**CPP Problem Design**

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| **Subject: Inverse matrix for N x N** |
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| **Main testing concept: ARRAYS**   |  |  | | --- | --- | | **Basics** | **Functions** | | ■ C++ BASICS  □ FLOW OF CONTROL  □ FUNCTION BASICS  □ PARAMETERS AND OVERLOADING  ■ ARRAYS  □ STRUCTURES AND CLASSES  □ CONSTRUCTORS AND OTHER TOOLS  □ OPERATOR OVERLOADING, FRIENDS,AND REFERENCES  □ STRINGS  □ POINTERS AND DYNAMIC ARRAYS | □ SEPARATE COMPILATION AND NAMESPACES  □ STREAMS AND FILE I/O  □ RECURSION  □ INHERITANCE  □ POLYMORPHISM AND VIRTUAL FUNCTIONS  □ TEMPLATES  □ LINKED DATA STRUCTURES  □ EXCEPTION HANDLING  □ STANDARD TEMPLATE LIBRARY  □ PATTERNS AND UML | |
| **Description:**  Write a program to calculate the inverse of a matrix of N x N and displays the result. The program checks for two conditions: if N is less than or equal to 1, it should indicate an invalid matrix size; if the determinant of matrix is 0, it should indicate that the inverse matrix cannot be computed. The output numbers should be of type double, rounded to three decimal places and must show three decimal places.  **Input:**  1: The first line of input contains an integer N, which indicates there’re N x N matrix.  2: The second line of input N x N integer numbers separated by space.  Example:  4  1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16  The input matrix should print out as the following.  <pre>  ┌ ┐  │ 1 2 3 4 │  │ 5 6 7 8 │  │ 9 10 11 12│  │ 13 14 15 16│  └ ┘  </pre>  **Output:**  Calculate and print the inverse result of the matrix of N x N. The numbers should be output as type double, rounded to three decimal places for every number, including integers. (For example, 10 should be output as 10.000). if the matrix size is invalid or its determinant is 0,  Output the respective error message:   * If N <= 1: ‘Invalid matrix size, please enter N greater than 1.’ * If determinant is 0: ‘Determinant is 0, Cannot compute inverse.’   **Sample Input / Output：**   |  |  | | --- | --- | | Sample Input | Sample Output | | 3  2 -2 5 2 1 -3 -9 2 -4  0  4  1 21 84 15 48 1 48 152 61 75 1 89 15 72 64 1 | -2.000 -2.000 -1.000 -35.000 -37.000 -16.000 -13.000 -14.000 -6.000  Invalid matrix size, Please enter N greater than 1.  0.279 -0.133 0.182 -0.269 -0.104 0.044 -0.058 0.104 0.053 -0.019 0.024 -0.040 -0.104 0.054 -0.065 0.097 | |
| **□ Eazy,Only basic programming syntax and structure are required.**  **■ Medium,Multiple programming grammars and structures are required.**  **□ Hard,Need to use multiple program structures or more complex data types.** |
| **Expected solving time:**  25 minutes |
| **Other notes:**  **Example :**  **N = 5**  **det(A) =**    = -  + -  +  where we can extend **the right of the first term** as    = -  + -  we can extend **the right of** **the second term** as    = -  + -  we can extend **the right of** **the third term** as    = -  + -  we can extend **the right of** **the fourth term** as    = -  + -  we can extend **the right of** **the fifth term** as  = -  + -  Therefore, the determinant of 5X5 matrix is computed as  det(A) =  +  The cofactor is calculated by taking the matrix A, removing the ith row and jth column, and then computing the determinant of the remaining matrix, denoted as .  Adj(A) =  ,  In details, we list all cofactor out as |