Mathematics 2200H – Mathematical Reasoning
TRENT UNIVERSITY, Fall 2016

Assignment #3
A little pidgeon quibbled with my Aristotelian logic ...
Due on Thursday, 29 September.

Suppose we have a first-order language with the usual variables, connectives, quantifiers, equality, and two one-place relations, P and Q. $P(x)$ is supposed to mean "x is a pidgeon" and $Q(x)$ is supposed to mean "x is a quibbler".

1. Translate the four sentences

All pidgeons are quibblers.
Some pidgeons are quibblers.
No pidgeons are quibblers.
Some pidgeons are not quibblers.

into logically equivalent formulas of the first-order language described above. *[4]*

NOTE: The four sentences reflect the four main sentence forms involving quantifiers studied in Aristotle's logic.

2. If there are no pidgeons, but there are some quibblers, in the universe the four sentences in question **1** are talking about, which of them must be true? If, instead, there are no quibblers, but there are some pidgeons in that universe, which of the four sentences must be true? (Do, please, explain why in each case.)*[3]*

3. Aristotelian logic pretty much consists of propositional logic, plus just enough first-order logic to properly handle the four sentence forms given above. Give an example of a mathematical result and its proof that Aristotelian logic is *not* adequate to handle, and explain why this is so. *[3]*

Probable-Possible, my black hen,
She lays eggs in the Relative When.
She doesn't lay eggs in the Positive Now
Because she's unable to Postulate How.

Three jolly sailors from Blaydon-on-Tyne
They went to sea in a bottle by Klein.
Since the sea was entirely inside the hull
The scenery was exceedingly dull.

Flappity, Floppity, Flip!
The Mouse on the Ḿobius Strip.
The Strip revolved,
The Mouse Dissolved
In a chronodimensional skip.

Taken from *The Space Child's Mother Goose* by Frederick Winsor.