Göktuğ
Ekinci
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for first even = 2

$9 = 1 \mod 8$

true

Proof by contradiction

assuming $(a+1)^2 \equiv 1 \mod 8$

if $a=2$ $\quad (2+1)^2 \equiv 1 \mod 8$ deduction

$= 9 \equiv 1 \mod 8$

if $a=4$ $\quad (4+1)^2 = 1 \mod 8$

$= 25 = 1 \mod 8$

if $a=6$ $\quad (6+1)^2 \equiv 1 \mod 8$

$49 = 1 \mod 8$

if $a=8$ $\quad (8+1)^2 \equiv 1 \mod 8$

$81 \equiv 1 \mod 8$

Every even integer is congruent to 2,4,6,8 by modulo 8 so;

$(a+1)^2 \equiv 1 \mod 8$

Göktuğ Ekinci

Part b)

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the congruence $x \equiv 2 \mod 6$ is equal to

$x \equiv 2 \mod 3$ and $x \equiv 0 \mod 2$

the congruence $x \equiv 3 \mod 9$ is equal to

$x \equiv 0 \mod 3$ and $x \equiv 3 \mod 3$

Only 3 of these are distinct

$x \equiv 2 \mod 3$, $x \equiv 0 \mod 2$, $x \equiv 0 \mod 3$

$x \equiv 2 \mod 3$ and $x \equiv 0 \mod 3$ is

a contradict since x is same for congruences

So, there is no simultaneous solution