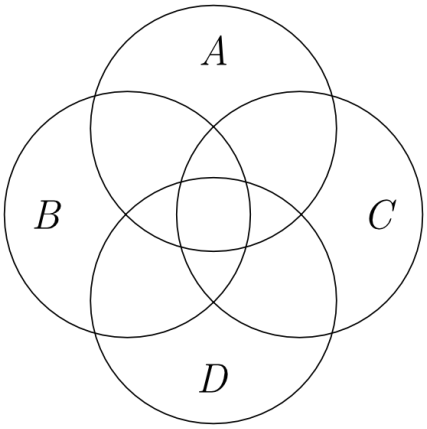
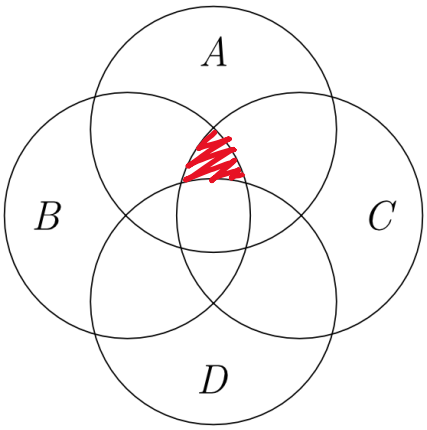
Worksheet 5

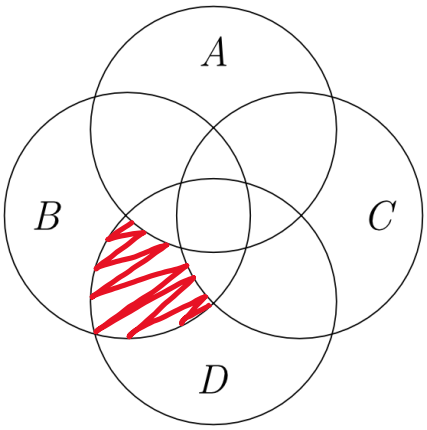
1. Consider the following Venn Diagram

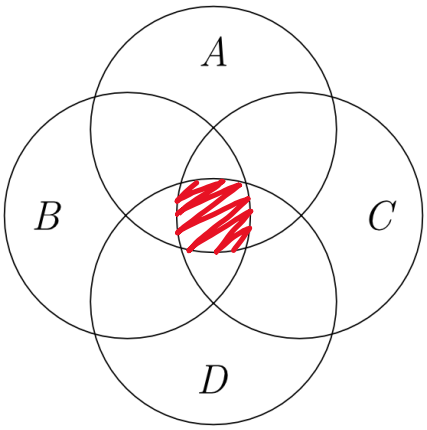


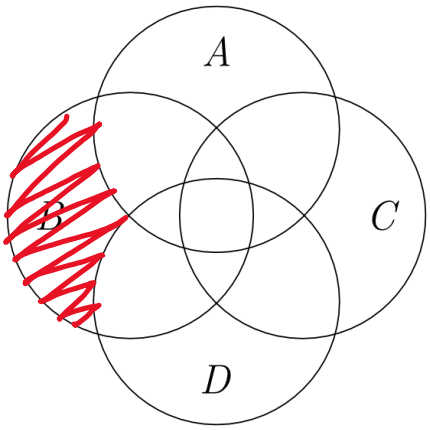
a. Color the region that represent $(A \cup C) \backslash D$ in the above Venn Diagram

b. Write in set notation to represent the following colored areas









2. List all the elements of the following sets, and then list all possible subsets of the following sets

   a. $\{2,5,6\}$

   b. $\{2,5,\{6\}\}$

   c. $\{\{4\}\}$

   d. $\{\emptyset,\{2,4\}\}$

3. Consider $A \backslash B$ and $A \cap B^c$

    a. Draw a Venn Diagram and color the above two sets, what conjecture can you make?

b. Prove $A \backslash B = A \cap B^c$ (Statement 4.59)

4. Prove the following statement:

$$A \cup B = A \text{ if and only if } B \subseteq A$$

5. Prove DeMorgan's Laws for sets

   a. $(A \cap B)^c = A^c \cup B^c$

   b. $(A \cup B)^c = A^c \cap B^c$

6. Prove the following generalized DeMorgan's Law

   (You can use the fact $(A \cup B)^c = A^c \cap B^c$ from what you just proved)

   Let $A_1, A_2, \ldots, A_n$ be sets, then

$$(A_1 \cup A_2 \cup \ldots \cup A_n)^c = {A_1}^c \cap {A_2}^c \cap \ldots \cap {A_n}^c$$