

## Exercises for Lecture 4

### 1 Sets 1

Let  $A = \{1, -2\}$ ,  $B = \{1, -1, 2\}$  and  $C = \{1, \{2, 3\}\}$ .

1. What is the the power-set of  $B$ ? And the power-set of  $C$ ?
2. Which of the following statements is true? **Argue why!**
  - (a)  $\{1\} \not\subseteq A$
  - (b)  $1 \in C$
  - (c)  $\{1\} \in A$
  - (d)  $2 \in C$
  - (e)  $1 \subseteq A$
  - (f)  $3 \in C$
  - (g)  $1 \in A$
  - (h)  $\{1\} \in C$
  - (i)  $A \subseteq B$
  - (j)  $\{2, 3\} \in C$
  - (k)  $B \subseteq A$
  - (l)  $\{2\} \in C$

### 2 Sets 2

Let  $A = \{-1, 0, 1\}$  and  $B = \{1, 2\}$ . Write explicitly the sets  $A \times B$ ,  $A \times A$ ,  $(A \times A) \cap (A \times B)$ ,  $A \times (A \cap B)$ ,  $(A \times A) \cup (A \times B)$ ,  $\mathcal{P}(B \times B)$  and  $\mathcal{P}(B) \times \mathcal{P}(B)$ .

### 3 Relations

In year 2052, management has decided to award an iPhone 50G-Teleport to the best teacher and the best student at ITU. In order to choose the winners, all students must vote for two teachers and all teachers must express a single vote for their favourite student. Given the set  $P$  of people at ITU (consisting

of both students and teachers), the relation  $V \subseteq P \times P$  expresses whether some person  $p_1$  has voted for some other person  $p_2$ . Moreover, the relation  $M$  relates two persons whenever they have voted for each other. Discuss the properties (reflexive, symmetric, antisymmetric, transitive) of relations  $V$  and  $M$ .