

1. Imagine a collection of 4 elements A, B and C and D under the operation $*$ where

$$A * B = A; \quad B * C = C, \quad B * D = D, \quad A * C = D, \quad A * A = D \quad A * D = B$$

	A	B	C	D
A	D	A	D	B
B	A			
C	D			
D	B			

a) Name the identity in the group or say that there is not one. B

b) Does A have an inverse element? If so name it and tell how you know. If not explain why.

yes, D is inverse since $A * D = B$, the identity element

c) From the evidence above does it seem like the "group" exhibits closure? Explain how you know.

no, because you cannot get C from $A * x$

d) Assume associativity. What is the period of A? 3

$$A * A = D \cdot A = B \cdot A = A$$

2. Explain why the set of numbers: $\{1, -1\}$ is a group under multiplication but not addition. To receive full credit, you must discuss all 4 characteristics of a group

mult **GROUP**

✓ closure: $1 \cdot 1 = 1, 1 \cdot -1 = -1, -1 \cdot 1 = -1, -1 \cdot -1 = 1$

✓ asso: multiplication is associative

✓ identity: 1 is I element since $1 \cdot x$ is still x

✓ inverse: mult 1 by 1 to get back to 1 (1) and mult -1 by -1 to get back to 1

add **NOT GROUP**

X closure: $-1 + (-1)$ is -2, which is not included

✓ asso: addition is associative

X identity: adding 1 or -1 will change the number it is being added to so no I

X inverse: no I element so no inverse

3. How many elements are there in the 6 post snap group? 6!

a. Draw a 6-post element that would have a period of 1 or state that there is no such element.



b. Draw a 6-post element that would have a period of 5 or state that there is no such element..



$0 \quad 6 = 6$
 $1 \quad 5 = 5$
 $2 \quad 4 = 4$
 $3 \quad 3 = 3$
 $2 \quad 3 \quad 1 = 6$

c. Draw a 6-post element that would have a period of 12 or state that there is no such element.

no such element

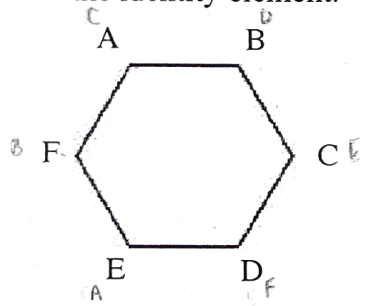
3 4. What is the maximum period of an element in the 15-post snap group? Draw this element. (you will receive partial credit if your element has a fairly large period, but isn't actually the maximum)

$3 \quad 4 \quad 5 \quad 3 = 60$
 $7 \quad 3 \quad 2 = 42$
 $6 \quad 4 \quad 5 = 60$
 $5 \quad 7 \quad 2 = 56$
 $7 \quad 6 \quad 2 = 84$



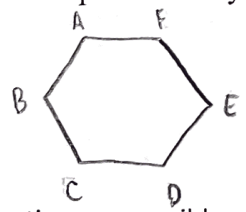
max pd is 105

5. Consider the dihedral (reflection/rotation) group for the regular hexagon where the element shown is the identity element.

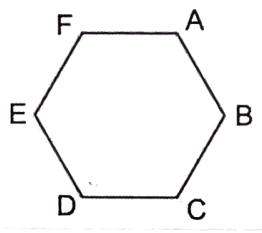


Let "f" be defined as the operation "reflect over the horizontal symmetry line (for the identity this would be line FC). Let "r" be defined as the operation rotate counterclockwise by 60 degrees.

a) Draw the element represented by $f \bullet r^2$



b) using as few operations as possible, name the element below (use r's and f's).



$f r f$

