

# Computability Assignment

## Year 2013/14 - Number 1

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### 1 Question

Define a binary property  $p(x, y)$  over natural numbers that satisfies both the requisites:

1.  $\forall x \in \mathbb{N}. \exists y \in \mathbb{N}. p(x, y)$  and
2. *it is false that*  $\forall y \in \mathbb{N}. \exists x \in \mathbb{N}. p(x, y)$

Provide a definition for  $p$ , and a proof for the above claims.

#### 1.1 Answer

Write your answer here.

$$p(x, y) := (y = x^2)$$

##### 1.1.1 Proof

1. For any  $x$  it is always possible to compute its square, hence it always exists  $y \in \mathbb{N}$ .
2. For a given  $y$  it is not always possible to compute its square root in  $\mathbb{N}$ .  
e.g. for  $y = 3$  there is no solution in  $\mathbb{N}$