Peter Smith, *Introduction to Formal Logic* (CUP, 2nd edition)

Exercises 3: Forms of argument

(a) Which of the following patterns of inference are deductively reliable, meaning that all their instances are valid? (Here 'F', 'G' and 'H' hold the places for general terms.) If you suspect an inference pattern is unreliable, find an instance which has to be invalid because it has true premisses and a false conclusion.

(1) Some F are G; no G is H; so, some F are not H.

(2) Some F are G; some H are F; so, some G are H.

(3) All F are G; some F are H; so, some H are G.

(4) No F is G; some G are H; so, some H are not F.

(5) No F is G; no H is G; so, some F are not H.

(6) All F are G; no G is H; so, no H is F.

(b) What of the following patterns of argument? Are these deductively reliable?

(1) All F are G; so, nothing that is not G is F.

(2) All F are G; no G are H; some J are H; so, some J are not F.

(3) There is an odd number of F, there is an odd number of G; so there is an even number of things which are either F or G.

(4) All F are G; so, at least one thing is F and G.

(5) m is F; n is F; so, there are at least two F.

(6) Any F is G; no G are H; so, any J is J.

(c) Arguments of the kinds illustrated in (a) are so-called (categorical) *syllogisms*, first systematically discussed by Aristotle in his *Prior Analytics*.

These syllogisms are formed from three propositions, each being of one of the following four forms, which have traditional labels:

A: All X are Y

E: No X is Y

I: Some X are Y

O: Some X are not Y..

By the way, these medieval labels supposedly come from the vowels of the Latin *affirmo* (I affirm, for the positive two) and *nego* (I deny, for the negative two).

A syllogism then consists of two premisses and a conclusion, each having one of these forms. The two terms in the conclusion occur in separate premisses, and then there is a third or 'middle' term completing the pattern – as in our six schematic examples above. Two questions arising:

(1) Which valid types of syllogism of this kind have a conclusion of the form A, 'All S are P'? (Use 'M for the 'middle' term in a syllogism.)

(2) Which have a conclusion of the form O, 'Some S are not P'?

(d) Ancient Stoic logicians concentrated on a different family of arguments. Using 'A' and 'B' to stand in for whole propositions, and 'not-A' to stand in for the denial of what 'A' stands in for, they endorsed the following five basic forms of arguments. Indeed they held them to be so basic as to be 'indemonstrable':

(1) If A then B; A; so B.

(2) If A then B; not-B; so not-A.

(3) not-(A and B); A; so not-B.

(4) A or B; A; so not-B.

(5) A or B; not-A; so B.

Which of these principles are acceptable, which – if any – are questionable? Give illustrations to support your verdicts!

What about these further forms of argument? Which are correct?

(6) If A then B; not-A; so not-B.

(7) If A then B; B; so A.

(8) not-(A and B); so either not-A or not-B.

(9) A or B; so not-(not-A and not-B).

(10) not-not-A; so A.

What about these general principles?

(11) If the inference A *so* B is valid, and the inference B *so* C is valid, then the inference A *so* C is also valid.

(12) If the inference A, B *so* C is valid, then so is the inference A, *not-*C *so not-*B.