

## COSC 030, Fall 2015: Problem Set #2

**Assigned:** Tuesday, 9/15.

**Due:** Tuesday, 9/22, at the beginning of class (hand in hard copy).

**Lectures Covered:** Week 3.

**Academic Integrity:** You must work alone on the problem set and not consult outside sources (with the exception of the professor and teaching assistants). See the syllabus for details on the academic integrity policy for problem sets.

### Problems

1. Let  $B$  be the set containing the first names of the Beatles and  $P$  be the set containing the first names of the US presidents. Define the set  $B \cap P$  using both roster and set builder notation.
2. Let  $A = \{a, b, c\}$ ,  $B = \{\text{dog}, \text{cat}, \text{house}, a\}$ , and  $C = \{a, \text{cat}\}$ . Specify whether each of the following statements is *true* or *false*.
  - (a)  $C \subset B$
  - (b)  $C \subseteq A$
  - (c)  $C \subseteq B$
  - (d)  $A \cap \mathbb{R}$  is infinite.
  - (e)  $|A \cup C| = 5$
3. Describe using set builder notation a set  $D$  such that: (a)  $D$  is infinite; and (b)  $|B - D| = 1$  (where  $B$  is defined in the preceding problem).
4. Define a function  $f$  that satisfies the following three properties: (1) its domain and range both contain 3 elements; (2) it is one-to-one; and (3) it is *not* onto.
5. Let  $\mathbb{D}_{\mathbb{E}}$  be the set of all words in the standard English dictionary. Let  $h : \mathbb{D}_{\mathbb{E}} \rightarrow \{a, b, c, \dots, y, z\}$  be the function that maps each word  $w \in \mathbb{D}_{\mathbb{E}}$  to the first letter in  $w$  (e.g.,  $h(\text{cat}) = c$ ). Let  $\{a_i\}$ , be the sequence defined for  $1 \leq i \leq 3$  where  $a_1 = \text{math}$ ,  $a_2 = \text{methods}$ ,  $a_3 = \text{problem}$ .

What is the value of the following summation:

$$\sum_{i=2}^3 |\{f(a_i)\} \cap \{m\}|$$