

1. Construct a multiplication table for $\mathbb{Z}/6\mathbb{Z} := \{0, 1, 2, 3, 4, 5\}$.

2. Find the least positive residue of $1! + 2! + 3! + \cdots + 10!$ modulo each of the following integers

(a) 3

(c) 11

(b) 4

(d) 23

3. Show that if a is an even integer, then

$$a^2 \equiv 0 \pmod{4}$$

and if a is an odd integer, then

$$a^2 \equiv 1 \pmod{4}$$

4. Show that $4^{3n+1} + 2^{3n+1} \equiv 6 \pmod{7}$ for all integers $n \geq 0$

5. Find all solutions to each of the following linear congruences:

(a) $3x \equiv 2 \pmod{7}$

(b) $17x \equiv 14 \pmod{21}$

(c) $15x \equiv 9 \pmod{25}$