} \right) \) | Create common denominators with the product \((bd)\).  
**Note:** The product \((bd)\) will produce a *common* denominator, but it will not always produce the *least* common denominator (LCD)...and that's okay! |
| \( \frac{ad}{bd} + \frac{cb}{db} \)     | Simplify  
**Note:** Multiplying a numerator and denominator by the same nonzero whole number (e.g. \( \frac{a}{d} \) or \( \frac{b}{b} \)) creates an equivalent fraction. |
| \( \frac{ad}{bd} + \frac{bc}{bd} \)     | Rewrite the numerator and denominator of the second fraction using the Commutative Property of Multiplication. |
| \( \frac{ad + bc}{bd} \)         | Simplify by adding the numerators of the two fractions with common denominators. |

**Conclusion:** Teach the math as an extension of equivalent fractions and adding/subtracting fractions with common denominators. Let the *students discover* the butterfly.