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

Exercises 6: Logical validity

Which of the following arguments are deductively valid? Which are logically valid? (Defend your answers, as best you can.)

(1) Only logicians are wise. Some philosophers are not logicians. All who love Aristotle are wise. Hence some of those who don't love Aristotle are still philosophers.

(2) The Battle of Hastings happened before the Battle of Waterloo. The Battle of Marathon happened before the Battle of Hastings. Hence the Battle of Marathon happened before the Battle of Waterloo.

(3) Jane is no taller than Jill, Jill is no taller than Jo, Jo is no taller than Jane. So Jane, Jill and Jo are the same height.

(4) Jane is taller than Jill, Jill is taller than Jo, Jo is taller than Jane. So Jane, Jill and Jo are the same height.

(5) Someone loves Alex, but Alex loves no-one. The person who loves Dr Jones, if anyone does, is Dr Jones. So Alex isn't Dr Jones.

(6) Whoever respects Socrates respects Plato too. All who respect Euclid respect Aristotle. No one who respects Plato respects Aristotle. Therefore Jo respects Euclid if she doesn't respect Socrates.

(7) Jill is a good logician only if she admires either Gödel or Gentzen. Jill admires Gödel only if she understands his incompleteness theorem. Whoever admires Gentzen must understand his proof of the consistency of arithmetic. No one can understand Gentzen's proof of the consistency of arithmetic without also understanding Gödel's incompleteness theorem. So if Jill is a good logician, then she understands Gödel's incompleteness theorem.

(8) All the Brontë sisters supported one another. The Brontë sisters were Anne, Charlotte and Emily. Hence Anne, Charlotte and Emily supported one another.

(9) There are exactly two logicians at the party. There is just one literary theorist at the party. No logician is a literary theorist. Therefore, of the party-goers, there are exactly three who are either logicians or literary theorists.

(10) There are no unicorns. Hence the set of unicorns is the empty set.

(11) There is water in the cup. Hence there is liquid H_2O in the cup.

(12) Necessarily, water is H_2O. Hence it is not possible that water isn't H_2O.

(13) It is possible that it is cold. It is possible that it is rainy. Hence it is possible that it is cold and rainy.

(14) This argument is valid. Hence this argument is invalid.