

1.  $-17 \bmod 23$ ?

→ To Compute  $-17 \bmod 23$ , we want to the remainder when  $-17$  is divided by  $23$ , expressed as a non-negative integer less than  $23$ .

$$-17 \bmod 23 = 23 - (17 \bmod 23) = 23 - 17 = 6$$

$$\therefore 6 = -17 \bmod 23$$

2. Multiplicative Inverse of -13 upon modulo 23?

⇒ To find the multiplicative inverse of -13 mod 23, we want a number  $x$  such that,  
$$(-13) \cdot x \equiv 1 \pmod{23}$$

Since modular arithmetic is cyclic, we can first reduce  $-13 \pmod{23}$ :  
$$-13 \pmod{23} = 10$$

So, the problem becomes:

$$10 \cdot x \equiv 1 \pmod{23}$$

To solve  $10x \equiv 1 \pmod{23}$

we need to find  $x$  such that is true.

Try small values:

$$* 10 \cdot 1 = 10 \quad (\text{less than } 23)$$

$$* 10 \cdot 2 = 20 \quad (\text{less than } 23)$$

$$* 10 \cdot 3 = 30 \equiv 7 \pmod{23}$$

$$* 10 \cdot 4 = 40 \equiv 17 \pmod{23}$$

$$* 10 \cdot 5 = 50 \equiv 4 \pmod{23}$$

$$* 10 \cdot 6 = 60 \equiv 14 \pmod{23}$$

$$* 10 \cdot 7 = 70 \equiv 1 \pmod{23}$$

So,  $10 \cdot 7 \equiv 1 \pmod{23}$

