HW 14 **Prof. Caldwell**
Due: 22 October 2009 **COSC 2300**

Recall: The *powerset* of a set A is written $\rho(A)$ and is the set of all subsets of A. We charaterized the power set by saying what it means to be an element of such a set.

$$x \in \rho(A) \stackrel{\text{def}}{=} x \subseteq A$$

The *Cartesian product* of A and B is the set of all pairs $\langle x, y\rangle$ such that $x \in A$ and $y \in B$.

$$A \times B \stackrel{\text{def}}{=} \{z \in \rho(\rho(A \cup B)) |\ \exists x : A. \exists y : B.\ z = \langle x, y\rangle\}$$

1. Let $A = \{x, y, z\}$ and $B = \{1, 2\}$, write down the following sets.

   a.) $A \times B$

   b.) $B \times A$

   c.) $\rho(B)$

   d.) $\rho(\emptyset)$

2. Recall, ordered pairs can be encoded as sets.

   $$\langle a, b\rangle = \{\{a\}, \{a, b\}\}$$

   Let $A = \{1\}$ and $B = \{a\}$, write down the elements of $\rho(\rho(A \cup B))$ (there should be 16 of them) and indicate which are valid encodings of ordered pairs[1]. (from $A \times A$, $A \times B$, $B \times A$ or $B \times B$).

[1] Remember that $\langle a, a\rangle = \{\{a\}\}$