



Core Logic

2005/2006; 1st Semester
dr Benedikt Löwe

Homework Set # 4

Deadline: October 4th, 2005

Exercise 10 (total of nine points).

Let $\mathfrak{B}_{GH} := \{\text{Giliri, Halodri}\}$

where **Giliri** is $\frac{AiB}{\frac{BiC}{AiC}}$ and **Halodri** is $\frac{AaB}{\frac{BoC}{AiC}}$.

For example, the following is a \mathfrak{B}_{GH} -proof:

$$\frac{BoA}{\frac{CaB}{AiC}} \xrightarrow{m} \frac{CaB}{\frac{BoA}{AiC}} \xrightarrow{s} \frac{CaB}{\frac{BoA}{CiA}} \xrightarrow{per} \frac{AaB}{\frac{BoC}{AiC}}$$

Following the proof, the mood $BoA, CaB:AiC$ could be called **Homalis**.

Give \mathfrak{B}_{GH} -proofs in the graphic representation (2 points each) and find names consistent with the medieval mnemonics (1 point each) for the following three moods:

$$\frac{AeB}{\frac{CoB}{AoC}} \quad \frac{BiA}{\frac{BaC}{AiC}} \quad \frac{BeA}{\frac{CaB}{AiC}}$$

Exercise 11 (total of six points).

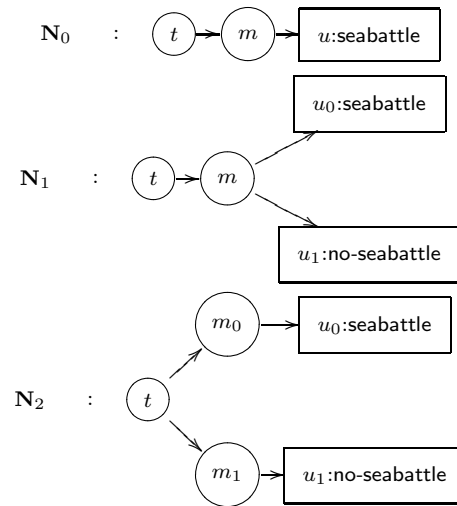
A **naumachic model** is a quadruple $\langle M, U, \leq, S \rangle$ where M and U are finite sets, \leq is a binary relation between M and U (i.e., $\leq \subseteq M \times U$) and S is a function from U to $\{\text{seabattle, no-seabattle}\}$.

We call the elements of M **tomorrows**, the elements of U **day-after-tomorrows**, if $m \leq u$, we say that “ u is a possible future of m ”, and if $S(u) = \text{seabattle}$ we say that “there is a sea battle at u ” (similarly, if $S(u) = \text{no-seabattle}$ we say that “there is no sea battle at u ”).

Given a naumachic model $\mathbf{N} = \langle M, U, \leq, S \rangle$, we say

- $\mathbf{N} \models$ “There will be a sea battle the day after tomorrow” if for all $m \in M$ and all u such that $m \leq u$, $S(u) = \text{seabattle}$.
- $\mathbf{N} \models$ “There will be a sea battle the day after tomorrow” if for all $m \in M$ and all u such that $m \leq u$, $S(u) = \text{no-seabattle}$.
- $\mathbf{N} \models$ “Tomorrow it will be determined whether there is a sea battle the day after tomorrow” if for all $m \in M$ the following holds: all u such that $m \leq u$ have the same value of $S(u)$.

We consider the following four naumachic models (t represents “today”, the m_i are the tomorrows, the u_i are the day-after-tomorrows, the arrows indicate the \leq relation, and u_i :seabattle means $S(u_i) = \text{seabattle}$).



Are the following statements true or false (1 point each)?

- (1) In N_0 , there will be a sea battle the day after tomorrow.
- (2) In N_1 , there will be a sea battle the day after tomorrow.
- (3) In N_2 , there will be a sea battle the day after tomorrow.
- (4) In N_0 , it will be determined tomorrow whether there is a sea battle the day after tomorrow.
- (5) In N_1 , it will be determined tomorrow whether there is a sea battle the day after tomorrow.
- (6) In N_2 , it will be determined tomorrow whether there is a sea battle the day after tomorrow.

Exercise 12 (total of seven points).

Read the paper

Christopher J. **Martin**, The Logic of Negation in Boethius, **Phronesis** 36 (1991), p. 277–304

(you can find a link to the PDF file on the webpage) and answer the following questions briefly:

- According to Martin, what does Stump claim about Boethius (1 points)? Does Martin agree (½ point)?
- Boethius claims that “among the Peripatetics only Theophrastus and Eudemus made even the barest beginnings” of a theory of hypothetical syllogisms. Explain (in at most three sentences) why, according to Martin, material found in Avicenna casts some doubt on this claim. (p. 295; 3 points).
- McCall calls the propositional principle $(p \rightarrow q) \rightarrow \neg(p \rightarrow \neg q)$ “Boethius’ principle”. Martin disagrees. If Martin were to call this “X’s principle”, who would be X (1 point)?
- Martin claims that propositional logic was invented three times in western civilization? Who were these three inventors (½ point each)?