# Quiz 2

This is a two-stage quiz. During the first stage, use your knowledge & calculator to take this quiz. You have 15 min. In the second stage, you are now welcome to use your books, notes, and students in the class to retake the same quiz. You have 15 min. to write one solution (with everyone's name on it!) to be turned in for the group.

Show your work as you would for a colleague. Partial credit requires reasonable support.

1. Consider the alternating group on four elements, $A_4$ and let $H = \langle (1,2,3) \rangle$. The left cosets of $\langle (1,2,3) \rangle$ are in the table below.

Table 1: left cosets of $\langle (1,2,3) \rangle$

| | | | |
|---|---|---|---|
| () | (1,2,4) | (1,3,4) | (1,4,2) |
| (1,2,3) | (1,3)(2,4) | (2,3,4) | (1,4,3)) |
| (1,3,2) | (2,4,3) | (1,2)(3,4) | (1,4)(2,3)) |

   (a) [1] What is $[A_4 : H]$?

   (b) [2] Find the elements in the right coset $H(1,2,4)$.

   (c) [1] Is $H \trianglelefteq A_4$? Justify your answer.

2. Consider $\theta : D_4 \to \mathbb{Z}_8$ defined by $\theta(rf) = 4$ and $\theta(r) = 4$.

   (a) [2] Does $\theta$ define a homormophism? Justify your answer.

   (b) [2] Find $\ker(\theta)$.

   (c) [2] What is $D_4/\ker(\theta)$ isomorphic to? Provide justification.