CISC-102

HOMEWORK 1

Please work on these problems and be prepared to share your solutions on Monday morning next week. Assignments will not be collected for grading. I will go over the solutions to the problems in class and after class I will post them on the course web page.

READINGS

Read sections 1.1, 1.2, 1.3, and 1.4 of Schaum’s Outline of Discrete Mathematics.
Read sections 1.1, 1.2 and 1.3 of Discrete Mathematics Elementary and Beyond.

PROBLEMS

(1) Rewrite the following statements using set notation, and then give an example by listing members of sets that match the description. For example: A is a subset of C. Answer: A ⊆ C. A = \{1, 2\}, C = \{1, 2, 3\}.
   (a) The element 1 is not a member of (the set) A.
   (b) The element 5 is a member of B.
   (c) A is not a subset of D
   (d) E and F contain the same elements.
   (e) A is the set of integers larger than three and less than 12.
   (f) B is the set of even natural numbers less than 15.
   (g) C is the set of natural numbers x such that 4 + x = 3.

(2) \( A = \{x : 3x = 6\} \). A = 2, true or false?

(3) Which of the following sets are equal \( \{r, s, t\} \), \( \{t, s, r\} \), \( \{s, r, t\} \), \( \{t, r, s\} \).

(4) Consider the sets \( \{4, 2\} \), \( \{x : x^2 - 6x + 8 = 0\} \), \( \{x : x \in \mathbb{N}, x \text{ is even}, 1 < x < 5\} \).
   Which one of these sets is equal to \( \{4, 2\} \)

(5) Which of the following sets are equal: \( \emptyset \), \( \{\emptyset\} \), \( \{0\} \).

(6) Explain the difference between \( A \subseteq B \), and \( A \subset B \), and give example sets that satisfy the two statements.

(7) Consider the following sets \( A = \{1, 2, 3, 4\} \), \( B = \{2, 3, 4, 5, 6, 7\} \), \( C = \{3, 4\} \), \( D = \{4, 5, 6\} \), \( E = \{3\} \).
   (a) Let \( X \) be a set such that \( X \subseteq A \) and \( X \subseteq B \). Which of the sets could be \( X \)?
      For example \( X \) could be \( C \), or \( X \) could be \( E \). Are there any other sets that could be \( X \)?
   (b) Let \( X \not\subseteq D \) and \( X \not\subseteq B \). Which of the the sets could be \( X \)?
   (c) Find the smallest set \( M \) that contains all five sets.
   (d) Find the largest set \( N \) that is a subset of all five sets.

(8) Is an “element of a set”, a special case of a “subset of a set”?
(9) Phrase the handshake counting problem using set theory notation.
(10) List all of the subsets of \( \{1, 2, 3\} \).
(11) Let \( A = \{a, b, c, d, e\} \). List all the subsets of \( A \) containing \( a \) but not containing \( b \).