

# CSE 390Z: Mathematics for Computation Workshop

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## QuickCheck: Predicate Logic Solutions (due Monday, April 15)

Please submit a response to the following questions on Gradescope. We do not grade on accuracy, so please submit your best attempt. You may either typeset your responses or hand-write them. Note that hand-written solutions must be legible to be graded.

We have created [this template](#) if you choose to typeset with Latex. [This guide](#) has specific information about scanning and uploading pdf files to Gradescope.

### 0. English to Logic Translation

Translate the following English statements to predicate logic:

**Domain of Discourse:**  $D := \text{"Mammals"}$

**Predicates:**

$\text{Walks}(x, y) := \text{"}x \text{ walks } y\text{"}$   
 $\text{Dog}(x) := \text{"}x \text{ is a dog"}$   
 $\text{Human}(x) := \text{"}x \text{ is a human"}$   
 $\text{Friends}(x, y) := \text{"}x \text{ and } y \text{ are friends"}$

- (a) Humans are not friends with each other.  
*Note that this means a human is also not friends with their self*

**Solution:**

$$\forall x \forall y ((\text{Human}(x) \wedge \text{Human}(y)) \rightarrow \neg \text{Friends}(x, y))$$

- (b) All humans are friends with the dogs that they walk.

**Solution:**

$$\forall x \forall y ((\text{Human}(x) \wedge \text{Dog}(y) \wedge \text{Walks}(x, y)) \rightarrow \text{Friends}(x, y))$$

- (c) Every human walks exactly one dog.

**Solution:**

$$\forall x (\text{Human}(x) \rightarrow \exists y (\text{Dog}(y) \wedge \text{Walks}(x, y) \wedge \forall z ((\text{Dog}(z) \wedge (z \neq y)) \rightarrow \neg \text{Walks}(x, z))))$$

### 1. Video Solution

Watch [this video](#) on the solution **after** making an initial attempt. Then, answer the following questions.

- (a) What is one thing you took away from the video solution?