$A = \{1, 2, 3, 4, 5\}$

$B = \{2, 4, 6, 8\}$

$C = \{7, 3, 2, 1\}$

1) $A \setminus (B \cup C) = (A \setminus B) \cap (A \setminus C)$

$B \cup C = \{1, 2, 3, 4, 6, 7, 8\}$

$A \setminus (B \cup C) = \{5\}$

$(A \setminus B) = \{1, 3, 5\}$

$(A \setminus C) = \{4, 5\}$

$(A \setminus B) \cap (A \setminus C) = \{5\}$

2) $A \setminus \underset{\{2\}}{(B \cap C)} = \underset{\{1,3,5\}}{(A \setminus B)} \cup \underset{\{1,4,5\}}{(A \setminus C)}$

$\{1, 3, 4, 5\} = \{1, 3, 4, 5\}$

3) $A \setminus \underset{\{1,3,5\}}{(A \setminus B)} = A \cap B$

$\{2, 4\} = \{2, 4\}$

4) $A \setminus B = A \setminus \underset{\{2,4\}}{(A \cap B)}$

$\{1, 3, 5\} = \{1, 3, 5\}$

5) $A \cap (B \setminus C) = (A \cap B) \setminus (A \cap C)$

   with annotations: $\{4,6,8\}$ over $B\setminus C$... $\{2,4\}$ over $A\cap B$, $\{1,2,3\}$ over $A\cap C$

$$\{4\} = \{4\}$$

6) $(A \cap B) \setminus (A \cap C) = (A \cap B) \setminus C$

   annotation $\{2,4\}$ over $A\cap B$

$$\{4\} = \{4\}$$

7) $A \cap (B \setminus C) = (A \cap B) \setminus C$

   annotations $\{4,6,8\}$ over $B\setminus C$, $\{2,4\}$ over $A\cap B$

$$\{4\} = \{4\}$$

8) $(A \setminus B) \setminus C = (A \setminus C) \setminus (B \setminus C)$

   annotations $\{1,3,5\}$ over $A\setminus B$, $\{4,5\}$ over $A\setminus C$, $\{4,6,8\}$ over $B\setminus C$

$$\{5\} = \{5\}$$

9) $A \cup B = A \cup (B \setminus A)$

   annotation $\{6,8\}$ over $B\setminus A$

$$\{1,2,3,4,5,6,8\} = \{1,2,3,4,5,6,8\}$$

10) $(A \cap B) \cup (A \cap \overline{B}) = A$

   annotations $\{2,4\}$ over $A\cap B$, $\{1,3,5\}$ over $A\cap \overline{B}$

$$\{1,2,3,4,5\} = \{1,2,3,4,5\}$$

11) $(A \cup B) \cap (A \cup \bar{B}) = A$

$\{1,2,3,4,5\} = \{1,2,3,4,5\}$

12) $(\bar{A} \cup B) \cap A = A \cap B$

$\{2,4\} = \{2,4\}$