1: For each of these pairs of sets, determine whether the first is a subset of the second, the second is a subset of the first, or neither is a subset of the other.

(a) the set of people who can write programs, the set of people who can write C++ programs

(b) the set of fruits, the set of citrus fruits

(c) the set of students studying discrete mathematics, the set of students studying data structures

2: Determine whether each of these statements are true or false. Note that here $\subset$ denotes "is a proper subset of".

(a) $\emptyset \in \{\emptyset\}$

(b) $\emptyset \in \{\emptyset, \{\emptyset\}\}$

(c) $\{\emptyset\} \in \{\emptyset\}$

(d) $\{\emptyset\} \in \{\{\emptyset\}\}$

(e) $\{\emptyset\} \subset \{\emptyset, \{\emptyset\}\}$

(f) $\{\{\emptyset\}\} \subset \{\emptyset, \{\emptyset\}\}$

(g) $\{\{\emptyset\}\} \subset \{\{\emptyset\}, \{\emptyset\}\}$

3: What is the cardinality of each of these sets?

(a) $\emptyset$

(b) $\{\emptyset\}$

(c) $\{\emptyset, \{\emptyset\}\}$

(d) $\{\emptyset, \{\emptyset\}, \{\emptyset, \{\emptyset\}\}, \{\emptyset, \{\emptyset\}, \{\emptyset, \{\emptyset\}\}\}\}$

4: Prove that if n is an integer and $5n + 2$ is even, then n is even.

5: Show that at least four of any 37 days must fall in the same month of the year.