

1) Consider the set \mathbb{Z}_4 with binary operations $+$ and $*$ (multiplication).

a. Fill in the tables below.

$+$	0	1	2	3
0				
1				
2				
3				

$*$	0	1	2	3
0				
1				
2				
3				

b. List the additive inverse of each element in \mathbb{Z}_4 below.

c. List all of the multiplicatively invertible elements in and their inverses below.

d. Solve the equation $2x - 1 = 0$ in \mathbb{Z}_4 .

e. For each element, $n \in \mathbb{Z}_4$, find out the smallest positive integer, k , such that

$$kn = 0 \pmod{4}$$

$$n^k = 1 \pmod{4}$$

2) Consider the set \mathbb{Z}_5 with binary operations $+$ and $*$ (multiplication).

a. Fill in the tables below.

$+$	0	1	2	3	4
0					
1					
2					
3					
4					

$*$	0	1	2	3	4
0					
1					
2					
3					
4					

b. List the additive inverse of each element in \mathbb{Z}_5 below.

c. List all of the multiplicatively invertible elements in and their inverses below.

d. Solve the equation $2x - 1 = 0$ in \mathbb{Z}_5 .

e. For each element, $n \in \mathbb{Z}_5$, find out the smallest positive integer, k , such that

$$kn = 0 \pmod{5}$$

$$n^k = 1 \pmod{5}$$

3) Consider the set \mathbb{Z}_6 with binary operations $+$ and $*$ (multiplication).

a. Fill in the tables below.

$+$	0	1	2	3	4	5
0						
1						
2						
3						
4						
5						

$*$	0	1	2	3	4	5
0						
1						
2						
3						
4						
5						

b. List the additive inverse of each element in \mathbb{Z}_6 below.

c. List all of the multiplicatively invertible elements in and their inverses below.

d. Solve the equation $2x - 1 = 0$ in \mathbb{Z}_6 .

e. For each element, $n \in \mathbb{Z}_6$, find out the smallest positive integer, k , such that

$$kn = 0 \pmod{6}$$

$$n^k = 1 \pmod{6}$$

4) Consider the set \mathbb{Z}_7 with binary operations $+$ and $*$ (multiplication).

a. Fill in the tables below.

+	0	1	2	3	4	5	6
0							
1							
2							
3							
4							
5							
6							

*	0	1	2	3	4	5	6
0							
1							
2							
3							
4							
5							
6							

b. List the additive inverse of each element in \mathbb{Z}_7 below.

c. List all of the multiplicatively invertible elements in and their inverses below.

d. Solve the equation $2x - 1 = 0$ in \mathbb{Z}_7 .

e. For each element, $n \in \mathbb{Z}_7$, find out the smallest positive integer, k , such that

$$kn = 0 \pmod{7}$$

$$n^k = 1 \pmod{7}$$

5) Consider the set \mathbb{Z}_8 with binary operations $+$ and $*$ (multiplication).

a. Fill in the tables below.

+	0	1	2	3	4	5	6	7
0								
1								
2								
3								
4								
5								
6								
7								

*	0	1	2	3	4	5	6	7
0								
1								
2								
3								
4								
5								
6								
7								

b. List the additive inverse of each element in \mathbb{Z}_8 below.

c. List all of the multiplicatively invertible elements in and their inverses below.

d. Solve the equation $2x - 1 = 0$ in \mathbb{Z}_8 .

e. For each element, $n \in \mathbb{Z}_8$, find out the smallest positive integer, k , such that

$$kn = 0 \pmod{8}$$

$$n^k = 1 \pmod{8}$$