Homework 1 part 1 solution

1. Translates the following English sentences into **FOL** representation

(a) Every person who dislikes all selfish vegetarians is smart.

$\forall x \forall y, (person(x) \wedge vegetarian(y) \wedge selfish(y) \wedge dislikes(x, y) \Rightarrow smart(x)$

(b) Only one student failed both history and biology.

$\exists x, student(x) \wedge fails(x, History) \wedge fails(x, Biology) \wedge$

$(\forall y, student(y) \wedge fails(y, History) \wedge fails(y, Biology) \Rightarrow (x=y))$

(c) Every triangle has exactly 3 sides.

$\forall t, (triangle(t) \wedge(\exists s1, \exists s2, \exists s3, (\wedge side(s1) \wedge side(s2) \wedge side(s3) \wedge has(t, s1) \wedge has(t, s2) \wedge$

$has(t, s3) \wedge(s1!=s2)\wedge(s1!=s3)\wedge(s2!=s3) \wedge (\forall w,(side(w) \wedge has(t, w) \Rightarrow ((s1=w) \vee (s2=w) \vee (s3=w))$

(d) There is a teacher who taught everyone in town.

$\exists x, teacher(x) \wedge (\forall y (person(y) \wedge lives(y, town) \Rightarrow taught(x, y))$

(e) If an agent feels breeze in one room, there must be a pit in its neighboring room.

$\forall x, \forall y, agent (x) \wedge room(y) \wedge in(x, y) \wedge feels\text{-}breeze(x) \wedge$

$(\exists z, w, room(z) \wedge neighbor (z, y) \wedge pit(w)\wedge in(w, z))$

(f) One's uncle is his father's brother.

$\forall x \forall y, uncle (x, y) <==> (\exists z, male(x)\wedge male(y)\wedge male(z)\wedge father(z, x) \wedge brother(z, y))$

(g) Sam took the only apple in the fruit basket.

$\exists x, person (SAM)\wedge apple (x)\wedge take(SAM, x) \wedge (\forall y, apple(y) \wedge take(SAM, y) \Rightarrow (x=y))$