When we say “A is B” or write “A=B”, what do we mean?

**Possibilities:**

1. “this object is that object”
2. “the sign A means the same thing as the sign B”
   - (1) is a tautology (assuming the person who says it is truthful) – obviously, any object is equal to itself!
   - (2), on the other hand, is an informative statement

**Examples:**

3. the sun that rises every day is the same object
4. comet streaking across the sky may be the same one as 20 years ago

Clearly, when we say “A is B”, we don’t mean that the actual names are the same, what we mean is that the object named A is the same as the object named B (modes of presentation)

- Reference of a sign = the object in the world that the sign stands for
- Sense of a sign = the way that the sign establishes its connection to the object it stands for = mode of presentation

**Examples:**

5. “morning star” and “evening star”
6. “point of intersection of a and b” and “point of intersection of b and c”

- There are many ways of naming the same mode of presentation (synonyms, different languages) = many signs for a given sense

**Examples:**

7. “Sophia” “Ms. Sophia Malamud” etc.
8. “the instructor of ling130 in 2007” “the professor who teaches ling130 in 2007” “the teacher of semantics course in 2007 at Brandeis” “the teacher of this course” etc.
9. “apple” “помме” “яблоко” “mela” “omena” “apfel” etc.

- There are many ways of presenting the same object = many senses for a given reference

**Examples:**

10. “I” “Sophia” “the teacher of ling130 in 2007” “the teacher of ling100 in 2007” “the linguistics professor hired at Brandeis in 2006” “the person closest to the board of this classroom” etc.
11. “the morning star” “the evening star” “planet Venus” etc.

   - Sometimes there may not even be a reference for a given sense! (Note: this might be different from imaginary objects)

**Examples:**

12. “The celestial body most distant from Earth”
13. “the perfect woman”
14. “the 20th student in this class”
Possible worlds:
The biggest prime number

Think of expressions like the ones in (12)-(15) that have senses that don’t have a reference in the actual world, but don’t simply denote imaginary objects.

Think of examples where these expressions have a reference in another world.
Are there ones that don’t have a reference in another world?

• In speech reports, the reference of indirect speech is the original sense of the reported speech.

Examples:

(16) John: “This is a chair”
I: “John said that the object he pointed to is a piece of furniture”

Possible worlds: we’ll answer this question later in the course

How can we use possible worlds to talk about speech and attitude reports?

• Distinguish sense from idea or concept: an idea is a mental representation, potentially different for each person; a sense of an expression is the same for all people.

Example: (17) Frida Kahlo – the contents of the filecard & associations with that name are different for different people, but the mapping from the name “Frida Kahlo” to the person is the same for all who know whose name it is.

Because senses are “common property” we can transmit meaning from one person to another by using language.

Example: (18) Moon, telescope image, retinal image = reference, sense, idea

• The sense and reference of sentences: thought vs. truth value

(19) “Odysseus was set ashore at Ithaca while sound asleep” –

o in a poem, we’re concerned with sense (and ideas) – i.e., with the images and events described and the feelings and ideas they arouse in us.

o once we go beyond art, we start caring about whether something is true or false, and then we want to know not just the sense, but the reference of proper names (e.g. “Odysseus”) and other words

Example:

(20) If I tell you, “To get an A in this class, you should read the paper PTQ”, you would assume that I am truthful, and crucially want to know what actual paper is called “PTQ”

• So, there are only two objects that can serve as reference for any sentence: the truth values 1=TRUE and 0=FALSE

Possible worlds:

• Think how Frege’s thinking may be recast using possible world semantics. What can we say about the truth of (19)?
A possibly related question (perhaps a good topic for a project): What makes a work of fiction “ring true”? (different genres?)

Test cases: reference of subordinate clauses (prediction: true or false).
First, exceptions: indirect speech.
(21) “John said that the morning star is the evening star”
(22) “John said that the rose is a rose”
  o (21) is a different claim than (22) – because in reported speech the words of the subordinate clause refer to the sense of John’s words.
(23) “Holmes knows that the murderer is Bill”
(24) “Holmes knows that the murderer is the left-handed man with a red face who arrived in a cab”
  o (23) may be false while (24) is true

Possible worlds:
Recall: How can we use possible worlds to talk about speech and attitude reports?

Second, apparent exceptions: definite descriptions and other “proper names”
(25) “Whoever discovered the elliptic form of the planetary orbits died in misery”
(26) “Someone discovered the elliptic form of the planetary orbits”
  o (25) seems to assert, as a part of its thought (26).
  o Similarly (27) seems to assert the existence of a unique male monarch of France.
(27) “The king of France visited yesterday”
In fact, this is not asserted but presupposed, just as
(28) “Kepler died in misery”
  presupposes (rather than asserts)
(29) “There was a person named Kepler”.

We may address presuppositions later in the course (in any case, you can read up on them, or maybe even do a project related to them)

Frege later returns to the problem of presuppositions, by observing that certain attitude report verbs do strange things with the interpretation of reported attitude:
(30) Sentences with presuppositional verbs contain more than one thought:
  a. “Bebel fancies that the return of Alsace-Lorraine would appease France’s desire for revenge.”
    1. Bebel believes that p
    2. It is not the case that p
  b. “John knows that we’re meeting in this room”
    1. John believes that p
    2. It is the case that p
  c. “Galileo discovered that the Earth is rotating”
    1. Galileo didn’t believe that p
    2. Galileo came to believe that p
    3. It is the case that p
Third, probably also exceptions: conditionals with indefinite expression in the antecedent:

(31) If a number is less than 1 and greater than 0, its square is less than one and greater than 0.
   
   o “…The component in question is ‘a number’ in the conditional clause and ‘its’ in the dependent clause.”
   
   1. It is by means of this very indefiniteness that the sense acquires the generality expected of a law
   2. It is this which is responsible for the fact that the antecedent clause alone has no complete thought as its sense and in combination with the consequent clause expresses one and only one thought, whose parts are no longer thoughts

We will return to examples like (31) with a vengeance in a few of weeks – keep this in mind, for next week and beyond. We’ll need a bit more logic to unpack this into a statement of a semantic problem, and quite a bit more stuff to start offering some solutions.

Stuff we probably won’t have time for: logic of time

(32) “When the Sun is in the tropic of Cancer, the longest day in the northern hemisphere occurs”

Frege: this is synonymous with something like

(33) “A time when the Sun is in the tropic of Cancer is the time when the longest day in the northern hemisphere occurs”

Finally, our test cases: relative clauses modifying proper names:

(34) Frida Kahlo, who had a back injury when she was young, married Diego Rivera
   
   This is only true if both of these are true:
   
   1. Frida Kahlo had a back injury when she was young
   2. Frida Kahlo married Diego Rivera

Strange cases: some discourse connectives:

(35) a. “Although she’s from Brooklyn, she’s nice”
   b. “She is from Brooklyn, but she is nice”
   c. “She is from Brooklyn; yet, she is nice”

Frege’s claim: these are literally synonymous with (36)

(36) “She is from Brooklyn and she is nice.”

The difference is “rhetorical effect” with no bearing on truth conditions.

   A possible project: what is the contribution of discourse connectives?

Frege’s claim on “because”:

(37) “Because ice is less dense than water, it floats on water”
   
   1. Ice is less dense than water
   2. If any is less dense than water, it floats on water
   3. Ice floats on water
Finally, other connectives, like present-tense conditionals with no indefinites, contain complete thoughts in their clauses – so replacing each clause with something equivalent in truth-value doesn’t change the truth of the conditional:

(38) “If the Sun has already risen, the sky is very cloudy”

(think of \( p \rightarrow q \) : if we replace \( p \) and \( q \) with propositions without changing their truth-values, the result doesn’t change since the truth-table remains the same)

More strange cases: counterfactuals. We’ll address those in a few weeks:

(39) If iron were less dense than water, it would float on water
   1. If anything is less dense than water, it floats on water
   2. Iron is not less dense than water
   3. Iron does not float on water

**Possible worlds:** Bach already mentioned that counterfactuals are “world-creating contexts” - we will most certainly use possible worlds to talk about these sentences.

**Recap:** when we analyse complex sentences into clauses, their truth-value may fail to be a simple combination of the truth-values of the clauses. Two possible reasons are:

1. sentence-parts may fail to refer to a truth-value
2. the result is a complex combination of the truth-values of the parts

To come back full circle: “A=B” and “A=A” are very different statements:

Their reference is the same (true), because the reference of their parts is the same
Their sense is different (one is a contingency, the other a tautology), because the senses of their parts are different.