



Ain Shams University
Faculty Of Engineering
General Electrical Department

CSE131s

Matrix Calculator Project

Somaya Ayman El Said Ahmed Gaafer

2000423

Section 14

Introduction

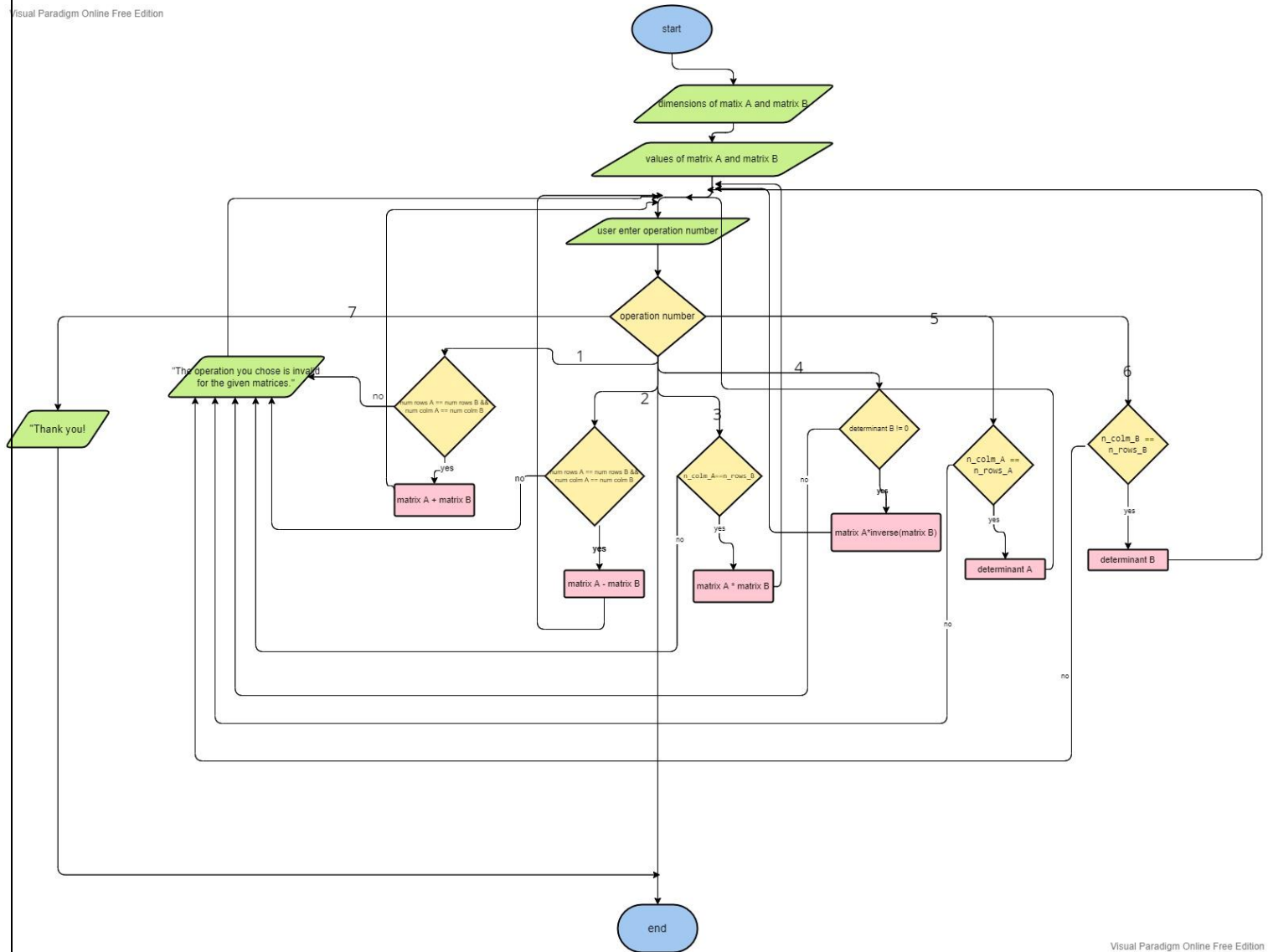
The objective of this project is to make a matrix calculator using C++ programming language

The operations the code provides

- $(Y \times Z)$ Matrices Summation
- $(Y \times Z)$ Matrices Subtraction
- $(Y \times Z)$ Matrices Multiplication
- $(Y \times Y)$ Matrix Determinant Value
- (3×3) Matrices Division

Flowchart:

Visual Paradigm Online Free Edition



Visual Paradigm Online Free Edition

Code testing:

