

# Homework 7 Problem 1 Solution

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**Problem 1.**

a) Let us figure out the winning and losing positions. All the positions from 112 to 999 are winning, as from there one can win by one move of multiplying by 9. All positions from 56 to 111 are losing, as they only lead to winning positions. From 7 to 55 it is possible to get in the range from 56 to 111 by one move (why?), so they are all winning positions. Then 6, 5, 4 are all losing, and thus 1, 2, 3 are winning. So the first player can select 6 and put their opponent in a losing position, thus ultimately winning the game.

b) Whoever is the first person to be in a losing position, they will just skip the turn by multiplying by 1. But then their opponent is in a losing position, so they will also skip their turn. This will go on forever, so the game will never end.