

Formal Reasoning 2016
Test Block 2: Predicate Logic
(21/09/16)

Before you read on, write your name, student number and study on the answer sheet!

The mark for this test is the number of points divided by ten. For each question you can score fifteen points, and the first ten points are free. Good luck!

The first three exercises use the following ‘dictionary’.

s	Socrates
E	living beings
$H(x)$	x is a (human) man
$M(x)$	x is mortal
$P(x)$	x is a Great Basin bristlecone pine tree

1. Give a formula of predicate logic that approximates the meaning of the following sentence as well as possible:

All men are mortal, Socrates is a man, hence Socrates is mortal.

2. Give a formula of predicate logic with equality that approximates the meaning of the following sentence (after 1 Timothy 6:16) as well as possible:

There is only one man that has immortality.

3. Give an English sentence that corresponds to the following formula of predicate logic:

$$\forall x \in E [P(x) \rightarrow \neg M(x)] \wedge [\exists x \in E (\neg P(x) \wedge \neg M(x))]$$

4. Write the formula from the previous exercise according to the official grammar from the course notes.
5. Is your answer to exercise 1 above a logically valid formula? Explain your answer.
6. Give an interpretation I_6 in the model $M_6 := (\mathbb{Z}, 0, <)$ under which the formula from exercise 3 is true. Explain your answer.