

Much easier to use Wolstenholme's theorem directly:

$$822! \left(\sum_{n=1}^{822} \frac{1}{n} \right) \equiv 0 \pmod{823^2}$$

$$\therefore 822! \left(\frac{r}{823s} - \frac{1}{823} \right) \cdot 823s \equiv 0 \pmod{823^3}$$

$$\therefore 822! (r-s) \equiv 0 \pmod{823^3}$$

but $(822!, 823) = 1$ as 823 is prime $\therefore r \equiv s \pmod{823^3}$.

and therefore the two strings are identical