

- What are the requirements a set of elements must satisfy in order for them to be a group under a certain operation? [3]
- Consider the four-member collection of elements Q, R, S and T as displayed in the table below under the operation @

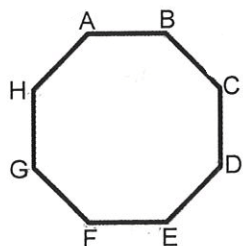
	Q	R	S	T
Q	Q	R	S	T
R	R	S	T	Q
S	S	T	Q	R
T	T	Q	R	S

- Is there an identity in this group? If so, name it and defend your answer. If not, justify. [ 2]
  - Does every element have an inverse element? Name the inverse of each element that has one.[ 2]
  - Name the period of element T ( or state that it does not have one) [2]
  - Do the set of these elements satisfy the requirements to be a group? [2]
- Draw a 10-post element that would have a period of 16 or state there is no such element. [2]
  - What is the **maximum** period of an element in the 30-post snap group? Justify your reasoning.[3]

5. Is the set of numbers:  $\{1, -1, i, -i\}$  a group under multiplication? If not, justify using the requirements to be a group. [2]
6. Is the set of numbers:  $\{1, -1, i, -i\}$  a group under addition? If not, justify using the requirements to be a group. [2]
7. Below are some of the elements of the 10-post snap group. Below each element, write down its period. [4]

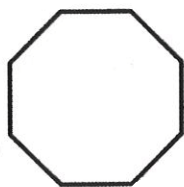


8. Consider the dihedral (reflection/rotation) group for the regular octagon where the element shown is the identity element.

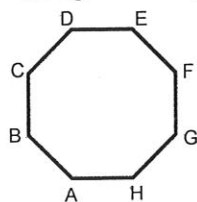


Let "f" be defined as the operation "reflect over the GC line in the identity. Let "r" be defined as the operation rotate counterclockwise by 225 degrees.

- a) Draw the element represented by  $r \cdot f \cdot r$  [2]



- b) using as few operations as possible, name the element below (use r's and f's). [3]



- c) If we just use <sup>generator</sup> r, rotate clockwise by 225 degrees, as a generator, can we generate all the elements of the dihedral group for the regular octagon? [1]