# Computability Assignment
# Year 2012/13 - Number 1

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## 1 Question

Define a binary property $p(x, y)$ over natural numbers such that we have both

1. $\forall x \in \mathbb{N}.\exists y \in \mathbb{N}.p(x, y)$
2. $\neg\exists y \in \mathbb{N}.\forall x \in \mathbb{N}.p(x, y)$

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

### 1.1 Answer

$$p(x, y) = \begin{cases} true & y = 2x \\ false & o.w. \end{cases}$$

1. Obvious, all even numbers are natural numbers. OK - RZ
2. Equivalent to$\forall y \in \mathbb{N}.\exists x \in \mathbb{N}.\neg p(x, y)$. OK - RZ

Apparently, for an odd number $y$ we don't have a natural number $x$ s.t. $y = 2x$.

I don't understand: the above proves $\forall y \in Odd.\neg\exists x.y = 2x$, which is not the same thing as $\forall y \in \mathbb{N}.\exists x \in \mathbb{N}.\neg p(x, y)$.