① Simple Congruency:

Check if $17 \equiv 5 \pmod{12}$

$x \equiv y \pmod{n} \iff n \mid (x-y)$

Step 1 – Compute the difference between x and y:

- $x = 17 \quad y = 5 \quad (x-y) = (17-5) = 12$

Step 2 – Check divisibility of difference result:

- 12 is DIVISIBLE by 12 ($12 \mid 12 = 1$)

Answer: $17 \equiv 5 \pmod{12}$ because 12 divides 12

② Same remainder method:

Verify if $15 \equiv 3 \pmod{4}$

$x \equiv y \pmod{n} \iff n \mid (x-y)$

$x = 15 \quad y = 3 \quad n = 4$

Step 1 – Find the remainders between x and n:

- $15 \div 4 = 3$ remainder 3
  $3 \div 4 = 0$ remainder 3

Answer: $15 \equiv 3 \pmod{4}$
Since both 15 and 3 leave a remainder of 3 when divided by 4

③ Negative numbers:

Determine if $-8 \equiv 4 \pmod{6}$

$x \equiv y \pmod{n} \iff n \mid (x-y)$

$x = -8 \quad y = 4 \quad n = 6$

$(x-y) = (-8-4) = -12$

$-12/6 = -2$ remainder $0 \rightarrow$ Divisible

Answer: $-8 \equiv 4 \pmod{6}$ since -12 is divisible by 6