▶ **Problem 4.5-18** Find the smallest nonnegative integer x that satisfies the given system of congruences.

$x \equiv 1 \pmod 4$

$x \equiv 8 \pmod 9$

$x \equiv 10 \pmod{25}$

Solution. We first solve $x \equiv 1 \pmod 4$ and $x \equiv 8 \pmod 9$.

Since $1 = 1 \cdot 9 + (-2) \cdot 4$, we have $x = 1 \cdot 1 \cdot 9 + (-2) \cdot 8 \cdot 4 = -55 \equiv 17 \pmod{36}$.

Then we solve $x \equiv 10 \pmod{25}$ and $x \equiv 17 \pmod{36}$.

Since $1 = 13 \cdot 25 + (-9) \cdot 36$, we have $x = 13 \cdot 17 \cdot 25 + (-9) \cdot 10 \cdot 36 = 2285 \equiv 485 \pmod{900}$.

Therefore, $x = 485$. □