

# 1 Propositional Logic

## 1.1 Translations

**Exercise 1.** Translate the following three sentences into propositional logic.

- Nadhi will eat a fruit if it is an apple.
- Nadhi will eat a fruit only if it is an apple.
- Nadhi will eat a fruit if and only if it is an apple.

$n$ : Nadhi will eat a fruit.

$a$ : The fruit is an apple.

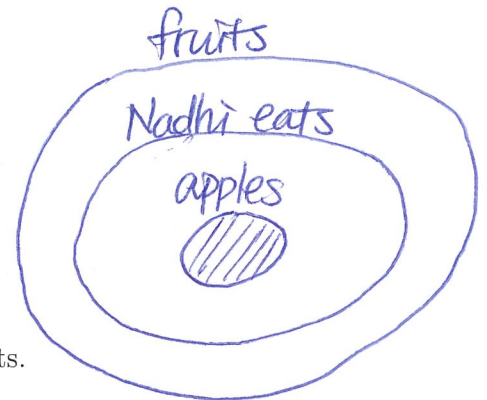
- ① **Nadhi will eat a fruit if it is an apple.**

Translation:  $(a \rightarrow n)$

If the fruit is an apple, we know that Nadhi will eat it.

If the fruit is not an apple, Nadhi may or may not eat it.

The set of apples is a subset of the set of fruits that Nadhi eats.



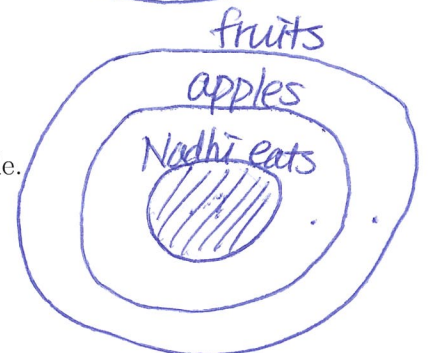
- ② **Nadhi will eat a fruit only if it is an apple.**

Translation:  $(n \rightarrow a)$

If Nadhi eats a fruit, then we know that it is an apple.

If Nadhi does not eat a fruit, the fruit may or may not be an apple.

The set of fruits that Nadhi eats is a subset of the set of apples.



- ③ **Nadhi will eat a fruit if and only if it is an apple.**

Translation:  $(n \leftrightarrow a)$

If Nadhi eats a fruit, then it is an apple.

If Nadhi does not eat a fruit, then it is not an apple.

The set of fruits that Nadhi eats and the set of apples coincide.

