1. ☐10 pts. each☐ Use an Euler diagram to determine whether the syllogism is valid.

   (a) No poodles are caterpillars.
        No caterpillars are four-legged.
        ∴ No poodles are four-legged.

   (b) All nutty professors wear tweed coats.
        Some tweed coat wearers are not stylish.
        ∴ Some nutty professors are not stylish.

   (c) Some clowns are evil people.
        Some evil people are fascists.
        All fascists are clowns.
        ∴ Some fascists are not evil people.

2. ☐10 pts. each☐ Express each set in roster form.

   (a) The set of integers between 2 and 7.

   (b) $E = \{x \mid x \in \mathbb{N} \text{ and } x \text{ is even}\}$

3. ☐10 pts. each☐ Express each set in set-builder notation.

   (a) $A = \{5, 6, 7, 8, 9, 10, 11, 12, 13, 14\}$.

   (b) B is the set of odd natural numbers.

4. ☐5 pts. each☐ State whether each statement is true or false. If false, give the reason.

   (a) $\{\#\} \in \{\$, \&, \%, @, \#, =\}$

   (b) $\psi \notin \{\alpha, \beta, \gamma, \delta, \epsilon, \zeta\}$

   (c) $\boxdot \subset \{\boxdot, \square, \boxdot, \boxslash, \boxdot, \boxasterisk\}$

   (d) $\varnothing \subset \varnothing$

   (e) $\{1, 2, 3\} = \{2, 2, 3, 3, 3, 3, 1, 1, 1, 2\}$

5. ☐10 pts.☐ List all the proper subsets of the set $C = \{\oslash, \sqcup, \times\}$.
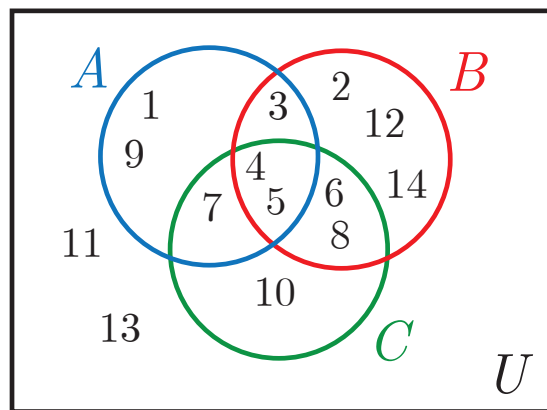
6. ☐10 pts. each☐ Let $U = \{1, 2, 3, 4, 5, 6, 7, 8\}$ be the universal set, $A = \{1, 2, 4, 5, 8\}$, and $B = \{2, 3, 4, 6\}$. Determine the following.

   (a) $(A \cup B)'$

   (b) $A' \cup (A \cap B)$

   (c) $A - B'$

7. ☐15 pts.☐ Determine $(C' \cup A) \cap B$, given that
   $U = \{x \mid x \in \mathbb{N} \text{ and } x < 10\}$
   $A = \{x \mid x \in \mathbb{N}, \ x \text{ is odd, and } x < 10\}$
   $B = \{x \mid x \in \mathbb{N}, \ x \text{ is even, and } x < 10\}$
   $C = \{x \mid x \in \mathbb{N} \text{ and } x < 6\}$

8. ☐15 pts.☐ For $A = \{q, r\}$ and $B = \{4, 6, 8\}$, determine $A \times B$. Also, determine $n(A)$, $n(B)$, and $n(A \times B)$.

9. ☐10 pts.☐ Use the Venn diagram below to determine the set $A \cap (B \cup C)$.

10. ☐10 pts. each☐ Use Venn diagrams (or some other technique demonstrated in class) to determine whether the following expressions are equal for all sets A, B, and C.

   (a) $(A' \cap B)'$, $A \cup B'$

   (b) $A \cup (B \cap C)'$, $A' \cap (B \cup C)$