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: $A \subseteq C$. $A = \{1, 2\}$, $C = \{1, 2, 3\}$.
   (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.