

Artificial Intelligence

Joint class 5314 / 4320

Exercises – 1/25/05

Exercise 1 *Represent the following facts in FOL:*

- *Every apple is either green or yellow.*
- *No apple is blue.*
- *If an apple is green then it is tasty.*
- *Every man likes tasty apples.*

Exercise 2 *Write logic statements or rules to describe the following relations:*

- *parent(Parent,Child)*
- *son(Son,Parent)*
- *daughter(Daughter,Parent)*
- *grandfather(Grandfather,Grandchild)*
- *grandparent(Grandparent,Grandchild)*
- *brother(Brother,Sibling)*
- *sibling(Sibling1,Sibling2)*
- *have-children-together(Person1,Person2)*
- *uncle(Uncle,Person)*

Check if half-brothers are considered brothers. If so, change the predicate in such a way that this is not the case anymore. Can a person be his own brother? If yes, fix the problem.

Do the same for the sibling relation. Are halfbrothers/halfsisters siblings of each other? If yes, fix the problem. Can somebody be a sibling of himself? If yes, fix the problem.

Exercise 3 *Solve 3 of the following 6 problems: first simply guess what the answer is; and then by using proof techniques of logic:*

Some cave dwellers use fire.

1. *All who use fire have intelligence.
So ???*

(a) All who have intelligence use fire.

(b) Some cave dwellers have intelligence.

- (c) *All cave dwellers have intelligence.*
- (d) *None of these validly follows.*

If you overslept, you'll be late.

2. *You aren't late.*
So ???
- (a) *You didn't oversleep.*
 - (b) *You're late.*
 - (c) *You did oversleep.*
 - (d) *None of these validly follows.*

No one held for murder is given bail.

3. *Smith isn't held for murder.*
So ???
- (a) *Smith is given bail.*
 - (b) *Smith isn't given bail.*
 - (c) *Smith is innocent.*
 - (d) *None of these validly follows.*

No court that suppresses evidence is impartial.

4. *Some courts subject to political pressure suppress evidence.*
So ???
- (a) *Some courts subject to political pressure aren't impartial.*
 - (b) *No courts subject to political pressure are impartial.*
 - (c) *Some courts subject to political pressure are impartial.*
 - (d) *None of these validly follows.*

Anyone who has just lost a lot of blood is likely to faint.

5. *No one who is likely to faint is a safe pilot.*
So ???
- (a) *Everyone who has just lost a lot of blood is a safe pilot.*
 - (b) *No one who has just lost a lot of blood is a safe pilot.*
 - (c) *All safe pilots have just lost a lot of blood.*
 - (d) *None of these validly follows.*

If there's knowledge, then either some things are known without proof or we can prove every premise by previous arguments infinitely.

6. *We can't prove every premise by previous arguments infinitely.*
There's knowledge.
So ???

- (a) *Some things are known without proof.*
- (b) *Everything that's known is provable.*
- (c) *There's no knowledge.*
- (d) *None of these validly follows.*

Exercise 4 *Translate the following English sentences into FOL sentences:*

- *Whenever an integer is positive, it is not less than 1.*
- *An integer is non-negative, provided that it is greater than 1.*
- *An integer is not necessarily positive.*
- *There are integers which are greater than 1, only if there are positive integers .*
- *For an integer to be positive it is necessary that it is greater than 1.*

Important remark: these exercises will be randomly checked and graded on Thursday January, 27th.