2017124B
안재형

Algorithms – Assignment 2

(Basic Coding Questions)

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Due: 9th April 2021

Submit a pdf file to the e-class that contains your answers for the following exercises including codes written in the C or Python programming language (screenshots okay).

1) [Programming] Write a program that takes a number n and displays the largest positive integer k satisfying the following equations: $2^k \leq n$. Display the results for three different n's: 10,50, and 1025.

```
n = int(input())

k = 0
k_powered = 1
while k_powered <= n:
    k += 1
    k_powered *= 2

print(k-1)
```

2) [Programming] Palindrome refers to words that have the same results when we read from the beginning and read from the end, such as level, bob, and radar. Write a function that determines if the given word is palindrome or not. Display the results when you put two different words (one is palindrome and the other is not).

```
word = input()
isPalindrome = True


for i in range(0, int(len(word)/2)):
    if word[i] != word[len(word)-1-i]:
        isPalindrome = False
        break


if isPalindrome:
    print(f"{word} is Palindrome")
else:
    print(f"{word} is NOT Palindrome")
```

```
root@goorm:/workspace/Algorithm_Assignment(main)#
python 2.py
hello
hello is NOT Palindrome
```

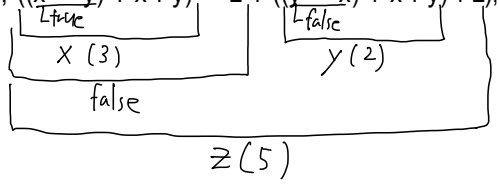
```
root@goorm:/workspace/Algorithm_Assignment(main)#
python 2.py
level
level is Palindrome
```

3) What is the output of the following code? The code shows the partial lines in a complete program. (Just give an answer, not a programming question)

5

```
int x = 3, y = 2, z = 5;

printf("%d\n", ((x > y) ? x : y) > z ? ((y > x) ? x : y) : z);
```



4) [Programming] Write a program that search for the integer 120 in the following list of integers using the binary search algorithm.

12 34 37 45 57 82 99 120 134

```
searchValue = 12
arr = [12, 34, 37, 45, 57, 82, 99, 120, 134]
unsearchedIndex = [0, len(arr)-1]

while True:
    centerIndex = int((unsearchedIndex[0] + unsearchedIndex[1]) / 2)
    centerValue = arr[centerIndex]
    if unsearchedIndex[0] > unsearchedIndex[1]:
        print(f"There is no {searchValue} in this array")
        break
    elif centerValue == searchValue:
        print(f"{searchValue}'s index is {centerIndex}")
        break
    elif centerValue > searchValue:
        unsearchedIndex[1] = centerIndex - 1
    elif centerValue < searchValue:
        unsearchedIndex[0] = centerIndex + 1
```

5) [Programming] Given an image represented by a 5×5 matrix, write a method to rotate the image by 90 degrees (clockwise). You can generate a matrix randomly.

```
import random

originalMatrix = [[0 for col in range(5)] for row in range(5)]
print("Original Matrix : ")
for i in range(0, len(originalMatrix)):
    for j in range(0, len(originalMatrix[i])):
        originalMatrix[i][j] = random.randrange(0, 256)
    print(originalMatrix[i])



print("₩nRotated Matrix : ")
rotatedMatrix = [[0 for col in range(5)] for row in range(5)]
for i in range(0, len(rotatedMatrix)):
    for j in range(0, len(rotatedMatrix[i])):
        rotatedMatrix[i][j] = originalMatrix[len(originalMatrix)-1-j][i]
    print(rotatedMatrix[i])
```

6) [Programming] Write a function to find all pairs of an integer array whose sum is equal to a given number.

Function: pairSum([2, 4, 3, 5, 6, -2, 4, 7, 8, 9], 7)

Output: [‘2+5’, ‘4+3’, ‘3+4’, ‘-2+9’]

```
def pairSum(arr, num):
    result = []
    for i in range(0, len(arr)):
        for j in range(i+1, len(arr)):
            if arr[i]+arr[j] == num:
                result.append(f'{arr[i]}+{arr[j]}')
    print(result)
    return result

pairSum([2, 4, 3, 5, 6, -2, 4, 7, 8, 9], 7)
```