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# Common Algebra Mistakes

## Example: Solving an Equation

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### The Goal

Solve the equation for  $c$ :

$$\frac{1}{c-1} \cdot \frac{6c-6}{c} = 1$$

### The Mistake

Find the algebra mistake:

$$\frac{1}{c-1} \cdot \frac{6c-6}{c} = 1 \implies c + 6c^2 - 6c - 6c + 6 = 1$$

Need a hint? Look carefully at the red part of the algebra:

$$\frac{1}{c-1} \cdot \frac{6c-6}{c} = 1 \implies c + 6c^2 - 6c - 6c + 6 = 1$$

### The Correction

$$\begin{aligned} \frac{1}{c-1} \cdot \frac{6c-6}{c} = 1 &\implies 6(c-1) = (c-1)c \implies 6(c-1) - (c-1)c = 0 \\ &\implies (6-c)(c-1) = 0 \implies 6-c = 0 \text{ or } c-1 = 0 \implies c = 6 \text{ or } c = 1 \end{aligned}$$

We reject  $c = 1$  since it gives  $\frac{0}{0}$  in the original equation. Thus  $c = 6$ .

### An Explanation

The algebra attempted by the student is just plain wrong. (It appears that the student cross-multiplied the two rational expressions and added; this approach is invalid.) A correct solution starts by *multiplying* by the denominators and then continues by bringing all terms to the left side and then factoring. We note that one of the solutions obtained this way is rejected since it does not satisfy the original equation. An alternate approach starts by factoring the numerator of the original left side and then canceling the factor  $(c-1)$ . It is then easy to see that  $c = 6$  is the solution.