

## COSC 030, Fall 2014: Problem Set #2

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

**Due:** Tuesday, 9/16, 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. Consider the set consisting of the first names of the Beatles. Write this set using both roster and set builder notation.
2. Let  $A = \{a, b, c\}$ ,  $B = \{dog, cat, house, a\}$ , and  $C = \{a, cat\}$ . 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 finite.
  - (e)  $|A \cup C| = 5$
3. Describe using set builder notation a set  $D$  such that: (a)  $D$  is infinite; and (b)  $B - D = \{dog, house\}$  (where  $B$  is defined in the preceding problem).
4. Describe a function  $f : \{1, 2, 3, 4, 5\} \rightarrow \{1, 2, 3, 4, 5\}$  that is *not* onto.  
(To describe a function, draw a table that provides the value of  $f(i)$  for each  $i$  in its domain.)
5. Describe a function  $g : \{1, 2, 3, 4, 5\} \rightarrow \{1, 2, 3, 4, 5\}$  that is a bijection.
6. 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  $w$  (i.e.,  $h(cat) = c$ ). 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:

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