1. Apply the Euclidean algorithm and calculate

$$\gcd(26,9) \qquad\qquad \gcd(81,18)$$

2. Express the following pairs of numbers in the form of Bezout identity

$$\alpha a + \beta b = \gcd(a,b) \ .$$

$$(60,12) \qquad\qquad (12,18) \qquad\qquad (26,9)$$

3. Find multiplicative modular inverse

$$2^{-1} \text{ in } \mathbb{Z}_7 \qquad\qquad 4^{-1} \text{ in } \mathbb{Z}_{11}$$
$$9^{-1} \text{ in } \mathbb{Z}_{26} \qquad\qquad 2^{-1} \text{ in } \mathbb{Z}_6$$

4. Find additive inverse

$$-3 \text{ in } \mathbb{Z}_5 \qquad\qquad -4 \text{ in } \mathbb{Z}_{10}$$

5. How many invertible elements?

$$\mathbb{Z}_6 \qquad\qquad \mathbb{Z}_6^\times \qquad\qquad \mathbb{Z}_{11}^\times$$

6. Which elements have multiplicative inverses in $\mathbb{Z}_8$ and $\mathbb{Z}_{20}$?
7. Write out addition and multiplication tables in $\mathbb{Z}_5$ and $\mathbb{Z}_8$.
8. Which numbers are invertible in $\mathbb{Z}_8$ and $\mathbb{Z}_{20}$?
9. Solve the following linear equations

$$\begin{array}{lll}
2x \equiv 1 \pmod 7 & 4x \equiv 1 \pmod{11} & 9x \equiv 1 \pmod{26} \\
x+3 \equiv 2 \pmod 5 & 5+6 \equiv x \pmod{11} & 5x+2 \equiv 3 \pmod 7 \\
4x+3 \equiv 11 \pmod{12} & x-4 \equiv 7 \pmod{12} & 4x \equiv 2 \pmod{19} \\
4x+3 \equiv 5 \pmod{13} & 2x+1 \equiv 9x-4 \pmod{23} & 5x-1 \equiv 3x+1 \pmod{26}
\end{array}$$

10. Solve the systems of linear equations

$$\begin{cases} a+b \equiv 17 \pmod{26} \\ 2a+b \equiv 0 \pmod{26} \end{cases} \qquad \begin{cases} a+b \equiv 17 \pmod{26} \\ 4a+b \equiv 1 \pmod{26} \end{cases}$$

$$\begin{cases} a+b \equiv 17 \pmod{26} \\ 3a+b \equiv 0 \pmod{26} \end{cases} \qquad \begin{cases} a+b \equiv 17 \pmod{26} \\ 16a+b \equiv 10 \pmod{26} \end{cases}$$

$$\begin{cases} 8a+b \equiv 8 \pmod{26} \\ 5a+b \equiv 13 \pmod{26} \end{cases}$$