COS30019 - Introduction to Artificial Intelligence
Tutorial Problems Week 8

Task 1: Represent the following sentences in first-order logic, using a consistent vocabulary (which you must define):

a. Some students took iAI in Semester 1 of 2001.
b. Every student who takes OOP passes it.
c. Only one student took OOP in Semester 1 of 2001.
d. The best score in iAI is always higher than the best score in OOP.
e. Every person who buys a policy is smart.
f. No person buys an expensive policy.
g. There is an agent who sells policies only to people who are not insured.
h. There is a barber who shaves all men in town who do not shave themselves.
i. A person born in the UK, each of whose parents is a UK citizen or a UK resident, is a UK citizen by birth.
j. A person born outside the UK, one of whose parents is a UK citizen by birth, is a UK citizen by descent.
k. Politicians can fool some of the people all of the time, and they can fool all of the people some of the time, but they can't fool all of the people all of the time.

Task 2: Represent the sentence "All Germans speak the same languages" in predicate calculus. Use *Speaks(x, l)*, meaning that person *x* speaks language *l*.

Task 3: A popular children's riddle is "Brothers and sisters have I none, but that man's father is my father's son." Can you use predicate logic to informally show who that man is?

TASK01
a.
S(x) Represents "Student x"
T(x, y, z): Represents "Student x took course y in semester z."
AI: Represents "AI course"
Semester1: Represent " Semester 1 of 2001"

Result: ∃x S(x) ^ T(x, AI, Semester1)
b.
T(x, y): Represents "student x takes course y"
P(x, y): Represents "student x passes course y"
OOP: Represents "OOP course"

Result: ∀x T(x, OOP) => P(x, OOP)
c.
S(x) Represents "Student x"
T(x, y, z): Represents "Student x took course y in semester z."
OOP: Represents "OOP course"
Semester1: Represent " Semester 1 of 2001"

Result: (∃x S(x) ^ T(x, OOP, Semester1)) ^ (∀y T(y, OOP, Semester1) => (y=x))
d.
A(x): Represents "x is the best/highest score in AI course"
O(x): Represents "x is the best/highest score in OOP course"

Result: ∀x,y A(x), B(y) => >(x, y)
f.
Buy(x, y): Represents "Person x buys y"
P(x): Represents "x is a person"
ExpPol: Represents expensive policy

Result: ∀x P(x) => ¬Buy(x, ExpPol)

TASK01
e.
Buy(x, y): Represents "Person x buys y"
P(x): Represents "x is a person"
Pol: Represents "policy"
Smart(x): Represents "Person x is smart"

Result: ∀x P(x), Buy(x, Pol) => Smart(x)
g.

TASK02
German(x):Represent "x is a German"
Speaks(x, l), Represent "person x speaks language l"
L1: Represent "language 1"
L2: Represent "language 2"

Result: ∀x, y German(x), German(y), Speaks(x, L1), Speak(y, L2) => L1 = L2

TASK03
B(x) represent "x is a brother of mine."
Let S(x) represent "x is a sister of mine."