

In semantics, **extension** refers to the set of all real-world entities that a word or phrase can refer to. It's the collection of all things that fit a given description.

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### Extension vs. Intension

Extension is best understood in contrast to **intension**. This is a fundamental distinction in formal semantics and the philosophy of language.

- **Extension (or Denotation):** The set of all actual things in the world that a term applies to. For example, the extension of the word "**dog**" is every single dog that has ever existed, exists now, or will ever exist. The extension of the phrase "**the current President of the United States**" is the one person who holds that office at this moment.
- **Intension (or Connotation):** The set of properties or qualities that define a term. It is the concept or meaning of the word itself, separate from any specific entities. For example, the intension of "**dog**" is the conceptual meaning: a four-legged, domesticated canine. The intension of the phrase "**the current President of the United States**" is the concept of "the person who holds the office of the presidency in the U.S. at the present time."

The key relationship is that a word's **intension determines its extension**. The conceptual meaning of "dog" is what allows us to identify all individual dogs in the world.

### Why this distinction matters:

- **Words with No Extension:** A word can have a clear intension but no extension. For example, the phrase "**the present King of France**" has a clear conceptual meaning (an intension), but because there is no king of France, its extension is the empty set (or null set).
- **Different Intentions, Same Extension:** Two different words or phrases can have different intensions but the same extension. For example, the phrases "**the morning star**" and "**the evening star**" have different conceptual meanings, but they both refer to the same object: the planet Venus. Therefore, their extension is the same.