Exercise 1 (points = 40)

1. How many elements are there in the powerset of {1, 2, 3, 42}? Your answer must be an integer.
2. Let A = {1, 2, 3}, B = {x, y}, C = {"hello", "world"}. How many elements are there in $A \times B \times C$? Your answer must be an integer.
3. Which of the following is correct? **Choose a single correct answer**.
   - (a) $\{0\} = \emptyset$.
   - (b) $\{1\} \subseteq Z$.
   - (c) $\{2n - 2 \mid n \in Z\} \neq Z$
   - (d) $\{5n + 6m \mid n \in Z, m \in Z\} \neq Z$.
4. Let N denote the set of natural numbers {1, 2, ...}. For each n ∈ N, let A_n = {−2n, 0, 2n}. Calculate the following two expressions involving A_n:
   - (a) $\cup_{i \in N} A_i$
   - (b) $\cap_{i \in N} A_i$

Exercise 2 (points = 60)

Use set identities to prove the following set properties, clearly stating which laws you are applying at each step. You can optionally follow the following pattern in writing,

```
LHS = ...  // by (set identity name)
    = ...  // by (set identity name)
    = RHS
```

1. B ∪ (ø ∩ A) = B
2. (A ∩ B) ∪ (A ∩ B') = A
3. (A ∩ B) ∪ (A ∪ B')' = B
4. A ∩ (A ∪ B) = A