CS4112 Tutorial Exercises 1

1. List the members of the following sets:

   - $\{x \mid x \text{ is a real number such that } x^2 = 1\}$
   - $\{x \mid x \text{ is a positive integer less than } 12\}$
   - $\{x \mid x \text{ is an integer and } x < 100\}$
   - $\{x \mid x \text{ is an integer such that } x^2 = 2\}$

2. What is the cardinality of each of the following sets?

   - $\{a\}$
   - $\{\{a\}\}$
   - $\{a, \{a\}\}$
   - $\{a, \{a\}, \{a, \{a\}\}\}$

3. For each of the sets in the previous question determine if the element $\{a\}$ is in each set.

4. Let $A = \{m, n, p\}$ and $B = \{1, 2\}$. Compute the Cartesian Product of $A \times B$, $B \times A$ and $A \times A$. What relationship can you identify between $A \times B$ and $B \times A$? Is $A \times B = B \times A$? What does this mean about the cartesian product? What is the relationship between the number of elements in $A \times B$, and the number of elements in A and B?

5. Calculate $\emptyset \times A$ for any set A.

6. Give an example of a relation in terms of a set of ordered pairs which is not a function giving a reason for your answer.