DAY-02

DATE-07/06/2024

1) **Reverse Number**

```
def reverse_number(num, rev=0):
    if num == 0:
        return rev
    else:
        return reverse_number(num // 10, rev * 10 + num % 10)
num = 12345
print(reverse_number(num))
```

2) **Perfect Number**

```
def is_perfect(n):
    sum_divisors = 0
    for i in range(1, n // 2 + 1):
        if n % i == 0:
            sum_divisors += i
    return sum_divisors == n
n = 28
print(is_perfect(n))
```

3) **Demonstrate usage of Big-O Notation**

```
def constant_time(n):
    return n + 1
def linear_time(arr):
    total = 0
    for num in arr:
        total += num
    return total

def quadratic_time(arr):
    for i in range(len(arr)):
        for j in range(len(arr)):
            print(i, j)
print(constant_time(5))
print(linear_time([1, 2, 3, 4, 5]))
quadratic_time([1, 2, 3])
```

4) **Mathematical Analysis of Non-Recursive and Recursive Algorithms**

```
def linear_search(arr, target):
    for i in range(len(arr)):
        if arr[i] == target:
            return i
    return -1
def factorial(n):
    if n == 0 or n == 1:
```

```
        return 1
    else:
        return n * factorial(n - 1)
print(linear_search([1, 2, 3, 4, 5], 4))
print(factorial(5))
```

5) Solving Recurrence relations

```
def master_theorem(n):
    if n == 1:
        return 1
    return 2 * master_theorem(n // 2) + n
print(master_theorem(8))


def substitution_method(n):
    if n == 1:
        return 1
    return substitution_method(n - 1) + 1
print(substitution_method(5))


def iteration_method(n):
    if n == 1:
        return 1
    return 2 * iteration_method(n // 2) + n
```

6) Intersection unique

```
def intersection_unique(nums1, nums2):
    return list(set(nums1) & set(nums2))
nums1 = [1, 2, 2, 1]
nums2 = [2, 2]
print(intersection_unique(nums1, nums2))
from collections import Counter
```

7) Intersection multiset

```
def intersection_multiset(nums1, nums2):
    counts1 = Counter(nums1)
    counts2 = Counter(nums2)
    intersection = []
    for num in counts1:
        if num in counts2:
            intersection.extend([num] * min(counts1[num], counts2[num]))
    return intersection
nums1 = [1, 2, 2, 1]
nums2 = [2, 2]
print(intersection_multiset(nums1, nums2))
```

8) Merge Sort

```
def merge_sort(arr):
    if len(arr) > 1:
        mid = len(arr) // 2
        L = arr[:mid]
        R = arr[mid:]
        merge_sort(L)
        merge_sort(R)
        i = j = k = 0
        while i < len(L) and j < len(R):
            if L[i] < R[j]:
                arr[k] = L[i]
                i += 1
            else:
                arr[k] = R[j]
                j += 1
            k += 1
        while i < len(L):
            arr[k] = L[i]
            i += 1
            k += 1
        while j < len(R):
            arr[k] = R[j]
            j += 1
            k += 1
    return arr
nums = [5, 2, 3, 1]
print(merge_sort(nums))
```

9) Sort half_odd and half_even

```
def sort_half_odd_half_even(nums):
    odd_index = 0
    even_index = 1
    n = len(nums)
    while odd_index < n and even_index < n:
        if nums[odd_index] % 2 == 0:
            while even_index < n and nums[even_index] % 2 == 0:
                even_index += 2
            if even_index < n:
                nums[odd_index], nums[even_index] = nums[even_index], nums[odd_index]
        odd_index += 2
    return nums
nums = [4, 1, 2, 3, 6, 7, 8, 5]
print(sort_half_odd_half_even(nums))
```

10) Sorted array

```
def sort_array_by_parity(nums):
    odd_index = 1
    even_index = 0
```

```
    n = len(nums)
    while odd_index < n and even_index < n:
        if nums[even_index] % 2 == 0:
            even_index += 2
        elif nums[odd_index] % 2 == 1:
            odd_index += 2
        else:
            nums[even_index], nums[odd_index] = nums[odd_index], nums[even_index]
            even_index += 2
            odd_index += 2
    return nums
nums = [4, 1, 2, 3, 6, 7, 8, 5]
print(sort_array_by_parity(nums))
```