

CS 598mp: Fall 2005: Homework #2
Due on Fri 16 Sep
Hand over in class or to Colin Robertson at 3229 SC

Problem.

We showed in class that Presburger arithmetic, which is the first-order logic over the structure $(\mathbb{N}, S, <, +, 0, 1, =)$ is decidable.

- Show Presburger arithmetic with the extra predicate *Even* is decidable where *Even* is a monadic predicate such that *Even*(*i*) is true iff *i* is even.
- Similarly, show Presburger arithmetic with predicate *PowerOfTwo* is decidable where *PowerOfTwo* is a monadic predicate such that *PowerOfTwo*(*i*) is true iff *i* is a power of 2, i.e. $i = 2^j$ for some $j \in \mathbb{N}$.
- Is Presburger arithmetic with the predicate *PowerofThree* decidable, where *PowerOfThree*(*i*) is true iff *i* is a power of 3?

Don't give entire proofs; just give proofs of the extra constructions needed in order to prove the results.