Problem 1. Suppose I think of a number that is positive. I do not tell you the range of the number (in class we played the game where I thought of a number between 1 and 1000, here there is no bound on how large the number is). What clever strategy can we use to find out what the number might be. We are allowed to ask questions such as “Is the number at least 5?” etc.

Problem 2. Write a function in ruby that takes an array $A$ of integers and returns the index of the maximum element in the array.

For example, if $A = [5, 8, 1, 4, 6, 9, 11, 2, 4]$ then the maximum element is 11 and its index is 6.

Problem 3. Suppose we have a graph $G$. Add up the degrees of all the vertices. Why is this always an even number?

Problem 4. Write a function named inOrder that takes an array $a$ as input, and returns true if and only if the elements of the array are in increasing order. Consider two input arrays:

\[ A = [1, 1, 2, 3, 5, 8, 13], \quad B = [3, 1, 4, 1, 5, 9] \]

Your function inOrder would return TRUE if $A$ is the input, but FALSE if $B$ is the input.

```ruby
def inOrder(a)
    # a is an array
    # returns TRUE if a is in increasing order
    # FALSE otherwise
    end
```

Problem 5. Write a function named inArray that takes an array $a$ and a search element $s$ as input. You may assume that the input array is sorted in increasing order. The return value of the function is an index in $a$ which contains $s$. If $a$ does not contain $s$, return nil. Your function should not simply linearly scan the array $a$ looking for $s$. 
def inArray(a, s)
    # a is an array
    # returns an index i in a such that a[i] == s
    # nil if such an i does not exist
end

Problem 6. (Extra Credit) Give an example of the Hotel partner problem where there is no stable solution. The problem is defined as follows. There are 2n people, and n hotel rooms. Each person rank orders the remaining 2n − 1 people in preference order. We have to assign two people to a room with the property that the assignment is stable. An unstable assignment is one where there is a pair of people assigned to different rooms, such that they both prefer each other to the current partners.