

# LINGUIST 130a Worksheet 1 Answer Key

Topic: Basic Set Theory

January 10, 2022

## Exercise 1.1.

1.  $\{4\}$
2.  $\{6\}$
3.  $\{\}$
4.  $\{1,2,3,4\}$
5.  $\{\}$

**Exercise 1.2.** Note that there should be more than one correct answers for each question.

Possible answers:

1.  $\{x: x \text{ is an integer and } 5 > x > 0\}$
2.  $\{x: x \text{ is a prime number and } x < 8\}$
3.  $\{y: y \text{ has been a US president at some point between 2008 and 2022}\}$

## Exercise 2.

1. 4
2. 4
3. 0
4. 1
5. 1
6. 3
7. 1

## Exercise 3.

1.  $\emptyset \subset A$  is false. Note that  $\emptyset \not\subset \emptyset$ .
2.  $\emptyset \subseteq A$  is true. The empty set is a subset of every set (although it is not a **proper subset** of itself, it is still a subset of itself).
3.  $\emptyset \in A$  is false: there can be sets that do not contain the empty set as a member (e.g.  $\{1,2,3,4\}$ ).

4.  $A = \{y : y \in A\}$  is true. By definition,  $x \in A$  iff  $x \in \{y : y \in A\}$
5.  $A = \{y : y \subseteq A\}$  is false. An exception would be  $A = \{1\}$ , where 1 is not a set and therefore is not a subset of A.

**Exercise 4.**

1.  $\{\emptyset, \{1\}, \{2\}, \{1, 2\}\}$
2.  $\{\emptyset, \{1\}, \{2\}, \{3, 4\}, \{0\}, \{1, 2\}, \{1, \{3, 4\}\}, \{1, 0\}, \{2, \{3, 4\}\}, \{2, 0\}, \{\{3, 4\}, 0\}, \{1, 2, \{3, 4\}\}, \{1, 2, 0\}, \{1, \{3, 4\}, 0\}, \{2, \{3, 4\}, 0\}, \{1, 2, \{3, 4\}, 0\}\}$
3.  $\emptyset$
4.  $\{\emptyset, \{\emptyset\}\}$

**Exercise 5.**

1.  $\{0, 1, 2, 3\}$
2.  $\{\text{Kamala Harris}\}$
3.  $\emptyset$
4.  $\{5\}$
5.  $\{0, 1\}$
6.  $\{3\}$

**Exercise 6.** Both statements are true. if  $A - B$  is empty, it means that there is no  $x$  such that  $x \in A$  and  $x \notin B$ . Equivalently, this means that for all  $x$ , if  $x \in A$  then  $x \in B$ . By definition, this means that  $A \subseteq B$ . From this, we know that  $A \cup B = B$ , and  $A \cap B = A$ .