

## Tutorial 04

$$\textcircled{1} \quad \begin{aligned} N &\equiv 2 \pmod{5} \\ N &\equiv 3 \pmod{6} \end{aligned}$$

Using chinese remainder theorem ;

$b_i$	$N_i$	$x_i$	$b_i N_i x_i$
2	6	1	12
3	5	5	75

$$\begin{aligned} M &= n_1 \times n_2 \\ &= 5 \times 6 = 30 \end{aligned}$$

$$\begin{aligned} \therefore N &= \sum_{i=1}^2 b_i N_i x_i \pmod{M} \\ &= 87 \pmod{30} \\ &= 27 \pmod{30} \end{aligned}$$

$$N \equiv 27 //$$

$$\textcircled{2} \quad \begin{aligned} N &\equiv 2 \pmod{9} \\ N &\equiv 6 \pmod{12} \end{aligned}$$

$$\textcircled{3} \quad \begin{aligned} x &\equiv 1 \pmod{3} \\ x &\equiv 1 \pmod{4} \\ x &\equiv 1 \pmod{5} \\ x &\equiv 0 \pmod{7} \end{aligned}$$

$b_i$	$N_i$	$x_i$	$b_i N_i x_i$
1	140	5	700
1	105	1	105
1	84	4	336
0	60	2	120

$$\begin{aligned} N &= 3 \times 4 \times 5 \times 7 \\ &= 420 \end{aligned}$$

$$x = \sum_{i=1}^4 b_i N_i x_i \pmod{N}$$

$$\begin{aligned}
&= (700+105+336+120)(\text{mod } 420) \\
&= 1261(\text{mod } 420) \\
&= 1(\text{mod } 420) //
\end{aligned}$$

④  $x \equiv 3(\text{mod } 5)$   
 $x \equiv 1(\text{mod } 7)$   
 $x \equiv 6(\text{mod } 8)$

$b_i$	$N_i$	$x_i$	$b_i N_i x_i$
3	56	11	1848
1	40	3	120
6	35	3	630

$$\begin{aligned}
N &= 5 \times 7 \times 8 \\
&= 280
\end{aligned}$$

$$\begin{aligned}
x &= \sum_{i=1}^3 b_i N_i x_i (\text{mod } N) \\
&= (1848+120+630)(\text{mod } 280) \\
&= 2598(\text{mod } 280) \\
&= 78(\text{mod } 280) //
\end{aligned}$$