| Functions: | for all $x,y \in$ NaturalNumber ; TRUE, FALSE $\in$ Boolean and where

$+,-,\times$ and $==$ are the usual integer operations.

- NaturalNumber ~~Zero~~ Zero() $::= 0$
- Boolean IsZero(x) $::=$ if(x) return FALSE
  else return TRUE

- Boolean Equal(x,y) $::=$ if($x==y$) return TRUE
  else return FALSE

- NaturalNumber Successor(x) $::=$ if($x==INT\_MAX$) return x
  else return $x+1$

- NaturalNumber Add(x,y) $:=$ if(($x+y$)$<=INT\_MAX$) return $x+y$
  else return INT_MAX

- NaturalNumber Subtract(x,y) $:=$ if($x<y$) return 0
  else return $x-y$

endNaturalNumber

Exercises 1.4

1. Add the following operations to the NaturalNumber ADT: Predecessor, &
is Greater, Multiply, Divide. float is a usual data type in C

| Soln: | $>,*,/$ are the usual integer operations.

- NaturalNumber Predecessor(x) $::=$ if($x==0$) return x
  else return ($x-1$)

- Bool IsGreater(x,y) $::=$ if($x>y$) return TRUE
  else return FALSE

- NaturalNumber Multiply(x,y) $::=$ if(($x*y$)$<=INT\_MAX$) return $x*y$
  else return INT_MAX

- ~~NaturalNumber~~ float Divide(x,y) $::=$ if($y==0$) return -1; // Not valid
  else return ($x*1.0$)/($y*1.0$)