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Please answer the following questions in 60 minutes. Solve #1 & #2 correctly before attempting to #3 & #4. You may use any programming language you are familiar with.

1. Write a function to check whether a given string is a palindrome without using any built-in functions. (A **palindrome** is a word, phrase, number, or other sequence of characters which reads the same backward or forward.) (4 points

Public void palindrome()

isPalindrom(“apple”)

1. Given a sorted array of integers, write a recursive function to perform binary search.

(**Binary search** algorithm compares the search value with the middle element of the array. If they match, then return its index. Otherwise, if the search value is less than the middle element, then repeat the algorithm on the sub-array to the left of the middle element or, if the search value is greater, on the sub-array to the right. If the remaining array to be searched is empty, then the search value cannot be found and return -1.) (6 points)

[ Please check that your responses to 1 & 2 are both correct before starting 3 or 4. ]

1. Your friend has been kidnapped and you have received a ransom note. The note has been constructed by cutting out letters from a printed magazine. Due to the unusual font used, the police think they can find your friend if only they are sure which magazine the letters are from. Your job is to determine if the ransom note could have been constructed from the set of letters given by the police.

Write a function that takes in two Strings (‘note’ and ‘magazine’). Return true if the note could have been cut out from the magazine. Example 1) note = “ceba”; magazine = “abcde” returns true (the magazine has ≥ 1 ‘e’, ≥ 1 ‘c’, ≥ 1 ‘b’, ≥ 1 ‘a’ so the note could have been made by cutting characters out of the magazine); example 2) note = “deaa”, magazine = “abcde” returns false (the note has more ‘a’ characters than can be cut out of the magazine); example 3) note = “aacc”, magazine = “bbccaa” returns true. (5 points)

1. Write a function that converts a Roman numeral to an integer. (ex: “I” = 1, “III” = 3, “IV” = 4, “V” = 5, “VI” = 6, “X” = 10, “L” = 50, “LX” = 60, “XLIX” = 49, “C”= 100, “CIX” = 109, “CLX” = 160, “D” = 500, “M” = 1000, “CDXLIV” = 444, “MCMIV” = 1904, …). The input to the function is a String and the output is an int. (5 points)

Assume that the given Roman numeral is valid.

Assume that the value will be in the range [1, 3999].

Assume that you have a function rCharToInt that converts a single character to an integer. In java it would be:

public static int rCharToInt(char c) {

switch (c) {

case ‘I’: return 1; case ‘V’: return 5; case ‘X’ return 10; case ‘L’: return 50; case ‘C’ return 100; case ‘D’ return 500; case ‘M’ return 1000;

return 0;

}}