Formale Grundlagen der Informatik I - Assignment 02

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1 The logic of Quantified Statements

a) i. False, $\forall x \in V$: $\neg$ Hexagon(x)
   ii. True, example: First row, second column.
   iii. False, example: First row, first column "red circle", x $\in$V but $\neg$Square(x).
   iv. False, counter-example: First row, last column, "green circle".
   v. Depends on definition of "the left" - not immidiately on the next left slot, but in the left yes.
   vi. True.

b) v and vi

2 Number Theory and Proofs

a) m $\in N$, n = -m $\rightarrow$ this way we allways get 0, which is an integer.

b)
- If we have two consecutive numbers, one number will allways be odd and the other one will be even.
- Every even number is a multiple of 2.
- A product of two integers a$\cdot$b will always be divisible by a and b.
- Let's say a is our even number, if c = a$\cdot$b, then c is divisible by a, and a is divisible by 2 since its even, therefore c is also divisible by 2, meaning it's even.

c) (7m + 1) : 7 =? integer
7m : 7 + 1 : 7 =? integer
7m : 7 = m, which is an integer
But:
1:7 != integer !
→ The statement leads to a contradiction, it is therefore false.

d)
   i. a divides b and a divides c
      (b + c) mod a =? 0
      (b mod a) + (c mod a) =? 0
      0 + 0 = 0
      →The statement is true.

   ii. c mod (a · b) =? 0
      (c mod a) · (c mod b) =? 0
      0 · 0 = 0
      →The statement is true.

   iii. n= n * n * n; n is divisible by 2, therefore n is also divisible by 2, meaning it is even.

   iv. True, example: a = 2, b = 3
      4 + 9 = 13, which is an odd integer

   v.

vi.