

4장 연습문제 정답

01.

- (a) $B = \{b | -5 \leq b < 10, b \in \mathbb{Z}\}$ 또는 $B = \{-5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$,
 $|B| = 15$, 유한집합
 (b) $C = \{c | -5 \leq c < 10, b \in \mathbb{R}\}$, $|C| = \infty$, 무한집합
 (c) $A = \{a | a \text{는 한빛 대학교 컴퓨터과학과 21학번 학생}\}$, $|A| = 150$, 유한집합
 (d) $D = \{d | d \text{는 2020년 6월에서 8월 사이에 눈이 내린 날}\}$, $|D| = 0$, 유한집합

02.

- (a) 유한집합 : A, B, C, D, E, H 무한집합 : F, G, I, J
 (b) $A = \{1, 2, 3, 4\}$ $B = \{b | b = \text{소수}, 0 < b < 20\}$
 $C = \{5, 8, 11, 14, 17, 20, 23, 26, 29, 32\}$ $D = \{d | d \text{는 요일명}\}$
 $E = \{\text{봄, 여름, 가을, 겨울}\}$ $F = \{f | f = 4k, k \in \mathbb{Z}\}$
 $G = \{-3.333..., \dots, 3.333...\}$ $H = \{h | h = \text{영대소문자 중 모음}\}$
 $I = \{\dots, 95, 96, 97, 98, 99\}$ $J = \{j | j = \sqrt{k}, k \in \mathbb{N}\}$
 (c) $|A| = 4$ $|B| = 8$ $|C| = 10$ $|D| = 7$ $|E| = 4$
 $|F| = \infty$ $|G| = \infty$ $|H| = 10$ $|I| = \infty$ $|J| = \infty$

03.

- (a) $a \in X$, $a \notin Y$, $a \in Z$ (b) $B \in X$, $B \in Y$, $B \notin Z$
 (c) $가 \notin X$, $가 \notin X$, $가 \notin Z$ (d) $C \in X$, $C \in X$, $C \notin Z$
 (e) $4.21 \notin X$, $4.21 \notin X$, $4.21 \notin Z$ (f) $10 \notin X$, $10 \notin Y$, $10 \notin Z$
 (g) $e \in X$, $e \notin Y$, $e \in Z$

04.

- (a) $A \subset X$ (b) $B \subset X$ (c) $X \subset C$ (d) $D \subset X$
 (e) $E \not\subset X$ 또는 $X \not\subset E$ (f) $X \subset F$

05.

- (a) $A = E$ 또는 $A \subseteq E$ (또는 $E \subseteq A$) (b) $B = J$ 또는 $B \subseteq J$ (또는 $J \subseteq B$)
 (c) $C = H$ 또는 $C \subseteq H$ (또는 $H \subseteq C$) (d) $F \subset D$
 (e) $I \subset D$ (f) $G \subset D$ (g) $F \not\subset G$ (h) $H \subset A$

06.

$$A = C = D \qquad B = E = F$$

07.

- (a) $A \cap B = \{x | -3 \leq x < 0, x \in \mathbb{Z}\}$
- (b) $B \cap D = \{x | -3 < x < 0, x \in \mathbb{Z}\}$
- (c) $A \cup F = \{x | [(x < -5) \vee (x > 5), x \in \mathbb{R}] \vee (-3 \leq x \leq 5, x \in \mathbb{Z})\}$
- (d) $C \cup E = \{x | (x < -10) \vee (x > 5), x \in \mathbb{Z}\} \vee \{x | -10 \leq x < 5, x \in \mathbb{R}\}$
- (e) $B \cup D = \{x | (x > -3, x \in \mathbb{R}) \vee (x \leq -3, x \in \mathbb{Z})\}$
- (f) $A \cup E = \{x | (x < -5) \vee (x \geq -3), x \in \mathbb{Z}\}$
- (g) $B \cup F = \{x | [(x < -5) \vee (x > 5), x \in \mathbb{R}] \vee (-5 \leq x < 0, x \in \mathbb{Z})\}$
- (h) $B \cap F = \{x | x < -5, x \in \mathbb{Z}\}$

08.

