CSI323: Algorithms
University of Botswana
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Problem Set 1

Problems

1. Write an algorithm that takes an array of integers,$A[0:n-1]$, and determines if there is a pair of values whose product is even.

2. Write an algorithm that takes an array of integers,$A[0:n-1]$, and determines if all the numbers are different from each other (that is, they are distinct).

3. You are given an array A containing $n+1$ integers where each integer is in the range $[1\,..\,n]$. There is exactly one repeated integer in A, write an algorithm to find it.

4. Write an algorithm whose input is an array $A[0:n-1]$ of positive integer values. Your algorithm should rearrange the array so that all even values precede all odd values.

5. Write an algorithm that determines if a string *str* is a *palindrome*. A **palindrome** is a string that is equal to its reverse.

6. Write an algorithm whose input is an integer array $A[0:n-1]$. Your algorithm should compute the shortest distance between any two elements in the array.

7. Write an algorithm whose input is an array $A[0:n-1]$ of integer values and an integer k. Your algorithm should rearrange the array so that all integers less than or equal to k precede all integers greater than k.

8. Draw a decision tree for sorting 4 elements. Make sure that all possible permutations appear as leaves of the tree. What is the height and depth of your tree?

9. Professor X claims to have discovered an algorithm to sort 5 numbers using 4 comparisons. Is this possible using the decision tree computation model? Explain your answer.