When we have created a labeling scheme that proves two groups are the "same", we call the labeling scheme an *isomorphism* and say that the two groups are *isomorphic*. (The terminology comes from the Greek phrase for "identical structure."

Consider the following labeling scheme between $\boldsymbol{D}_6$ and the mystery group ***G***.

$$A \leftrightarrow {}_FS_i \qquad B \leftrightarrow S_i \qquad C \leftrightarrow {}_FS_{2R}$$

$$D \leftrightarrow S_{1R} \qquad E \leftrightarrow {}_FS_{1R} \qquad G \leftrightarrow S_{2R}$$

TASK 1: Working on your own, decide whether or not this labeling scheme is an isomorphism.

TASK 2: Discuss and justify your decision with your group members.

TASK 3: Working on your own, decide whether or not it is possible to complete the labeling scheme started below so that the end result is an isomorphism.

$$G \leftrightarrow {}_FS_i \qquad C \leftrightarrow S_{1R}$$

TASK 4: Discuss your strategy with your group members.

A labeling scheme between two groups is really a special *function* between the universes of these groups. For example, the labeling scheme used in Task 1 could be written using function notation.

Let *L* represent the labeling scheme as a function *from* the set *G* *to* the set D_6. In function notation, we would have

$$L(A) = {}_FS_i \qquad L(B) = S_i \qquad L(C) = {}_FS_{2R}$$

$$L(D) = S_{1R} \qquad L(E) = {}_FS_{1R} \qquad L(G) = S_{2R}$$

TASK 5: Suppose we let *M* represent the labeling scheme as a function *from* the set D_6 *to* the set *G*. Write the labeling scheme using function notation.

TASK 6: How are the functions *L* and *M* related to each other?

TASK 7: Suppose that ***G***=(G,*) and ***H*** = (H, #) are groups, and suppose *f* is a function *from* the set *G* *to* the set *H*. What conditions must *f* satisfy to guarantee that *f* is an isomorphism?