EX-1.12

Title :

Find the maximum money that can be robbed from houses arranged in a circle without alerting the police.

Aim:

To design and implement a Python program to find the maximum amount of money that can be robbed from houses arranged in a circle such that no two adjacent houses are robbed.

Procedure:

1. Read the input list `nums` representing money in each house arranged in a circle.
2. Handle edge cases when there are 0, 1, or 2 houses.
3. Because the houses are in a circle, robbing the first and last house together is not allowed.
4. Break the problem into two linear problems:
    - Rob houses from first to second last house.
    - Rob houses from second house to last house.
5. Use the linear house robber algorithm (dynamic programming) for both scenarios.
6. Take the maximum of the two results as the final answer.
7. Print the maximum amount robbed.

Algorithm:

1. Start
2. If the list is empty, return 0
3. If length = 1, return value of the single house
4. Define a helper function `rob_linear` for linear houses:
   - Use two variables `prev1` and `prev2` for storing max loot without alerting police up to previous houses.
   - Iterate through the houses, update these variables based on whether to rob current house or not.
5. Calculate `max_rob1 = rob_linear(nums[0:n-1])`
6. Calculate `max_rob2 = rob_linear(nums[1:n])`
7. Maximum money robbed = max(`max_rob1`, `max_rob2`)
8. Print the result.
9. Stop

Input:

3

2 3 2

4

1 2 3 1

Output:

The maximum money you can rob without alerting the police is : 3

The maximum money you can rob without alerting the police is : 4

Program :

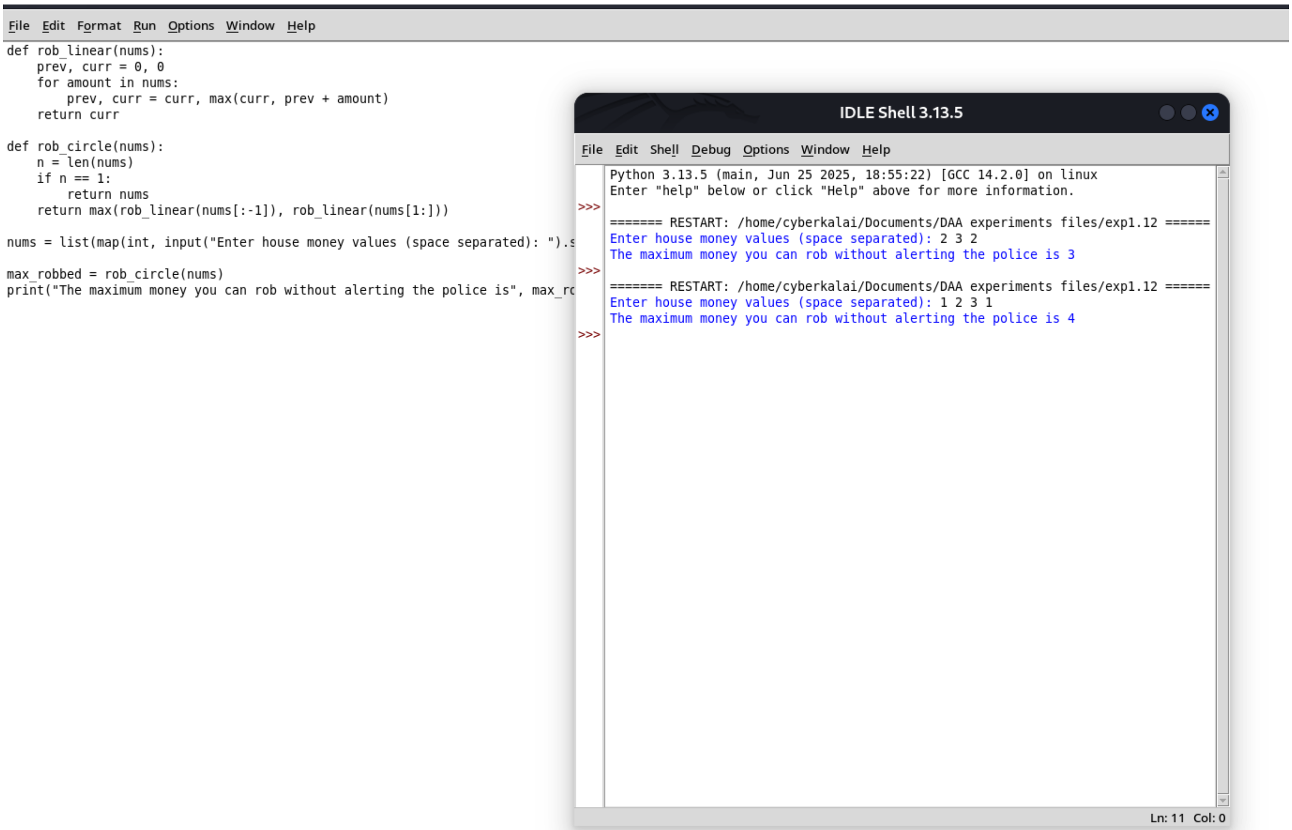
```
def rob_linear(houses):
    prev1, prev2 = 0, 0
    for amount in houses:
        temp = prev1
        prev1 = max(prev2 + amount, prev1)
        prev2 = temp
    return prev1
n = int(input("Enter number of houses: "))
nums = list(map(int, input("Enter money in each house: ").split()))
if n == 0:
    print("The maximum money you can rob without alerting the police is 0")
elif n == 1:
    print(f"The maximum money you can rob without alerting the police is {nums[0]}")
else:
    max_rob1 = rob_linear(nums[:-1])
    max_rob2 = rob_linear(nums[1:])
    result = max(max_rob1, max_rob2)
    print(f"The maximum money you can rob without alerting the police is {result}")
```

Performance Analysis:

Time Complexity: O(n)

Space Complexity: O(1)

program output:



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```
def rob_linear(nums):
    prev, curr = 0, 0
    for amount in nums:
        prev, curr = curr, max(curr, prev + amount)
    return curr

def rob_circle(nums):
    n = len(nums)
    if n == 1:
        return nums
    return max(rob_linear(nums[:-1]), rob_linear(nums[1:]))

nums = list(map(int, input("Enter house money values (space separated): ").s

max_robbed = rob_circle(nums)
print("The maximum money you can rob without alerting the police is", max_ro
```

IDLE Shell 3.13.5
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```
    Python 3.13.5 (main, Jun 25 2025, 18:55:22) [GCC 14.2.0] on linux
    Enter "help" below or click "Help" above for more information.
>>>
    ======= RESTART: /home/cyberkalai/Documents/DAA experiments files/exp1.12 ======
    Enter house money values (space separated): 2 3 2
    The maximum money you can rob without alerting the police is 3
>>>
    ======= RESTART: /home/cyberkalai/Documents/DAA experiments files/exp1.12 ======
    Enter house money values (space separated): 1 2 3 1
    The maximum money you can rob without alerting the police is 4
>>>
```

Result :

Thus the given program Climbing Stairs is executed and got output successfully.