I. This whole course is motivated by the following deceptively simple observation:

Some statements appear to follow from others: when the latter are true, the former must be as well (or at least likely to be), or when you accept the latter, you are obliged to accept the former as well.

Here are some examples of what I’m talking about:

(1) All birds have wings, and Tweety is a bird.

Does any novel statement follow from this?

How about:

(2) He’s either drunk or stupid, but he’s certainly not stupid.

However, compare (1) above with:

(3) All birds have wings, and Tweety has wings.

Does anything follow from this? Why or why not?

We can even extend the point to deliberately fanciful examples.

(4a) Unless it’s holding its popadoo, then that squeeziel won’t garble its farfilnuts. But that squeeziel is garbling its farfilnuts. So it must be holding its popadoo.

The esteemed logician Lewis Carroll (author of Alice in Wonderland) was famous for concocting fanciful examples like this – think of his poem, The Hunting of the Snark, with all its talk or boojums, brillig, and the bandersnatch. The point is that it makes a “kind of sense” (as Alice said), from which one can draw some inferences, even though one has no idea what exactly one is talking “about.” How can that be?

Our example above has the following form (where P and Q both stand for sentences):

(1) Unless P, not Q
(2) But Q
so (3) P

Here’s another, perhaps more illuminating illustration (or instance) of that very same form:
(4b) Unless you take all the exams in this class, then I won’t pass you.
But you will pass this class (right?)
So it follows that you must take all the exams.

The overall point is that in some cases, statements follow from others when they are instances of specific, logically valid forms. One of the chief purposes of this course is to investigate those privileged forms, and to distinguish the valid forms from invalid ones, like (3) above.

II. Let’s cover some preliminary definitions:

An **argument** is a set of sentences (or statements) the truth of one (the conclusion) is supposed to follow from the assumed truth of the others (the premises).

**Deductive arguments** are ones in which the truth of the premises is supposed to guarantee the truth of the conclusion.

**Inductive arguments** are those in which the truth of the premises is supposed to show that the truth of the conclusion, while not guaranteed, is nevertheless likely or probable. Drawing generalizations from particular instances is an extremely common type of inductive argumentation.

Our first exercise set aims to get you clear on this distinction.

In this course, we shall be focusing on deductive arguments. If you are interested in inductive arguments, you would be well-served taking a philosophy of science or scientific reasoning course. Scientific reasoning is rife with this type of argumentation.

**Validity**: A logically valid deductive argument is one whose form is such that its premises do indeed guarantee the truth of its conclusion. Or in other words, it has a form in which it is impossible for its premises to be true and its conclusion to false.

*It is essential to realize that an argument’s validity is not simply a matter of the actual truth or falsity of its premises or conclusion.* Valid arguments may have false premises, and they might have false conclusions, or these truth values might be unknown (witness the fanciful example above). A valid argument that happens to have true premises (hence a true conclusion) is further called a **sound argument**.

An invalid deductive argument, by contrast, is one whose form allows the possibility of there being true premises and a false conclusion. In order to show, then, that an argument is logically invalid, one can construct a **counterexample**: an instance of that very same form in which the premises are clearly true and the conclusion clearly false.

Consider once again, the argument implied in (3) above: All birds have wings. Tweety has wings. So Tweety must be a bird.
In order to show that this argument is invalid, one must come up with an argument with the same overall form, with CLEARLY true premises and a CLEARLY false conclusion. Here’s one such example:

(3b) All dogs have four legs.
My pet cat Ickey has four legs.
So my pet cat Ickey must be a dog.

I’m hoping that it’s clear that argument (3b) has the same form as (3) and that it has true premises and a false conclusion. Even if you’re not so sure about Ickey, then I imagine you can come up with a counterexample involving something with which you’re much more familiar.

One thing to keep in mind: an invalid argument may nevertheless happen to have a true conclusion. Think again of example (3). While the argument is demonstrably invalid, the conclusion might happen to be true, especially if we think that Tweety here refers, not to my pet bat, but rather to the marginally articulate bird of cartoon fame (Sylvester’s the cat’s nemesis). That is, there are bad (invalid) ways to reason to true conclusions!!!

The remaining exercises from Chapter 1 is meant to hone your intuitions regarding validity and invalidity, and to get you to start constructing possible counterexamples to argument forms when you suspect that they are invalid. There is something of an art to constructing illustrative counterexamples. Don’t despair if you face some difficulty doing so. Just winge at your TA following lecture.

III. Let’s close with a couple more fanciful examples (thanks to Winnie the Pooh and The Lorax). What, if anything, follows logically from the following? And how would you characterize their logical form?

(6) That heffalump is going snuff-snuff, which it would be doing only if we were approaching its woozle.…

(7) That heffalump would be going snuff-snuff only if we were approaching its woozle, which in this case we aren’t.

(8) All Lorax are bar-ba-loots, and no bar-ba-loot would ever garble their truffula fruit!

(9) No bar-ba-loot (doncha know!) would ever garble their truffula fruit, yet some oncelers do…

Finally, can you think of a counterexample for the following, perhaps tempting, variation on (9)?: No bar-ba-loot would ever garble their truffula fruit, yet some oncelers do. Hence oncelers must not be bar-ba-loots.
[Hint: think of what happens when you substitute “Mammal” for onceler, “eats mice” for garbles their truffula fruit, and “cow” for bar-ba-loot. Now come up with other substitutional variants that would also demonstrate the invalidity of this form]