- (a) $U - A = \{h, i, j, \dots, x, y, z, A, B, C, \dots, X, Y, Z\}$
- (b) $C - B = \{a, c, e, g, i, k, m, o, q, s, u, w, y, C, G, K, M, Q, S, W, Y\}$
- (c) $A \oplus B = \{a, b, c, d, e, f, g, A, E, I, O, U\} = A \cup B$
- (d) $C - (A \oplus B) = \{i, k, m, o, q, s, u, w, y, C, G, K, M, Q, S, W, Y\}$
- (e) $A - B = \{a, b, c, d, e, f, g\} = A$
- (f) $A - C = \{b, d, f\}$
- (g) $B \oplus C = C - B$
- (h) $(A \oplus B) - C = \{b, d, f\}$

09.

- (a) $\overline{A} = \{a | a \leq 30, a \in \mathbb{N}\}$
- (b) $\overline{B} = \{b, d, f, h, j, l, n, p, r, t, v, x, z\}$
- (c) $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}, C = \{3, 5, 7, 9\}$
 $\therefore \overline{C} = \{1, 2, 4, 6, 8, 10\}$
- (d) $\overline{D} = \{d | d < -50 \vee d \geq 20, d \in \mathbb{R}\}$



10.

- (a) $A \cup B = \{x | -30 \leq x < 20, x \in \mathbb{R}\}$
- (b) $B \cup C = \{x | x \in \mathbb{R}\}$
- (c) $B \cap E = \{x | -10 < x < 20, x \in \mathbb{R}\}$
- (d) $C \cap E = \{x | x < 0 \vee 15 < x \leq 20, x \in \mathbb{R}\}$
- (e) $A \cup D = \{x | x \leq 0, x \in \mathbb{R}\}$
- (f) $B \cup D = \{x | x < -30 \vee -10 < x < 20, x \in \mathbb{R}\}$
- (g) $A \cap B = \{x | -10 < x \leq 0, x \in \mathbb{R}\}$
- (h) $A \cap C = \{x | -30 \leq x < 0, x \in \mathbb{R}\}$

11.

- (a) $A - B = \{x | -30 \leq x \leq -10, x \in \mathbb{R}\}$
- (b) $D - E = \emptyset$
- (c) $E - B = \{x | x = 20 \vee x \leq -10, x \in \mathbb{R}\}$
- (d) $E - C = \{x | 0 \leq x \leq 15, x \in \mathbb{R}\}$
- (e) $A \oplus B = \{x | -30 \leq x \leq -10 \vee 0 < x < 20, x \in \mathbb{R}\}$

- (f) $B \oplus D = \{x \mid x < -30 \vee -10 < x < 20, x \in \mathbb{R}\}$
 (g) $C \oplus D = \{x \mid -30 \leq x < 0 \vee x > 15, x \in \mathbb{R}\}$
 (h) $C \oplus E = \{x \mid x > 20 \vee 0 \leq x \leq 15, x \in \mathbb{R}\}$

12.

- (a) $\overline{B} = \{x \mid x \leq -10 \vee x \geq 20, x \in \mathbb{R}\}$ (b) $\overline{E-D} = \{x \mid x < -30 \vee x > 20, x \in \mathbb{R}\}$
 (c) $\overline{B \oplus C} = \{x \mid -10 < x < 0 \vee 15 < x < 20, x \in \mathbb{R}\}$ (d) $\overline{A \cup B \cup C \cup D \cup E} = \emptyset$
 (e) $\overline{C} = \{x \mid 0 \leq x \leq 15, x \in \mathbb{R}\}$ (f) $\overline{D} = \{x \mid x \geq -30, x \in \mathbb{R}\}$
 (g) $\overline{A \cup B} = \{x \mid x < -30 \vee x \geq 20, x \in \mathbb{R}\}$
 (h) $\overline{B \cap C} = \{x \mid x \leq -10 \vee 0 \leq x \leq 15 \vee x \geq 20, x \in \mathbb{R}\}$

13.

