

Formal Models: Section 1 Exercises*

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Exercise 1.a

As a group, write down and define the following sets:

- N , which is the set composed of your group members
- A , which is the set composed of your group members' ages, in years
- M , which is the set composed of just yourself
- U , which is the set composed of everyone you collaborated on this question with
- T , which is the set defined as myself and Sean
- G , which is the set composed of everyone you've heard lecture for this class so far.

*While many exercises are original work, some draw on materials from Tak-Huen Chau. Any errant mistakes are mine alone.

Exercise 1.b

- Does $N = M$? Does $N = U$? Does $T = G$?
- Is U a subset of N ?
- Is M a subset of N ?
- Is T a subset of G ?
- Is A a subset of \mathbb{R} ?

Exercise 2.a

Translate the following statements into plain English:

- 2.1.1: $\forall x \in \mathbb{R}, \exists y \in \mathbb{R}$ such that $y > x$
- 2.1.2: $A \subseteq B \wedge B \subseteq C \implies A \subseteq C$
- 2.1.3: $\forall x \in [0, 1], x^2 \in [0, 1]$

Exercise 2.b

Translate the following statements into formal math:

- 2.2.1: “There exists a real number that is greater than 5 and less than 6.”
- 2.2.2: “If x is an element of set A , and A is a subset of B , then x is an element of set B .”
- 2.2.3: “For all elements in the open interval from negative 1 to 1, the absolute value of that element is less than 1.”

Exercise 3

Define a binary relation L over a set of all humans, where aLb means that a “loves” b . Is L a preference relation?