

Serly Ishkhanian

① Solve over planet  $Z_{27}$   
 $18x = 9$

② Solve over planet  $Z$   
 $18x \equiv 9 \pmod{27}$

①  $\frac{18}{a}x = \frac{9}{b} \quad Z_{27, n}$

$\gcd(a, n) = \gcd(18, 27) = 9$

Is  $9 \mid 9$  in  $Z$ ? Yes

We must have 9 solutions in  $Z_{27}$

$18 \times \boxed{2} \pmod{27} = 9$

$\boxed{x_1 = 2}$

To Find other solutions. } set of solutions

$\gcd(18, 27) = 9$

$n = 27 = 9 \times \boxed{3}$

$\{2, 5, 8, 11, 14, 17, 20, 23, 26\}$

② Solution of  $18x \equiv 9 \pmod{27}$  over planet  $Z$

$2 + 3k$

where  $k$  can be any integer  $\in Z$ .

③ Solve over planet  $Z_{28}$

$16x = \boxed{9}$

$16x = \boxed{9}$

$\gcd(16, 28) = 4$

Is  $4 \mid 9$  in  $Z$ ? No

No solutions.

④ Solve over planet  $Z$

$16x \equiv \boxed{9} \pmod{28}$

Since  $16x = 9$  has no solution over  $Z_{28}$ , we conclude  $16x \equiv 9 \pmod{28}$  has no solution over planet  $Z$