- (a) $|A \cap B| = 5$
 (b) $|A| = 4$
 (c) $|B| = 8$

14.

- (a) 문제 수정 : $|A \cup B| = 12, |A \cup C| = 13$
 $|A \cap B \cap C| = 3$

- (b) $|A \cup B| = |A| + |B| - |A \cap B| = 11 + 7 - 2 = 16$
 $|A \cup C| = |A| + |C| - |A \cap C| = 11 + 9 - 3 = 17$
 $|B \cup C| = |B| + |C| - |B \cap C| = 7 + 9 - 1 = 15$
 $|A \cap B \cap C| = |A| + |B| + |C| - |A \cup B| - |A \cup C| - |B \cup C| + |A \cup B \cup C|$
 $= 11 + 7 + 9 - 16 - 17 - 15 + 21 = 0$

- (c) $|A \cup B| = |A| + |B| - |A \cap B| = |A| + |B| - 4 = 14$ $\therefore |A| + |B| = 18 \dots \textcircled{1}$
 $|A \cup C| = |A| + |C| - |A \cap C| = |A| + |C| - 6 = 12$ $\therefore |A| + |C| = 18 \dots \textcircled{2}$
 $|B \cup C| = |B| + |C| - |B \cap C| = |B| + |C| - 5 = 13$ $\therefore |B| + |C| = 18 \dots \textcircled{3}$

$$\textcircled{1} + \textcircled{2} + \textcircled{3} = 2|A| + 2|B| + 2|C| = 54 \quad \therefore |A| + |B| + |C| = 27$$

$$\therefore |A \cup B \cup C| = |A| + |B| + |C| - |A \cap B| - |A \cap C| - |B \cap C| + |A \cap B \cap C|$$

$$= 27 - 4 - 6 - 5 + 3 = 15$$

15.

- (a) $|A - B| = 5$
 (b) $|B - A| = 7$
 (c) $|A - B| = |A \cup B| - |B| = 11 - 6 = 5$
 (d) $|B - A| = |B| - |A \cap B| = 5 - 1 = 4$

16.

- (a) $|A \oplus B| = 16$
 (b) $|A \oplus B| = 14$
 (c) $|A \oplus B| = |A| + |B| - 2|A \cap B| = 11 + 10 - 8 = 13$
 (d) $|A \oplus B| = (|A \cup B| - |A|) + (|A \cup B| - |B|) = 3 + 10 = 13$

17.

- (a) $|A \times B| = 25$
 (b) $|\text{학년} \times \text{전공}| = 12$
 (c) $|A \times B \times C| = 40$
 (d) 조건1 \times 조건2 \times 조건3 \times 조건4 = {(참, 참, 참, 참), (참, 참, 참, 거짓), (참, 참, 거짓, 참),
 (참, 참, 거짓, 거짓), (참, 거짓, 참, 참), (참, 거짓, 참, 거짓), (참, 거짓, 거짓, 참),
 (참, 거짓, 거짓, 거짓), (거짓, 참, 참, 참), (거짓, 참, 참, 거짓), (거짓, 참, 거짓, 참),
 (거짓, 참, 거짓, 거짓), (거짓, 거짓, 참, 참), (거짓, 거짓, 참, 거짓), (거짓, 거짓, 거짓, 참),
 (거짓, 거짓, 거짓, 거짓)}
 $|\text{조건1} \times \text{조건2} \times \text{조건3} \times \text{조건4}| = |\text{조건1}| \times |\text{조건2}| \times |\text{조건3}| \times |\text{조건4}| = 2 \times 2 \times 2 \times 2 = 16$

18.

- (a) 12개
 (b) 18개
 (c) 전공 \times 관심분야 \times 학년 = {(컴퓨터과학, 프로그래밍, 1), (컴퓨터과학, 프로그래밍, 2),
 (컴퓨터과학, 프로그래밍, 3), (컴퓨터과학, 프로그래밍, 4), (컴퓨터과학, 게임기획, 1),
 (컴퓨터과학, 게임기획, 2), (컴퓨터과학, 게임기획, 3), (컴퓨터과학, 게임기획, 4),

 (게임, 인공지능, 1), (게임, 인공지능, 2), (게임, 인공지능, 3), (게임, 인공지능, 4),
 (게임, 보안, 1), (게임, 보안, 2), (게임, 보안, 3), (게임, 보안, 4)}
 $|\text{전공} \times \text{관심분야} \times \text{학년}| = |\text{전공}| \times |\text{관심분야}| \times |\text{학년}| = 3 \times 6 \times 4 = 72\text{개}$

19.

- (a) $|P(A)| = 32$
 (b) $|P(B)| = 8$
 (c) $P(C) = \{\emptyset, \{\emptyset\}, \{1\}, \{\{\emptyset\}, 1\}, \{\emptyset, 1\}, \{\emptyset, \{\{\emptyset\}, 1\}\}, \{1, \{\{\emptyset\}, 1\}\}, \{\emptyset, 1, \{\{\emptyset\}, 1\}\}\}$
 $|P(C)| = 2^3 = 8$

20.

빵과 우유를 모두 먹은 학생은 34명이다.

21.

B 폴더에만 정리되어 있고 A 폴더에는 정리되어 있지 않은 논문 수 : 144편

22.

$$\begin{aligned}
 |\text{네트워크} \cup \text{보안} \cup \text{게임}| &= 100, |\text{네트워크}| = 49, |\text{보안}| = 47, |\text{게임}| = 45, \\
 |\text{네트워크} \cap \text{보안}| &= 19, |\text{네트워크} \cap \text{게임}| = 14, |\text{보안} \cap \text{게임}| = 13 \\
 |\text{네트워크} \cup \text{보안} \cup \text{게임}| &= |\text{네트워크}| + |\text{보안}| + |\text{게임}| - |\text{네트워크} \cap \text{보안}| - |\text{보안} \cap \text{게임}| \\
 &\quad - |\text{네트워크} \cap \text{게임}| + |\text{네트워크} \cap \text{보안} \cap \text{게임}| \\
 100 &= 49 + 47 + 45 - 19 - 14 - 13 + |\text{네트워크} \cap \text{보안} \cap \text{게임}| \\
 \therefore |\text{네트워크} \cap \text{보안} \cap \text{게임}| &= 5
 \end{aligned}$$

23.

$$\begin{aligned}
 |A \cup B \cup C| &= 128, |A \cap B \cap C| = 8, \\
 |A \cap B| &= 21, |A \cap C| = 20, |B \cap C| = 21, \\
 |A \cup B| &= 99, |A \cup C| = 98, |B \cup C| = 105 \\
 |A \cup B \cup C| &= |A| + |B| + |C| - |A \cap B| - |A \cap C| - |B \cap C| + |A \cap B \cap C| \\
 128 &= |A| + |B| + |C| - 21 - 20 - 21 + 8 \\
 \therefore |A| + |B| + |C| &= 182
 \end{aligned}$$

$$\begin{aligned}
 |A| + |B| &= 182 - |C|, |A| + |C| = 182 - |B|, |B| + |C| = 182 - |A| \\
 |A \cup B| &= |A| + |B| - |A \cap B| \\
 99 &= 182 - |C| - 21 \quad \therefore |C| = 62 \\
 |A \cup C| &= |A| + |C| - |A \cap C| \\
 98 &= |A| + 62 - 20 \quad \therefore |A| = 56 \\
 |B \cup C| &= |B| + |C| - |B \cap C| \\
 105 &= |B| + 62 - 21 \quad \therefore |B| = 64
 \end{aligned}$$

24.

107개

25.

U : 시험이 옷장 속 옷 A : 버려야 할 옷 B : 빨아야 할 옷 C : 수선 맡겨야 할 옷
 $|U| = 30, \quad |B \cup C| = |U| - |A| = 30 - 4 = 26, \quad |B| = 22, \quad |C| = 10$

$$\begin{aligned}
 \text{(a) } |B \cap C| &= |B| + |C| - |B \cup C| = 22 + 10 - 26 = 6 \\
 \text{(b) } |\text{빨기만 해야 하는 옷}| &= |B| - |B \cap C| = 22 - 6 = 16 \\
 \text{(c) } |\text{수선만 해야 하는 옷}| &= |C| - |B \cap C| = 10 - 6 = 4
 \end{aligned}$$

26.

- (a) 빨간색 : 38개, 노란색 : 50개, 파란색 46개
(b) 13개

27.

$$|P| = 80, \quad |D| = 95, \quad |\overline{P \cup D \cup S}| = 13, \quad |P \cup D \cup S| = 187$$

(a) $|U| = |P \cup C \cup S| + |\overline{P \cup C \cup S}| = 187 + 13 = 200$

(b) $|P \cup D| = 137$

$$\therefore |P \cap D| = |P| + |D| - |P \cup D| = 80 + 95 - 137 = 38 \text{명}$$

(c) $|P \cup S| = 130, \quad |P \cap S| = 40$

$$\therefore |S| = |P \cup S| + |P \cap S| - |P| = 130 + 40 - 80 = 90 \text{명}$$

(d) $|D \cap S| = 38$

$$|D \cup S| = |D| + |S| - |D \cap S| = 95 + 90 - 38 = 147$$

$$\begin{aligned} \therefore |P \cap D \cap S| &= |P| + |D| + |S| - |P \cup D| - |P \cup S| - |D \cup S| + |P \cup D \cup S| \\ &= 80 + 95 + 90 - 137 - 130 - 147 + 187 = 38 \text{명} \end{aligned}$$

28.

- (a) 풀이 생략
(b) 풀이 생략

- (c) $x \in A \cap \overline{A}$ 가 성립하지 않음을 증명

$$\begin{aligned} x \in A \cap \overline{A} &\Leftrightarrow x \in A \wedge x \in \overline{A} && \because \text{교집합의 정의} \\ &\Leftrightarrow x \in A \wedge x \notin A && \because \text{여집합의 정의} \\ &\Leftrightarrow \mathbf{F} && \because \text{논리연산의 부정법칙} \end{aligned}$$

\therefore 보법칙 $A \cap \overline{A} = \emptyset$ 이 성립한다.

- (d) $(x, y) \in A \times (B - C) \Leftrightarrow (x, y) \in (A \times B) - (A \times C)$ 임을 증명

$$\begin{aligned} (x, y) \in A \times (B - C) &\Leftrightarrow x \in A \wedge y \in (B - C) && (\because \text{곱집합의 정의}) \\ &\Leftrightarrow x \in A \wedge (y \in B \wedge y \notin C) && (\because \text{차집합의 정의}) \\ &\Leftrightarrow (x \in A \wedge y \in B) \wedge (x \in A \wedge y \notin C) && (\because \text{다른 원소에 대한 논리식의 분배법칙}) \\ &\Leftrightarrow \{(x, y) \in A \times B\} \wedge (x \in A \wedge y \notin C) && (\because \text{곱집합의 정의}) \\ &\Leftrightarrow \{(x, y) \in A \times B\} \wedge \{(x, y) \notin A \times C\} && (\because \text{원소 } y \text{가 집합 } C \text{에 포함되지 않음}) \\ &\Leftrightarrow (x, y) \in (A \times B) - (A \times C) && (\because \text{차집합의 정의}) \end{aligned}$$

$$\therefore \text{분배법칙 } A \times (B - C) = (A \times B) - (A \times C)$$

(e) 풀이 생략

29.

$$\begin{aligned} (a) \quad (A - B) \cap (A - C) &= (A \cap \overline{B}) \cap (A \cap \overline{C}) & (\because A - B = A \cap \overline{B}) \\ &= (A \cap A) \cap (\overline{B} \cap \overline{C}) & (\because \text{교환법칙, 결합법칙}) \\ &= A \cap (\overline{B} \cap \overline{C}) & (\because \text{멱등법칙}) \\ &= A \cap \overline{(B \cup C)} & (\because \text{드 모르간의 법칙}) \\ &= A - (B \cup C) & (\because A - B = A \cap \overline{B}) \end{aligned}$$

$$\begin{aligned} (b) \quad \overline{(A \cap B) \cap (\overline{A} \cap \overline{B})} &= \overline{(A \cap B) \cup (\overline{A} \cap \overline{B})} & (\because \text{드 모르간의 법칙}) \\ &= \overline{(A \cap B)} \cup (\overline{\overline{A} \cap \overline{B}}) & (\because \text{드 모르간의 법칙}) \\ &= (A \cap B) \cup (A \cup B) & (\because \text{이중 보법칙}) \\ &= [(A \cap B) \cup A] \cup B & (\because \text{결합법칙}) \\ &= A \cup B & (\because \text{흡수법칙}) \end{aligned}$$

(c) 풀이 생략

(d) 풀이 생략

(e) 풀이 생략

30.

(a) 풀이 생략

(b) 풀이 생략

$$\begin{aligned} (c) \quad (A \cup B) - \overline{A \cap B} &= (A \cup B) \cap \overline{\overline{A \cap B}} & \because A - B = A \cap \overline{B} \\ &= (A \cup B) \cap (A \cap B) & \because \text{이중보법칙} \\ &= \{(A \cup B) \cap A\} \cap B & \because \text{결합법칙} \\ &= A \cap B & \because \text{흡수법칙} \end{aligned}$$

$$\begin{aligned} (d) \quad (A \oplus B) - (A \cup B) &= \{(A - B) \cup (B - A)\} - (A \cup B) & \because \text{대칭차집합의 정의} \\ &= \{(A \cap \overline{B}) \cup (B \cap \overline{A})\} \cap \overline{A \cup B} & \because A - B = A \cap \overline{B} \\ &= \{(A \cap \overline{B}) \cup (B \cap \overline{A})\} \cap \overline{A} \cap \overline{B} & \because \text{드 모르간의 법칙} \\ &= [\{(A \cap \overline{B}) \cup (B \cap \overline{A})\} \cap \overline{A}] \cap \overline{B} & \because \text{결합법칙} \\ &= [\{(A \cap \overline{B}) \cap \overline{A}\} \cup \{(B \cap \overline{A}) \cap \overline{A}\}] \cap \overline{B} & \because \text{분배법칙} \\ &= [\{(\overline{A} \cap A) \cap \overline{B}\} \cup \{(B \cap \overline{A}) \cap \overline{A}\}] \cap \overline{B} & \because \text{교환 및 결합법칙} \\ &= [\{\emptyset \cap \overline{B}\} \cup \{(B \cap \overline{A}) \cap \overline{A}\}] \cap \overline{B} & \because \text{보법칙} \\ &= [\emptyset \cup \{B \cap (\overline{A} \cap \overline{A})\}] \cap \overline{B} & \because \text{지배법칙} \\ &= \{B \cap (\overline{A} \cap \overline{A})\} \cap \overline{B} & \because \text{항등법칙} \end{aligned}$$

$$\begin{aligned}
&= (\overline{A} \cap \overline{A}) \cap (B \cap \overline{B}) \\
&= (\overline{A} \cap \overline{A}) \cap \emptyset \\
&= \emptyset
\end{aligned}$$

\therefore 교환 및 결합법칙
 \therefore 보법칙
 \therefore 지배법칙

(e) 풀이 생략

31.

- (a) 풀이 생략
 (b) 풀이 생략
 (c) 풀이 생략

(d) $(A - C) \cap (A - B) \cup (A \cap B) \cup (A \cap C)$

$$\begin{aligned}
&= (A \cap \overline{C}) \cap (A \cap \overline{B}) \cup (A \cap B) \cup (A \cap C) & (\because A - B = A \cap \overline{B}) \\
&= \{(A \cap \overline{C}) \cap (A \cap \overline{B})\} \cup \{(A \cap B) \cup (A \cap C)\} & (\because \text{결합법칙}) \\
&= \{(A \cap A) \cap (\overline{B} \cap \overline{C})\} \cup \{(A \cap B) \cup (A \cap C)\} & (\because \text{교환법칙, 결합법칙}) \\
&= \{A \cap (\overline{B} \cap \overline{C})\} \cup \{(A \cap B) \cup (A \cap C)\} & (\because \text{멱등법칙}) \\
&= \{A \cap (\overline{B} \cap \overline{C})\} \cup \{A \cap (B \cup C)\} & (\because \text{분배법칙}) \\
&= \{A \cap (\overline{B \cup C})\} \cup \{A \cap (B \cup C)\} & (\because \text{드 모르간의 법칙}) \\
&= A \cap \{(\overline{B \cup C}) \cup (B \cup C)\} & (\because \text{분배법칙}) \\
&= A \cap U & (\because \text{보법칙}) \\
&= A & (\because \text{항등법칙})
\end{aligned}$$

(e) $\{(A \cap B) - (C - B)\} - \{(B - A) \cup (B \cap C)\}$

$$\begin{aligned}
&= \{(A \cap B) \cap (\overline{C \cap \overline{B}})\} \cap \overline{\{(B \cap \overline{A}) \cup (B \cap C)\}} & (\because A - B = A \cap \overline{B}) \\
&= \{(A \cap B) \cap (\overline{C} \cup \overline{\overline{B}})\} \cap \overline{\{(B \cap \overline{A}) \cup (B \cap C)\}} & (\because \text{드 모르간의 법칙}) \\
&= \{(A \cap B) \cap (\overline{C} \cup \overline{B})\} \cap \overline{\{(\overline{B} \cup \overline{A}) \cap (\overline{B} \cup \overline{C})\}} & (\because \text{드 모르간의 법칙}) \\
&= \{(A \cap B) \cap (\overline{C} \cup B)\} \cap \overline{\{(\overline{B} \cup A) \cap (\overline{B} \cup \overline{C})\}} & (\because \text{이중보법칙}) \\
&= [A \cap \{B \cap (\overline{C} \cup B)\}] \cap \overline{\{(\overline{B} \cup A) \cap (\overline{B} \cup \overline{C})\}} & (\because \text{결합법칙}) \\
&= (A \cap B) \cap \{(\overline{B} \cup A) \cap (\overline{B} \cup \overline{C})\} & (\because \text{흡수법칙}) \\
&= (A \cap B) \cap \{\overline{B} \cup (A \cap \overline{C})\} & (\because \text{분배법칙}) \\
&= A \cap [B \cap \{\overline{B} \cup (A \cap \overline{C})\}] & (\because \text{결합법칙}) \\
&= A \cap [(B \cap \overline{B}) \cup \{B \cap (A \cap \overline{C})\}] & (\because \text{분배법칙}) \\
&= A \cap [\emptyset \cup \{B \cap (A \cap \overline{C})\}] & (\because \text{보법칙}) \\
&= A \cap \{B \cap (A \cap \overline{C})\} & (\because \text{항등법칙}) \\
&= (A \cap A) \cap B \cap \overline{C} & (\because \text{교환 및 결합법칙}) \\
&= A \cap B \cap \overline{C} & (\because \text{멱등법칙})
\end{aligned}$$