Assignment-03

$-17 \bmod 23 = ?$

$\Rightarrow 23 \left| \begin{matrix} -17 \\ (+)-23 \end{matrix} \right| -1$

6

$-17 = (-1 \times 23) + 6$

$\therefore -17 \bmod 23 = 6$

Multiplicative inverse of -13 and 23 ?

→ The multiplicative inverse of a number a mod m is a number x such that : $ax \equiv 1 \bmod m$

In our case, we are looking for a number x such that :

$-13x \equiv 1 \bmod 23$

To simplify we first convert -13 into a positive equivalent module 23.

$-13 \bmod 23 = -13 + 23 = 10$

so, the equivalent equation become 3

$10x \equiv 1 \bmod 23$

Now, we find the integer x such that,

$10x \equiv 1 \mod 23$

if $10x \equiv 1 \mod 23$

if $x = 1$ $10 \times 1 = 10 \not\equiv 1 \mod 23$

if $x = 2$ $10 \times 2 = 20 \not\equiv 1 \mod 23$

if $x = 3$ $10 \times 3 = 30 \not\equiv 7 \mod 23$

if $x = 4$ $10 \times 4 = 40 \equiv 17 \mod 23$

if $x = 5$ $10 \times 5 = 50 \equiv 4 \mod 23$

if $x = 6$ $10 \times 6 = 60 \equiv 14 \mod 23$

if $x = 7$ $10 \times 7 = 70 \equiv 1 \mod 23$

we found it : $10 \times 7 = 70 \equiv 1 \mod 23$

∴ since $-13 \equiv 10 \mod 23$ and $10^{-1} \mod 23 = 7$

The multiplicative inverse of $-13 \mod 23$ is 7.