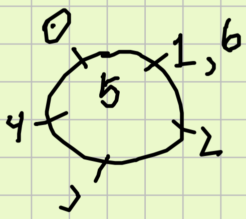
$2x \equiv 3 \pmod{5}$

are 2 and 5 relatively prime? yes

must find the inverse of 2 under mod 5.



$\frac{6}{2} = 3$

so 3 is $\tilde{2}$

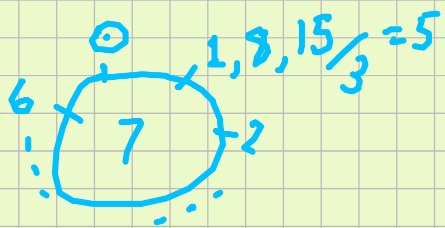
now multiply both sides by $\tilde{2}$ to eliminate the coefficient

$$\tilde{2} \cdot 2x \equiv \tilde{2} \cdot 3 \pmod{5}$$
$$x \equiv 3 \cdot 3 \pmod{5}$$
$$x \equiv 4 \pmod{5}$$

Solve $3x \equiv 2 \pmod{7}$ **for x.**

First, are 3 and 7 relatively prime? yes

Now find 3's inverse under mod 7:



So the inverse of 3 under mod 7 is 5.

Now multiply both sides of the congruence by 5 to eliminate the 3 coefficient on the left side:

$$3 \cdot 5x \equiv 2 \cdot 5 \pmod{7}$$
$$1x \equiv 10 \pmod{7}$$
$$x \equiv 3 \pmod{7}$$

Plugging back into the original congruence to check, we see that 3*3 is 9 which is 2 under mod 7.