

Pre Calc BC _____ **Isomorphisms**

Name _____

Examine the following pairs of groups and determine whether they are isomorphic. Make a list of elements and their orders to get started.

1. _____ and (\mathbb{Z}_4, \oplus) .

*	w	x	y	z
w	z	y	w	x
x	y	z	x	w
y	w	x	y	z
z	x	w	z	y

2. The *rotational* symmetry group of a square, and $(\{2, 4, 6, 8\}, \otimes_{10})$ (What is the identity in the second group?).

3. The permutation group of 2 elements, and (\mathbb{Z}_2, \oplus) .

4. $(\mathbb{Z}_5^*, \otimes)$, and $(\{1, 3, 7, 9\}, \emptyset)$, where $x \emptyset y =$ the last digit in the product xy .

5. (\mathbb{Z}_5, \oplus) and the rotational symmetry group for a regular pentagon.

6. $(\{1, 2, 4, 5, 7, 8\}, \otimes_9)$ and $\left(\left\{ 1, -1, \left(\frac{1}{2} + \frac{\sqrt{3}}{2}i \right), \left(-\frac{1}{2} + \frac{\sqrt{3}}{2}i \right), \left(-\frac{1}{2} - \frac{\sqrt{3}}{2}i \right), \left(\frac{1}{2} - \frac{\sqrt{3}}{2}i \right) \right\}, \times \right)$.

7. Can you draw a figure whose symmetry group is isomorphic to the group shown at right? (Can you draw a figure for which this represents the entire symmetry group, or is this merely a sub-group?)

*	C	I	P	S
C	S	P	I	C
I	P	S	C	I
P	I	C	S	P
S	C	I	P	S