3×3 matrix test

```
"C:\Users\somay\OneDrive\Documents\c++ projects\project\bin\Debug\project.exe"
Please enter dimensions of Matrix A:
3 3
Please enter dimensions of Matrix B:
3 3
Please enter values of Matrix A:
1 2 3
8 7 5
-5 6 4
Please enter values of Matrix B:
-3 -3 4
-9 7 4
3 -5 6
Please choose operation type(1: A+B, 2: A-B, 3: AxB, 4: A*inverse(B), 5: |A|, 6: |B|, 7: quit):
1
-2 -1 7
-1 14 9
-2 1 10
Please choose operation type(1: A+B, 2: A-B, 3: AxB, 4: A*inverse(B), 5: |A|, 6: |B|, 7: quit):
2
4 5 -1
17 0 1
-8 11 -2
Please choose operation type(1: A+B, 2: A-B, 3: AxB, 4: A*inverse(B), 5: |A|, 6: |B|, 7: quit):
3
-12 -4 30
-72 0 90
-27 37 28
Please choose operation type(1: A+B, 2: A-B, 3: AxB, 4: A*inverse(B), 5: |A|, 6: |B|, 7: quit):
4
-1 0 1
-4 1 3
-1 1 0
Please choose operation type(1: A+B, 2: A-B, 3: AxB, 4: A*inverse(B), 5: |A|, 6: |B|, 7: quit):
5
133
Please choose operation type(1: A+B, 2: A-B, 3: AxB, 4: A*inverse(B), 5: |A|, 6: |B|, 7: quit):
6
-288
Please choose operation type(1: A+B, 2: A-B, 3: AxB, 4: A*inverse(B), 5: |A|, 6: |B|, 7: quit):
7
Thank you!

Process returned 0 (0x0)   execution time : 30.371 s
Press any key to continue.
```


1×2 and 2×1 test

"C:\Users\somay\OneDrive\Documents\c++ projects\project\bin\Debug\project.exe"

```
Please enter dimensions of Matrix A:
1 2
Please enter dimensions of Matrix B:
2 1
Please enter values of Matrix A:
-5 9
Please enter values of Matrix B:
3
-1
Please choose operation type(1: A+B, 2: A-B, 3: AxB, 4: A*inverse(B), 5: |A|, 6: |B|, 7: quit):
1
The operation you chose is invalid for the given matrices.
Please choose operation type(1: A+B, 2: A-B, 3: AxB, 4: A*inverse(B), 5: |A|, 6: |B|, 7: quit):
2
The operation you chose is invalid for the given matrices.
Please choose operation type(1: A+B, 2: A-B, 3: AxB, 4: A*inverse(B), 5: |A|, 6: |B|, 7: quit):
3
-24
Please choose operation type(1: A+B, 2: A-B, 3: AxB, 4: A*inverse(B), 5: |A|, 6: |B|, 7: quit):
4
The operation you chose is invalid for the given matrices.
Please choose operation type(1: A+B, 2: A-B, 3: AxB, 4: A*inverse(B), 5: |A|, 6: |B|, 7: quit):
5
The operation you chose is invalid for the given matrices.
Please choose operation type(1: A+B, 2: A-B, 3: AxB, 4: A*inverse(B), 5: |A|, 6: |B|, 7: quit):
6
The operation you chose is invalid for the given matrices.
Please choose operation type(1: A+B, 2: A-B, 3: AxB, 4: A*inverse(B), 5: |A|, 6: |B|, 7: quit):
7
Thank you!

Process returned 0 (0x0)   execution time : 50.696 s
Press any key to continue.
```


4×4 test

 "C:\Users\somay\OneDrive\Documents\c++ projects\project\bin\Debug\project.exe"

```
Please enter dimensions of Matrix A:
4 4
Please enter dimensions of Matrix B:
4 4
Please enter values of Matrix A:
4 7 8 4
-3 -5 7 9
0 3 6 8
-2 8 7 6
Please enter values of Matrix B:
-1 -4 -5 4
3 8 9 5
3 -4 7 -5
2 3 9 8
Please choose operation type(1: A+B, 2: A-B, 3: AxB, 4: A*inverse(B), 5: |A|, 6: |B|, 7: quit):
1
3 3 3 8
0 3 16 14
3 -1 13 3
0 11 16 14
Please choose operation type(1: A+B, 2: A-B, 3: AxB, 4: A*inverse(B), 5: |A|, 6: |B|, 7: quit):
2
5 11 13 0
-6 -13 -2 4
-3 7 -1 13
-4 5 -2 -2
Please choose operation type(1: A+B, 2: A-B, 3: AxB, 4: A*inverse(B), 5: |A|, 6: |B|, 7: quit):
3
49 20 135 43
27 -29 100 0
43 24 141 49
59 62 185 45
Please choose operation type(1: A+B, 2: A-B, 3: AxB, 4: A*inverse(B), 5: |A|, 6: |B|, 7: quit):
4
The operation you chose is invalid for the given matrices.
Please choose operation type(1: A+B, 2: A-B, 3: AxB, 4: A*inverse(B), 5: |A|, 6: |B|, 7: quit):
5
1768
Please choose operation type(1: A+B, 2: A-B, 3: AxB, 4: A*inverse(B), 5: |A|, 6: |B|, 7: quit):
6
1250
Please choose operation type(1: A+B, 2: A-B, 3: AxB, 4: A*inverse(B), 5: |A|, 6: |B|, 7: quit):
7
Thank you!

Process returned 0 (0x0)   execution time : 65.533 s
Press any key to continue.
```

