# CS 309: Discrete Math (Exercises)

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# Contents

# Chapter 1: Sets and Logic

## Sets

Exercises 1-16:

Let

$$U = \{1, 2, 3, \ldots, 10\}$$
$$A = \{1, 4, 7, 10\}$$
$$B = \{1, 2, 3, 4, 5\}$$
$$C = \{2, 4, 6, 8\}$$

1. $A \cup B = \{1, 2, 3, 4, 5, 7, 10\}$
2. $B \cap C = \{2, 4\}$
3. $A - B = \{7, 10\}$
4. $B - A = \{2, 3, 5\}$
5. $\overline{A} = \{2, 3, 5, 6, 8, 9\}$
6. $U - C = \{1, 3, 5, 7, 9, 10\}$
7. $\overline{U} = \varnothing$
8. $A \cup \varnothing = A$
9. $B \cap \varnothing = \varnothing$
10. $A \cup U = U$
11. $B \cap U = B$
12. $A \cap (B \cup C) = \{1, 4\}$
13. $\overline{B} \cap (C - A) = \{6, 8\}$
14. $(A \cap B) - C = \{1\}$
15. $\overline{A \cap B} \cup C = \{2, 3, 4, 5, 6, 7, 8, 9, 10\}$
16. $(A \cup B) - (C - B) = A \cup B$

Exercises 61-64:

Let

$$X = \{1, 2\}$$
$$Y = \{a\}$$
$$Z = \{\alpha, \beta\}$$

61. $X \times Y \times Z = \{(1, a, \alpha), (1, a, \beta), (2, a, \alpha), (2, a, \beta)\}$
62. $X \times Y \times Y = \{(1, a, a), (2, a, a)\}$
63. $X \times X \times X = \{(1, 1, 1), (1, 1, 2), (1, 2, 1), (1, 2, 2), (2, 1, 1), (2, 1, 2), (2, 2, 1), (2, 2, 2)\}$
64. $Y \times X \times Y \times Z = \{(a, 1, a, \alpha), (a, 1, a, \beta), (a, 2, a, \alpha), (a, 2, a, \beta)\}$

Exercises 77-82:

77. $\{x\} \subseteq \{x\}$ [True]
78. $\{x\} \in \{x\}$ [False]
79. $\{x\} \in \{x, \{x\}\}$ [True]
80. $\{x\} \subseteq \{x, \{x\}\}$ [True]
81. $\{2\} \subseteq \mathcal{P}(\{1, 2\})$ [False]