chinese remainder theorem

$x \equiv 1 \pmod 3$
$x \equiv 4 \pmod 5$
$x \equiv 6 \pmod 7$

starting with greatest mod

$x = 7k+6$
$7k+6 \equiv 4 \pmod 5$
$2k+1 \equiv 4 \pmod 5$
$2k \equiv 3 \pmod 5$ $\quad k \to 4$
$k \equiv 4 \pmod 5$
$k = 5i+4$

$x = 7(5i+4)+6 = \underbrace{35i+34}_{x}$ $\qquad x \equiv 34 \pmod{35}$

$35i+34 \equiv 1 \pmod 3$
$2i+1 \equiv 1 \pmod 3$
$2i \equiv 0 \pmod 3$ $\quad i \to 0$
$i \equiv 0 \pmod 3$
$i = 3m$

$x = 35(3m)+34$
$= 105m+34$ $\qquad x \equiv 34 \pmod{105}$

$x \equiv 2 \pmod 3$
$x \equiv 3 \pmod 5$
$x \equiv 2 \pmod 7$

$x = 7k+2$
$7k+2 \equiv 3 \pmod 5$
$2k \equiv 1 \pmod 5$
$k \equiv 3 \pmod 5$
$k = 5i+3$
$x = 7(5i+3)+2$
$x = 35i+23$ $\qquad x \equiv 23 \pmod{35}$

$35i+23 \equiv 2 \pmod 3$
$2i+2 \equiv 2 \pmod 3$
$2i \equiv 0 \pmod 3$
$i \equiv 0 \pmod 3$
$i = 3m$

$35(3m)+23 = x$
$105m+23 = x$ $\qquad x \equiv 23 \pmod{105}$