# CS 228, Set and Function Exercises

**Name:**

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## Sets and Set Operations

The questions below will refer the following sets:

$A = \{a, b, \{a, b\}\}$         $C = \{\{\emptyset\}\}$         $E = \mathcal{P}(A)$

$B = \{a, b, c\}$         $D = \{x \mid \exists\, k \in \mathcal{Z}, x = 2k\}$         $F = \emptyset$

### Venn Diagrams

Draw a Venn diagram illustrating the relationship between sets $A$ and $B$

### Subsets

Complete the following tables:

| | True or False |
|---|---|
| $A \subseteq A$ | |
| $A \subset A$ | |
| $A \subseteq B$ | |
| $A \subset B$ | |
| $B \subseteq A$ | |
| $B \subset A$ | |

| | True or False |
|---|---|
| $A \subseteq C$ | |
| $C \subseteq A$ | |
| $A \subseteq E$ | |
| $E \subseteq A$ | |
| $A \subseteq F$ | |
| $F \subseteq A$ | |

### Cardinality

Complete the following table:

| | Cardinality |
|---|---|
| $A$ | |
| $B$ | |
| $C$ | |
| $D$ | |
| $E$ | |
| $F$ | |

### Cartesian Products

What is the Cartesian product of A and B?

What is the Cartesian product of B and D? (Use set-builder notation.)

$A = \{a, b, \{a, b\}\}$

$B = \{a, b, c\}$

$C = \{\{\emptyset\}\}$

$D = \{x \mid \exists\, k \in \mathcal{Z}, x = 2k\}$

$E = \mathcal{P}(A)$

$F = \emptyset$

## Set Operations

Fill in each entry in the following table with the result of performing the indicated set operation.

| | Resulting Set |
|---|---|
| $A \cap A$ | |
| $A \cap B$ | |
| $B \cap A$ | |
| $A \cup F$ | |
| $B \cap F$ | |

| | Resulting Set |
|---|---|
| $A \cap E$ | |
| $A \cup A$ | |
| $B \cup B$ | |
| $A \cup (B \times B)$ | |
| $A - B$ | |

# Functions

What are the domain and codomain of the floor function?

Is the floor function one-to-one?

Is the floor function onto?

Does the floor function have an inverse?

Consider the functions $f(x)$ and $g(x)$ from $\mathcal{R}$ to $\mathcal{R}$:

- $f(x) = 3x + 1$

- $g(x) = 2x$

What is $f^{-1}(x)$?

What is $(f \circ g)(x)$?