

Array

1. Write a program to find mode (element with maximum occurrence) of a sorted array. If there is more than one mode then print the last one.
Input: 2,2,2, 4,4,7,7,7,7,8,14,14 Output:7
Input: 2,2,2, 4,4,7,7,7,8,14,14,14,14 Output:14
2. Write a program to put an element in proper place of a sorted array with distinct elements.
Input: n=5, sorted array 2, 3, 5,6,7, t=4 Output: 2,3,4,5,6,7
Input: n=4, sorted array 1, 8, 12, 56, t=5 Output: 1,5,8,12,56
3. Write a program to find frequency of all elements in a sorted array. The elements of the sorted array need not to be distinct.
Input: 2,2,2, 4,4,7,7,7,7,8,14,14; Output: Frequencies are 3, 2, 4,1,2.
Input: 2,2, 4,4,7,7,7,7,8,14,14,14; Output: Frequencies are 2, 2, 4,1,3.
4. Write a program to write third smallest of a sorted array.
Input: 2,2,2, 4,4,7,7,7,7,8,14,14 Output:7
Input: 2,2,2, 4,4,8,14,14,14,14 Output:8

Function

1. Write a program to rotate left. (Using function).
Input: 1467 Output: 4671
Input: 31456 Output: 14563
2. Write a function nC_r (n choose r) taking integer n and r as input. Using it print the following.

Hints: Use 2 "for loop" suitably. Note that elements in last row are ${}^5C_0, {}^5C_1, \dots, {}^5C_5$.
1
1 1
1 2 1
1 3 3 1
1 4 6 4 1
1 5 10 10 5 1
3. Define function which takes as input 3 coordinate points and return area. Write program to find area of quadrilateral using this function.
Input: (0,0), (3,0), (4,0), (3,4) Output: 12
Input: (0,0), (6,0), (8,0), (6,8) Output: 48

Recursion

1. Define Ackerman's function using recursion and call in main.

$f(m,n)=n+1$ if $m=0$;
 $f(m,n)= f(m-1,1)$ if $m>0, n=0$;
 $f(m,n)= f(m-1,f(m,n-1))$ if $m>0, n>0$;
 Input $m=0, n=4$; Output: 5
 Input $m=1, n=2$; Output: 4
 Input $m=3, n=1$; Output: 13

2. Define Legendre polynomial using recursion and call in main.

$P_n(x) = 1$ if $n=0$

$P_1(x) = x$ if $n=1$

$P_n(x) = x \frac{2n-1}{n} P_{n-1}(x) - \frac{n-1}{n} P_{n-2}(x)$ if $n>1$

Input: $n=1, x=2$; Output: 2

Input: $n=2, x=3$; Output: 13

3. Write a program to compute nC_r (n choose r) using recursive function.

Input $n=5, r=5$; Output: 1

Input $n=5, r=1$; Output: 5

Input $n=5, r=2$; Output: 10

Note: Regarding If-else Q2 (previous practice set).

There is an issue in given input output. Consider following input output:

Input: $a=1, b=4, c=4$, Output: Equal, not positive

Input: $a=1, b=1; c=-2$, Output: maximum root 1, difference 3