

Extension and intension

Reading: none

I. Sentences

- Recall what we said so far: the denotation of a sentence is a proposition.
- We also talked about truth values, though. Now, what exactly is the relation between a sentence's truth value and the proposition it denotes?
- Here is the full picture. We distinguish between two different kinds of denotations, the *extension* and *intension*.

Extension

- The extension of a sentence is its truth value.
- We can think of the extension of a sentence as the denotation that the sentence has in a specific world. For example, the extension of (1) in the actual world is the truth value 1, because in this world Rome is indeed the capital of Italy.

(1) Rome is the capital of Italy.

Intension

- The intension of a sentence is a proposition, namely the set of possible worlds in which the sentence is true.
- For example, the intension of (1) is the set of all worlds in which Rome is the capital of Italy.
- The intension is the same in all possible worlds, whereas the extension varies across worlds.
- The intension is more general/informative than the extension: given the intension, we know for *any possible world* what the extension in that world is; but given the extension, we don't know what the intension is.

2. One-place predicates

2.1. Intransitive verbs

- We've already seen how to compositionally derive the meaning of sentences consisting of a name and an *intransitive verb*, like (2).

(2) Neil giggles.

- For intransitive verbs we can also distinguish between an intension and an extension.

Intension

- The intension of an intransitive verb corresponds to what we've been assuming so far: it is an unsaturated proposition. When it combines with an individual, it turns into a proposition.

- We can now express this in function talk: an unsaturated proposition is a function from individuals to sets of possible worlds. E.g., *giggles* denotes a function that maps any individual x to the set of worlds in which x giggles.

Extension

- The extension of an intransitive verb is a set of individuals, namely the set of those individuals that have the property expressed by the predicate.
- E.g., *giggles* denotes the set of individuals that giggle.

	extension	intension
sentence	truth value	proposition
intransitive verb	set of individuals	unsaturated proposition

In-class Exercise 1

- Write the extension of *giggles* in world w_0 in predicate notation.
- Write the extension of (2) in world w_0 using the extension of *giggles* and set membership notation.

2.2. Other kinds of one-place predicates

- We treat adjectival predicates and nominal predicates just like intransitive verbs.
- (3) Anna is smart.
- (4) a. Fido is a dog.
b. Karen is a cyclist.
- Their extension is a set of individuals. E.g., the extension of *smart* is the set of all individuals that are smart, and the extension of *dog* is the set of all dogs.
 - Their intension is an unsaturated proposition, i.e., a function from individuals to sets of worlds. E.g., the intension of *dog* is a function that maps any individual x to the set of worlds in which x is a dog.
 - We will ignore the copula *is* and the indefinite determiner a for now.

3. Two-place predicates

- *Two-place predicates* take two arguments. For example:

(5) John petted Fido.

- The extension of a two-place predicates is a *relation* as we already know it from set theory, i.e., a set of ordered pairs whose elements are the arguments of the verb.
- For example, the extension of *petted* is the set of ordered pairs consisting of “petters” and “pettees”.
- The intension of a two-place predicate is a doubly unsaturated proposition. It needs to combine with two arguments to turn into a proposition.
- In function talk: a doubly unsaturated proposition is a function that expects two arguments. Given two individuals as arguments, this function yields a proposition.
- Remember, our semantics is compositional, so it follows the syntax. In the syntax the verb combines first with the object (to form a simple unsaturated proposition) and then with the subject (to form a proposition) (for the syntax-savvy: you can perform constituency tests to show that *petted Fido* is indeed a constituent).

4. Individuals

- For names like *John*, extension and intension are the same, namely the individual with that name.

5. Overview

	extension	intension
sentence	truth value	proposition
intransitive verb	} set of individuals	unsaturated proposition
adjective		
noun		
transitive verb	set of pairs	doubly unsaturated proposition
name	individual	individual

In-class Exercise 2

- Draw a syntactic tree of (5).
- What is the extension of the terminal nodes (write the extension of the predicate *petted* in predicate notation)?
- What is the extension of the VP (in predicate notation)?
- What is the extension of the whole sentence (use the extension the VP and set membership notation)?
- Now go through the tree again and say what the intension of each node is. You don't need to write anything in predicate notation; just use terms like *unsaturated proposition* etc.

What you need to know

Key notions: extension, intension, one-place predicate, two-place predicate, relation, doubly unsaturated proposition

Skills:

- Compositionally derive the meanings of sentences that consist of names and intransitive/transitive verbs.
- Write extensions of sentences consisting of names and intransitive/transitive verbs using extensions of predicates and set membership notation.