UNIVERSITY OF LEEDS

School of Computing Assessment Brief

Module title	Knowledge Representation and Reasoning
Module code	COMP5450M
Assignment title	Assignment 1: Logical Representation and Proof
Assignment type and description	Create logical representations in the format used by the Prover9 theorem prover.
Rationale	The assignment is designed to develop and test the skill of precisely representing a reasoning problem by translating English sentences into logical formula. It also demonstrates the reasoning capabilities of automated theorem provers.
Length limit and guidance	Prover9 template files are provided. A total of 20 formulae need to be entered in the correct format at indicated places in the files.
Use of AI	**RED:** No Gen AI or other AI tools permtted.
Weighting	20% of total module grade
Submission deadline	10am, Friday 7th November 2025
Submission method	Gradescope
Feedback provision	Feedback will be provided via Gradescope.
Learning outcomes assessed	• Translate English sentences into propositional and first-order logic. • Understand how to use and create input files for the Prover9 theorem prover. • Use a theorem prover to check a problem formulation and compute inferences.
Module lead	Brandon Bennett `B.Bennett@leeds.ac.uk`
Other contacts	To be confirmed.

Knowledge Representation and Reasoning

COMP5450M

Assignment 1

Logical Representation and Proof

Due 10am Friday 7th November 2025

The aim of this assignment is to encode reasoning problems stated in English into classical logic. The required submission is in the form of ***Prover9*** input files that are to be submitted to ***Gradescope***.

More information on using ***Prover9*** can be found on my web page of information and exercises at:

https://teaching.bb-ai.net/KRR/Prover9/info.html

In order to get a good mark on this assignment it is very strongly recommended that you do the formative Prover9 exercises (maybe not the advanced ones but most most of the first two sets). They are of the same form as this assessment but give you direct feedback, that will provide some guidance to the correct answers.

The Gradescope submission link will not be available until a few days before the deadline. You will receive an announcement when it becomes available.

The Problems:

There are two problems, one should be encoded in propositional logic and the other requires first-order-logic (with equality):

A. Hotspot (propositional logic) [18 marks]

B. The Academy (first-order logic) [22 marks]

Total marks available: 40 (but counts for 20% of module grade)

Each student will have their own unique variation of the problems (although the underlying structure is the same, so they will be of equal difficulty). You can get your individual problem (determined by your email/username) from the following web site:

https://teaching.bb-ai.net/KRR/Prover9/problems/assignment1_2025/page_selector.html

Please visit that site and follow the instructions to get to your individualised problems. Similarly to the formative exercises, each of your problem pages will have a link to a Prover9 template file. You should use this as a starting point to create your solution, by adding logical translations of the sentences in the places indicated in the template.

You will get limited feedback after each submission to gradescope. It will tell you whether you have passed and give some other information, but it will not give your exact grade. You can make up to 10 submissions without any penalty. After that you will loose 4 marks for each additional submission, so it is best not to go beyond 10.

Mark Scheme

As with the formative work on logical representation and proof using Prover9, marks will be awarded for each formula in your submitted solution as follows:

- Your formula is equivalent to the correct answer: 2 marks.
- Your formula is consistent and entails the correct answer but is not equivalent to it: 1 mark.
- Your formula is entailed by the correct answer but not equivalent (except if your formula is logically valid on its own and so follows from anything): 1 mark.
- None of the above apply: 0 marks.

Submission via Gradescope

Your solutions will be checked and marked automatically using software that has been implemented by embedding Prover9 within the Gradescope platform. Follow the link to Gradescope on the 'Submit My Work' page of the module's Minerva web pages, and look for the assignment: Assignment 1

You may submit your answers up to 10 times without any penalty. For each additional submission 1 mark will be deducted. I would not advise continuing to submit. After each submission you will get limited feedback, not exact grades. But you will get enough information to know whether you have passed the assignment.