10. The sum of integers from 1 to n that are relatively prime to n is congruent to $0 \pmod n$ $\forall n > 2$

$$\sum_{i=0}^{n} \begin{cases} i, & \text{if } \gcd(n,i)=1 \\ 0 & \text{else} \end{cases} \equiv 0 \pmod n$$

Theorem from class: The sum of integers relatively prime to n $\{1, n\}$ is $\frac{1}{2} n \varphi(n)$ $\forall n \geq 2$

via ↑

$$\frac{1}{2} n \varphi(n) \equiv 0 \pmod n$$

$$\frac{1}{2}(0)\varphi(n) \equiv 0 \pmod n$$

$$0 \equiv 0 \pmod n \quad \#$$