# Problem Set 1
## Due: 10:00 a.m. on Tuesday, January 29

*Instructions:* All students except for the presenter are to complete all of the exercises below. Be sure to adhere to the expectations outlined on the sheet *Guidelines for Problem Sets*. Submit your solutions in-class or to Dr. Cooper's mailbox in the Department of Mathematics.

*Exercises:*

1. Determine the Stanley-Reisner ideal $I_\Delta$ associated to the simplicial complex $\Delta$ on the vertex set $V_\Delta = \{x_1, x_2, x_3, x_4\}$ where $\Delta$ has the maximal facets:

$$\{x_1, x_3, x_4\}, \{x_2, x_4\}, \{x_2, x_3\}.$$

2. Let $\Delta$ and $\Gamma$ be simplicial complexes on disjoint sets $V$ and $W$. The *join* $\Delta * \Gamma$ is the set on the vertex set $V \cup W$ with elements $F \cup G$ where $F \in \Delta$ and $G \in \Gamma$. Show that $\Delta * \Gamma$ is a simplicial complex.

3. Construct a graph from the map of Canada by letting the vertices be the provinces and territories and two vertices are connected by an edge if their corresponding provinces/territories are adjacent. What is the chromatic number of this graph?