

## Exercise 2.1

## Exercise 2.2

## Exercise 2.3

- (a) The set builder notation is wrong because it does not specify that  $x$  is a natural number and it also does not define  $n$ . The correct notation would be  $\{x \mid x \in \mathbb{N}, x < 20, x \bmod 2 = 1\}$ .
- (b) The notation is wrong since  $x$  is undefined and the 6 alone is not a set. The correct notation would be  $\{x \mid x \in \mathbb{N}, x \neq 6\}$ .

## Exercise 2.4

- (a) We can first find out what the union of  $A$  and  $B$  is:  $A \cup B = U \setminus (A \cup B)^c = \{1, 3, 5, 6, 8, 9, 10\}$ . With the latter and  $A \cap B = \{1, 3\}$  it follows that  $\{1, 3\} \subset A \subset A \cup B$  and  $\{1, 3\} \subset B \subset A \cup B$ . The following sets satisfy the properties:  $A = \{1, 3, 5, 6, 8, 9\}, B = \{1, 3, 10\}$ .
- (b) It is not possible to satisfy all conditions at the same time. If  $A \cap B = \emptyset$ , it means that  $A, B$  have no elements in common. However, if  $A \subset B$ , it means that every element of  $A$  is an element of  $B$ , which contradicts the first condition of  $A$  and  $B$  having no common elements. Therefore,  $A, B$  under the given conditions do not exist.
- (c) The following set  $A, B$  satisfy the required properties:  $A = B = \{6, 7, 8\}$ .