Philosophy 1102: Introduction to Logic

Department of Philosophy
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Problem Set 1

[Total: 50 marks]

Hand in answers to the following questions, at the start of class on Thursday, Jan. 11. In this course you will hand everything in on paper.

In general we will not cover everything in class, so be sure to read the relevant sections of the textbook to learn the material you need.

For this problem set, I suggest that you print off this question document and add your answers to it by hand. For future problem sets you should format your answers yourself, in a similar way.

1. In each of the following sentences, underline every occurrence of a proper name (i.e. individual constant, or singular term). If there are functions, i.e. names within names, then some parts of the sentence could be double (even triple) underlined. Also, if any occurrence of the word 'is' or 'was' expresses identity, then write the '=' symbol above it.

For example, if you were given the sentence: "Alec is my mother's new husband", the answer would be:

(i) Raman saw a rat in a park somewhere in Burnaby.

(ii) Devi was Helen's maid of honour

(iii) Alex is taller than Betty's grandmother.

(iv) Mike's wife is Wilson's mother.

[Total 14 marks]

2. Translate the following atomic sentences into FOL, *using the predicates listed on p. 22 of the textbook*, or pp. 4-5 in the online handout "Names, Predicates and Functions".

[*Hint*: Use the identity predicate '=' to translate 'is identical to', and remember that a = b means they're the *very same* object, not merely similar objects.]

N.B. There is just one right answer to each part here, and even slight differences from it (e.g. incorrect capitalisation) will be penalised.

[½ mark each, 6 total]

e.g.	a is in the same column as c	SameCol(a, c)
(i)	c is back of a	
(ii)	c is identical to e	
(iii)	c is in the same row as d	
(iv)	e is left of d	
(v)	a is a dodecahedron	
(vi)	d is a cube	
(vii)	c is between d and b	
(viii)	d is medium	
(ix)	d adjoins c	
(x)	c is a tetrahedron	
(xi)	a is right of b	
(xii)	c is small	

[*Hint*: Remember that 'a is right of b' just means that a is closer to the right-hand edge of the grid than b is. They don't have to be in the same row.]

3. By adding blocks to the world shown below, create a world in which all thirteen sentences in Qu. 2 (including the example) are true. (See the online handout "Names, Predicates and Functions", p. 4, for guidance on drawing worlds.) If you wish, you can use the program 'Tarski's World' to check your answer.

N.B. There are many different worlds where the sentences are true, so just *invent* any aspects of your world that the sentences leave unspecified, such as the shape of block b. [5 marks for world]
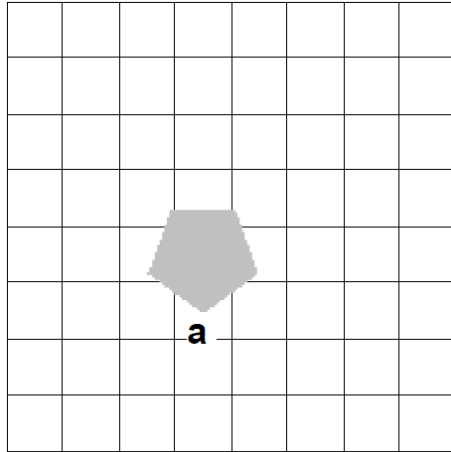
4. Translate the following English sentences into FOL, using the dictionary provided, as well as '=' where needed. [2 marks each]

Surgeon(x) – *x* is a surgeon mother(x) – *x*'s mother george – George rachel – Rachel alice – Alice	Friend(x, y) – *x* is a friend of *y* bff(x) – the best friend of *x* Lazy(x) – *x* is lazy fred – Fred Taller(x, y) – *x* is taller than *y*

e.g.	Fred is taller than his own mother	Taller(fred, mother(fred))
(i)	Rachel's mother is a surgeon	
(ii)	Rachel's mother is George's friend	
(iii)	George's mother is also Alice's mother	
(iv)	The best friend of Alice's mother is lazy.	

5. Using the same dictionary, translate the following FOL sentences into English. (Don't worry about whether or not they could all be true.) [2 marks each]

e.g.	Taller(rachel, fred)	Rachel is taller than Fred
(i)	rachel = mother(fred)	
(ii)	Lazy(mother(mother(alice)))	
(iii)	Friend(alice, fred)	
(iv)	Taller(bff(alice), bff(mother(alice)))	

6. Write each of the following arguments "Fitch format", or standard form (keeping them in English!), and say whether or not it is deductively valid. (You should leave out connecting words and phrases like 'but', hence', 'now', etc.) [3 marks each]

For example, if you were given the argument,

"If the Canucks don't win the game, Fred will be too depressed to do his homework tonight. But if the Canucks win, then Fred will go out and celebrate tonight rather than study. Hence Fred will not do his homework tonight."

then the answer would be:

1. If the Canucks don't win, Fred will be too depressed to do his homework tonight.
2. If the Canucks win, then Fred will go out and celebrate tonight rather than study.

∴ Fred will not do his homework tonight

The argument is *valid*.

(i) "A dog will be vicious, if its owner mistreats it. Your puppy Rex is always biting people, so you must be treating him badly."

1.

2.

∴

The argument is _____

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(ii)   "All ostriches are birds. So all ostriches lay eggs, since we know that all birds lay eggs."

1.

2.

∴

The argument is _____

(iii)   "Scientists cannot be trusted. If scientists were always right, then they could be trusted. However, we know that scientists are very often wrong – there are so many examples of this."

1.

2.

∴

The argument is _____