FIRST-ORDER LOGIC EXERCISES

CSE 511A: Introduction to Artificial Intelligence

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EXERCISES

- Brothers are siblings

2

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  $\forall x, y: \text{BrotherOf}(x,y) \Rightarrow \text{SiblingOf}(x,y)$
- One's mother is one's female parent and vice versa

3

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  $\forall x, y: \text{BrotherOf}(x,y) \Rightarrow \text{SiblingOf}(x,y)$
- One's mother is one's female parent and vice versa
  $\forall x, y: \text{MotherOf}(x,y) \Leftrightarrow \text{IsFemale}(x) \wedge \text{ParentOf}(x,y)$
- One's first cousin is a child of a parent's sibling and vice versa

4

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- Brothers are siblings
  $\forall x, y: \text{BrotherOf}(x,y) \Rightarrow \text{SiblingOf}(x,y)$
- One's mother is one's female parent and vice versa
  $\forall x, y: \text{MotherOf}(x,y) \Leftrightarrow \text{IsFemale}(x) \wedge \text{ParentOf}(x,y)$
- One's first cousin is a child of a parent's sibling and vice versa
  $\forall x, y, px, py: \text{FirstCousinOf}(x,y) \Leftrightarrow \text{ParentOf}(px,x) \wedge \text{ParentOf}(py,y) \wedge \text{SiblingOf}(px,py)$

MORE EXERCISES

- "You can fool all the people some of the time, and some of the people all the time, but you cannot fool all the people all the time."
  — Abraham Lincoln

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- "You can fool all the people some of the time, and some of the people all the time, but you cannot fool all the people all the time."
  — Abraham Lincoln
- You can fool all of the people some of the time
  $\forall p\ \exists t: \text{IsPerson}(x) \Rightarrow (\text{IsTime}(t) \wedge \text{Fool}(p,t))$
- You can fool some of the people all of the time
  $\exists p\ \forall t: \text{IsPerson}(p) \wedge (\text{IsTime}(t) \Rightarrow \text{Fool}(p,t))$
- You cannot fool all of the people all of the time
  $\neg(\forall p, t): (\text{IsPerson}(p) \wedge \text{IsTime}(t)) \Rightarrow \text{Fool}(p,t)$
  or equivalently $\exists p, t: \text{IsPerson}(p) \wedge \text{IsTime}(t) \wedge \neg\text{Fool}(p,t)$

TAKE-HOME EXERCISES

- All students are smart
- There exists a smart student
- Every student loves some student
- There exists a student who loves every student
- Every student loves him/herself
- Every student loves some other student
- There exists a student who is loved by all other students
- There exists exactly one student who is loved by all other students