CISC-102 Winter 2016

Quiz 1

January 26, 2016

Student ID: __Solutions__

Read the questions carefully. Please clearly state any assumptions that you make that are not explicitly stated in the question.

Please answer all questions in the space provided. Use the back of pages for scratch work. There are 3 pages to this quiz. Note that (x) denotes the question is worth x points.

Special symbols are used as follows:

$\mathbb{N}$ denotes the set of positive integers, $\mathbb{Z}$ denotes the set of integers, $\mathbb{Q}$ denotes the set of rational numbers and $\mathbb{R}$ denotes the set of real numbers.

1. List all of the elements in the following sets.

   (a) (2) A = $\{x : x \in \mathbb{N}, 1 \leq x \leq 7\}$.

   $$A = \{1, 2, 3, 4, 5, 6, 7\}$$

   (b) (2) B = $\{x : x \in \mathbb{Z}, x^2 - 1 = 0\}$.

   $$B = \{-1, 1\}$$

   (c) (2) C = $\{x : x \in \mathbb{Q}, x^2 - 4 = 0\}$.

   $$C = \{2, -2\}$$

   (d) (2) D = $\{x : x \in \mathbb{R}, x^2 + 4 = 0\}$

   $$D = \emptyset$$

2. Consider the following sets X = {1,3,5,7}, Y = {3,4,5,6}, Z = {3,7}.

(a) (3) Suppose $A \subseteq B$, which of the sets above can be A and which can be B? Please provide all of the possibilities if more than one.

$$X \subseteq X, \quad Y \subseteq Y, \quad Z \subseteq Z, \quad Z \subseteq X$$

(b) (3) Suppose $C \supset D$ which of the sets above can be C and which can be D? Please provide all of the possibilities if more than one.

$$X \supset Z$$

(c) (3) Let E be a set that is a subset of $X \cap Y \cap Z$ with the most elements. What are the elements of E?

$$\{3\}$$

(d) (3) Let F be a set that is a subset of $X \cup Y \cup Z$ with the fewest elements. What are the elements of F?

$$\emptyset$$

3. (3) Ten households responded to a survey on the pets that they had. Six responded that they had dogs, four said they had cats, and two replied that they had neither cats nor dogs. Using these responses find the number of households with both cats and dogs.

$$6 + 4 - x = 8$$

so $x = 2$ the number of households with both cats & dogs

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4. Recall that the *relative complement* of a set B with respect to set A is denoted by $A \setminus B$ and the *symmetric difference* of sets A and B is denoted by $A \oplus B$ are define as:
$$A \setminus B = \{x : x \in A, x \notin B\}, A \oplus B = (A \cup B) \setminus (A \cap B).$$

Let $\mathbb{U} = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$, $A = \{1, 3, 4\}$, $B = \{2, 3, 4, 5\}$, and $C = \{3, 4\}$.

(a) (3)What is $A \setminus B$?

$$A \setminus B = \{1\}$$

(b) (3)What is $A \oplus B$?

$$A \oplus B = \{1, 2, 5\}$$

(c) (3) What is $(B \setminus C) \oplus A$

$$(B \setminus C) = \{2, 5\}, \ (B \setminus C) \oplus A = \{1, 2, 3, 4, 5\}$$

5. Let A = {{a}, {b,c,d,e}, {c,d}}. Determine whether each of the following statements is true or false.

(a) (1) $a \in A$ F $\{a\} \in A$

(b) (1) $\{\{a\}, \{c, d\}\} \subseteq A$ T

(c) (1) $\emptyset \in A$ F

(d) (1) $\emptyset \subseteq A$ T

(e) (1) $\emptyset \subset A$ T

(f) (1) $\{a, b, c, d, e\} \subset A$ F

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