ICT600 Quiz:
First Order Logic

Instruction: Read each question carefully. Write **all** your works in the space provided. You won't get full credits even when your answer is right without your works all written down. You may use the back of the paper to continue your work. If you do so, write "continued on next page" or so to indicate that that is not the end of your solution. **This is NOT a group work.** You have to do it yourself.

Name:..... ID:.....

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Let

$Larger(x, y)$ be the predicate 'x is larger than y'
$Dog(x)$ be the predicate 'x is a dog'

where the domain for x, y is set of all animals.

1. Express 'Pluto is a dog' in first order logic (FOL).

$Dog(Pluto)$

2. Express 'Mickey is not a dog' in first order logic (FOL).

$\neg Dog(Mickey)$

3. Express 'Mickey is larger than Pluto' in first order logic (FOL).

$Larger(Mickey, Pluto)$

4. Express 'There is at most one dog large than Pluto' in first order logic (FOL).

$\forall x \forall y \left(\left(Dog(x) \wedge Larger(x, Pluto) \wedge Dog(y) \wedge Larger(y, Pluto) \right) \rightarrow (x = y) \right)$

5. Express 'Mickey is larger than all dogs' in first order logic (FOL).

$\forall x \left(Dog(x) \rightarrow Larger(Mickey, x) \right)$

6. Express

$$Dog(Pluto) \wedge Larger(Mickey, Pluto)$$

in plain English.

Mickey is larger than the dog named Pluto.

7. Express

$$\forall x\big(Dog(x) \rightarrow Larger(Pluto, x)\big)$$

in plain English.

Pluto is larger than all dogs.

8. Express

$$\neg\Big(\exists x\big(Dog(x) \wedge Larger(x, Mickey)\big)\Big)$$

in plain English.

No dogs is larger than Mickey

9. Express

$$\exists x \forall y\Big(Dog(x) \wedge Larger(x, Pluto) \wedge \big(Dog(y) \wedge Larger(y, Pluto) \rightarrow (x = y)\big)\Big)$$

in plain English.

There is exactly one dog that is larger than Pluto.

10. Express

$$\exists x \exists y\Big(Dog(x) \wedge Larger(x, Pluto) \wedge Dog(y) \wedge Larger(y, Pluto) \wedge \neg(x = y)\Big)$$

in plain English.

There are at least two dogs that larger than Pluto.