Exercises 1 Sets
Set, element, empty set, subset, intersection, union, complement

Objectives

- understand what a set, an element of a set, an empty set, a subset, an intersection, a union, a complement is.
- be able to perform basic set operations.

Problems

1.1 Look at the sets A, B, and C:

A = Set of all cities of the world
B = Set of all European cities
C = Set of all coastal cities of the world

Find at least four elements of the following sets:

a) $B \cap C$ b) $B \setminus C$

c) $C \setminus B$ d) $A \setminus (B \cup C)$

1.2 Harshbarger/Reynolds*: Chapter 0 (Algebraic Concepts), Section 0.1 (p. 2-9)
(Scanned pages 2-55 and A1-A5 in file “Algebraic Concepts.pdf” on Moodle)

a) Theory (p. 2-6) b) Exercises (p. 6-9)

*Harshbarger, R.J. and Reynolds, J.J.: Mathematical Applications for the Management, Life, and Social Sciences; Houghton Mifflin Company, Boston / New York 2007, 8th edition, ISBN 978-0-618-73162-6

1.3 Decide which statements are true or false. Put a mark into the corresponding box.
In each problem a) to c), exactly one statement is true.

a) A is any set.

- ☐ $A \in A$
- ☐ $\{\} \subset A$
- ☐ $A \cap A = \{\}$
- ☐ $A \cup \{\} = \{\}$

b) A = Set of all cities of the world
B = Set of all European cities

- ☐ $A \cap B = A$
- ☐ $A \cup B = A$
- ☐ $B \in A$
- ☐ $B \subset A$

c) A and B are sets.

- ☐ $(A \cup B) \subset (A \cap B)$
- ☐ $(A \cap B) = (A \setminus B)$
- ☐ $(A \cup B) = (A \setminus B) \cup (B \setminus A) \cup (A \cap B)$
- ☐ $(A \cap B) = (A \setminus B) \cup (B \setminus A) \cup (A \cap B)$

Answers

1.1 a) $B \cap C$ = {Lisbon, Copenhagen, Barcelona, Naples, Stockholm, ...}

b) $B \setminus C$ = {London, Paris, Madrid, Berlin, Rome, ...}

c) $C \setminus B$ = {Tokyo, San Francisco, Sydney, Rio de Janeiro, ...}

d) $A \setminus (B \cup C)$ = {Chicago, Mexico City, Nairobi, Beijing, ...}

1.2 see Harshbarger/Reynolds: Chapter 0, Algebraic Concepts
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1.3 a) 2nd statement

b) 4th statement

c) 3rd statement