Lesson 3

(1) Write the following sets using the roster form:
   (a) $\{x \in \mathbb{Z} | 10 \leq x^2 < 100\}$ (Careful, that is $\mathbb{Z}$, not $\mathbb{N}$!)
   (b) $\{x \in \mathbb{N} | x \leq 4\}$ (Remember that, in this text anyhow, $0 \in \mathbb{N}$.)

(2) Use set-builder notation to give a description of each set.
   (a) $\{4, 8, 12\}$.
   (b) $\{-2, 0, 2, 4, 6\}$.

(3) Let $A = \{1, 2, 3, 5, 6, 7\}$ and $B = \{2, 4, 6, 8, 9\}$. Find
   (a) $A \cap B$
   (b) $A \cup B$
   (c) $A - B$
   (d) $B - A$

(4) Draw Venn diagrams for $A \cap (B \cup C)$ and $(A \cap B) \cup (A \cap C)$ to show that $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$.

(5) Let $A = \{1, 2, 3, 4\} \times \{1, 2, 3\}$. List the elements of the set $B = \{(s, t) \in A \,|\, s \geq t\}$.

(6) (bonus) Is the proposition *Every element of the empty set has three toes* true or false? Explain your answer! Hint: In symbols, the proposition is written: $\forall x (x \in \emptyset \longrightarrow x$ has three toes). Think about the truth value of that implication.