DAA

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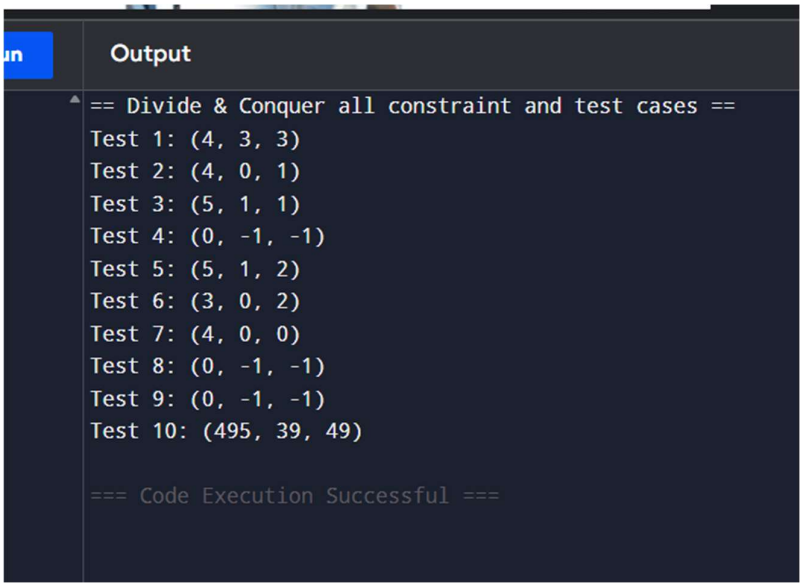
Practical - 4

Task A:

```
def max_subarray(arr, constraint):
    def max_crossing_sum(low, mid, high):
        left_sum = float('-inf')
        total = 0
        best_l = mid
        for i in range(mid, low - 1, -1):
            total += arr[i]
            if total <= constraint and total > left_sum:
                left_sum = total
                best_l = i

        right_sum = float('-inf')
        total = 0
        best_r = mid
        for j in range(mid + 1, high + 1):
            total += arr[j]
            if total <= constraint and total > right_sum:
                right_sum = total
                best_r = j

        if left_sum != float('-inf') and right_sum != float('-inf'):
            if left_sum + right_sum <= constraint:
```

```
            return (left_sum + right_sum, best_l, best_r)

    if left_sum != float('-inf') and left_sum <= constraint:
        return (left_sum, best_l, mid)
    if right_sum != float('-inf') and right_sum <= constraint:
        return (right_sum, mid + 1, best_r)

    return (0, -1, -1)

def solve(low, high):
    if low == high:
        if arr[low] <= constraint:
            return (arr[low], low, high)
        else:
            return (0, -1, -1)

    mid = (low + high) // 2
    left_ans = solve(low, mid)
    right_ans = solve(mid + 1, high)
    cross_ans = max_crossing_sum(low, mid, high)

    candidates = [ans for ans in (left_ans, right_ans, cross_ans) if ans[1] != -1]
    if not candidates:
        return (0, -1, -1)

    return max(candidates, key=lambda x: x[0])

if not arr or constraint <= 0:
    return (0, -1, -1)
return solve(0, len(arr) - 1)
```

```
tests = [
    ([2, 1, 3, 4], 5),
    ([2, 2, 2, 2], 4),
    ([1, 5, 2, 3], 5),
    ([6, 7, 8], 5),
    ([1, 2, 3, 2, 1], 5),
    ([1, 1, 1, 1, 1], 4),
    ([4, 2, 3, 1], 5),
    ([], 10),
    ([1, 2, 3], 0),
    (list(range(1, 101)), 500)
]

print("== Divide & Conquer all constraint and test cases ==")
for i in range(len(tests)):
    arr, cons = tests[i]
    ans = max_subarray(arr, cons)
    print(f"Test {i + 1}: {ans}")
```



Task 2

LEETCODE: