Some material relevant to the Syllogism.

First, we should get straight on the four "categorical forms" of statements. They are:

A: All X are Y
E: No X are Y
I: Some X are Y
O: Some X are not Y

The A, E, I, O are the standard names for the type of statement indicated. As mentioned in class, the medievals also allowed proper names to be the subject term of Aristotle's categorical forms, and counted them as A-statements. So, 'Socrates is a man' is understood as 'All Socrates is a man. (This plays a role in understanding "distribution", which we look at below).

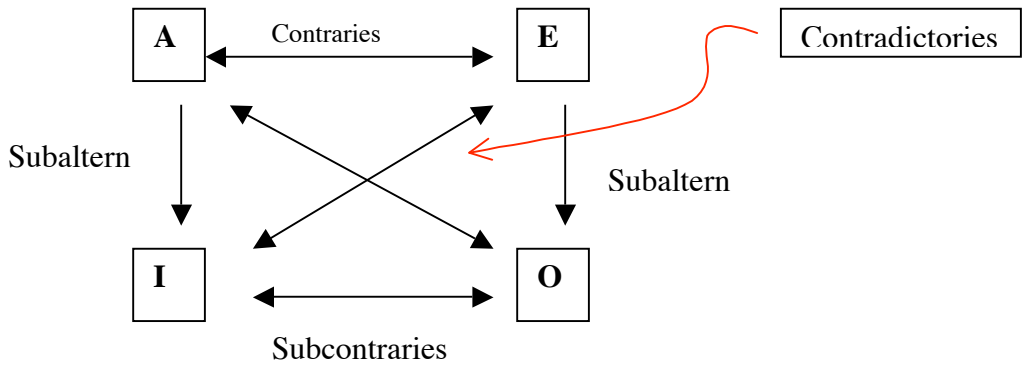
You might note that A and O statements are contradictories, and so are E and I statements. This means that one of them must be true and the other false, for any particular substitution of predicates for X and Y.

Also, A and E statements are contraries – which means that they can't both be true (although they can both be false; for instance 'All dogs have brown fur' and 'No dogs have brown fur' are both false). The I and O statements are sub-contraries – they can't both be false (although they can both be true; for instance 'Some dogs have pointy ears' and 'Some dogs do not have pointy ears).

In Aristotelian logic, E and I statements convert: you can swap the subject and predicate terms and retain truth or falsity. ('No dogs are reptiles' and 'No reptiles are dogs' are both true; 'No dogs are mammals' and ' No mammals are dogs' are both false).

Note that (in Aristotelian logic) A and E statements imply the corresponding I and O statements (respectively). [The traditional name for this is that the I and O are subalterns of A and E].

These relations are often represented in the square of opposition:



A syllogism is a set of three statements, each in categorical form. Each of the two terms (the subject and predicate) that are in each of the three statements occur in exactly two of the three statements. (Not stated very clearly…but you get the picture). Two of the statements are the premises of the syllogism, and the other one is the conclusion. This means that there will be a term that is common to both premises, and doesn't occur in the conclusion. This is the middle term. One of the premises is called the major premise and the other is called the minor premise, although we won't follow this distinction up. (It plays a role in questioning whether there is a "fourth figure syllogism". In not making this distinction, we are implicitly saying that these are "really" first figure syllogisms.)

First Figure Syllogisms: The middle term is the predicate of one premise and the subject of the other.

Second Figure Syllogisms: The middle term is the predicate in both premises.

Third Figure Syllogisms: The middle term is the subject in both premises.

It is traditional to use terminology like AEE-2 to designate the syllogistic form "second figure, one premise an A statement, the other premise an E statement, and the conclusion an E statement". That is:

All X is Y
No Z is Y
No X is Z

Determining Validity of Syllogisms

You could memorize the ones that are valid, couldn't you? The medievals developed names for all the syllogisms, using the order of the vowels in the 'AEE' style of designating premises and conclusions, and then filling in consonants to form names. So, 'AAA' became Barbara (at least for the first figure), and the like. And they invented a poem that told you what figure which of the valid syllogisms were in. Ya wanna know whether AII-3 is valid? Recite the poem and see.

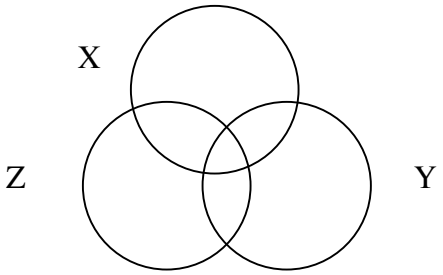
I'll give two methods to use in determining a valid syllogism: The Rules of Distribution, and Venn Diagrams (so-called). The Distribution rules were invented in the middle ages; John Venn was a 19th Century English mathematician.

The notion of Distribution is very fuzzy, although the rules are completely clear - so long as you don't try to understand why they work. Here are the rules. The idea is that an occurrence of a term in a statement can be distributed or not-distributed. The subject of all universal statements (A and E) is distributed; the predicate of all negative statements (E and O) is distributed. None of the others are distributed. (So: in an A statement the subject-term is distributed; in an E statement both the subject- and predicate-terms are distributed; in an O statement the predicate-term is distributed. None of the others are.)

The Rules of Distribution for a valid syllogism are:

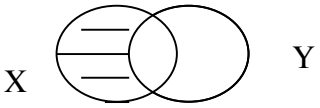
1. The middle term must be distributed at least once.
2. If a term is distributed in the conclusion, it must be distributed in a premise.
3. (Negation Rules). There cannot be two negative premises, and if one of them is negative then the conclusion must be also.

With Venn Diagrams one draws three circles to represent the three terms in a syllogism. They are drawn in such a way that all possible overlaps are represented (if there are three terms, then there will be eight possible overlaps, counting the "empty overlap", which is outside all three circles. If the three terms are X, Y, Z, then we would have:

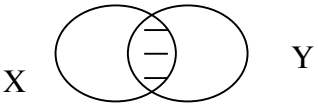


Here are the "shading rules" for statements:

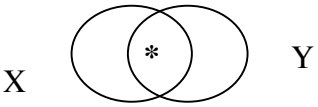
All X is Y:



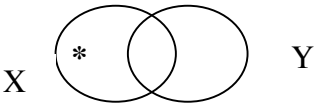
No X is Y:



Some X is Y:



Some X is not Y:



The shaded areas indicate that "there is nothing in this area"; the * indicates that there is definitely something in this area. To use this method, you start with the three-circle diagram and shade in (or put *s) in the appropriate areas to describe the two premises. If when you finish this, you have also thereby described the conclusion, then it is a valid syllogism. Otherwise it is invalid. (There are some caveats about making sure you have really put *s in the right areas, etc.)

And now you know how to determine the validity of syllogisms!! (Well, there are those caveats, which make the Venn method a bit tricky sometimes).