3×5 and 4×3 test

 "C:\Users\somay\OneDrive\Documents\c++ projects\project\bin\Debug\project.exe"

```
Please enter dimensions of Matrix A:
3 5
Please enter dimensions of Matrix B:
4 3
Please enter values of Matrix A:
3 4 5 3 2
4 3 -4 3 4
0 -9 7 6 5
Please enter values of Matrix B:
3 5 6
0 98 8
22 3 4
7 66 90
Please choose operation type(1: A+B, 2: A-B, 3: AxB, 4: A*inverse(B), 5: |A|, 6: |B|, 7: quit):
1
The operation you chose is invalid for the given matrices.
Please choose operation type(1: A+B, 2: A-B, 3: AxB, 4: A*inverse(B), 5: |A|, 6: |B|, 7: quit):
2
The operation you chose is invalid for the given matrices.
Please choose operation type(1: A+B, 2: A-B, 3: AxB, 4: A*inverse(B), 5: |A|, 6: |B|, 7: quit):
3
The operation you chose is invalid for the given matrices.
Please choose operation type(1: A+B, 2: A-B, 3: AxB, 4: A*inverse(B), 5: |A|, 6: |B|, 7: quit):
4
The operation you chose is invalid for the given matrices.
Please choose operation type(1: A+B, 2: A-B, 3: AxB, 4: A*inverse(B), 5: |A|, 6: |B|, 7: quit):
5
The operation you chose is invalid for the given matrices.
Please choose operation type(1: A+B, 2: A-B, 3: AxB, 4: A*inverse(B), 5: |A|, 6: |B|, 7: quit):
6
The operation you chose is invalid for the given matrices.
Please choose operation type(1: A+B, 2: A-B, 3: AxB, 4: A*inverse(B), 5: |A|, 6: |B|, 7: quit):
7
Thank you!

Process returned 0 (0x0)   execution time : 52.000 s
Press any key to continue.
```

10×10 test

"C:\Users\somay\OneDrive\Documents\c++ projects\project\bin\Debug\project.exe"

Please enter dimensions of Matrix A:

10 10

Please enter dimensions of Matrix B:

10 10

Please enter values of Matrix A:

1 2 3 4 5 6 7 8 9 0
44 37 4 3 9 0 8 4 3 2
0 -5 -8 3 1 2 4 7 5 -2
88 90 3 4 2 1 7 0 9 3
3 -9 0 -5 8 2 4 1 33 4
33 67 87 34 62 4 6 3 2 3
8 7 3 0 1 2 0 4 0 5
4 5 1 0 -9 4 5 2 5 2
3 5 1 -5 3 2 -3 1 2 4
3 -6 5 1 2 -6 5 3 4 1

Please enter values of Matrix B:

1 0 9 0 2 3 4 2 4 3
-3 4 2 1 5 -9 0 6 5 3
6 5 3 8 9 75 66 3 5 6
4 5 2 6 5 43 4 5 4 3
-5 4 3 2 5 -6 5 -9 0 5
6 5 3 2 1 6 4 3 2 2
5 6 77 44 5 3 65 7 6 3
5 4 2 7 8 5 2 4 6 7
33 4 23 4 75 3 2 67 5 2
55 4 6 2 6 24 5 7 5 8

Please choose operation type(1: A+B, 2: A-B, 3: AxB, 4: A*inverse(B), 5: |A|, 6: |B|, 7: quit):

1
2 2 12 4 7 9 11 10 13 3
41 41 6 4 14 -9 8 10 8 5
6 0 -5 11 10 77 70 10 10 4
92 95 5 10 7 44 11 5 13 6
-2 -5 3 -3 13 -4 9 -8 33 9
39 72 90 36 63 10 10 6 4 5
13 13 80 44 6 5 65 11 6 8
9 9 3 7 -1 9 7 6 11 9
36 9 24 -1 78 5 -1 68 7 6
58 -2 11 3 8 18 10 10 9 9

Please choose operation type(1: A+B, 2: A-B, 3: AxB, 4: A*inverse(B), 5: |A|, 6: |B|, 7: quit):

2
6 2 -6 4 3 3 3 6 5 3

the rest of 10×10 test

"C:\Users\somay\OneDrive\Documents\c++ projects\project\bin\Debug\project.exe"

```
36 9 24 -1 78 5 -1 68 7 6
58 -2 11 3 8 18 10 10 9 9
Please choose operation type(1: A+B, 2: A-B, 3: AxB, 4: A*inverse(B), 5: |A|, 6: |B|, 7: quit):
2
0 2 -6 4 3 3 3 6 5 -3
47 33 2 2 4 9 8 -2 -2 -1
-6 -10 -11 -5 -8 -73 -62 4 0 -8
84 85 1 -2 -3 -42 3 -5 5 0
8 -13 -3 -7 3 8 -1 10 33 -1
27 62 84 32 61 -2 2 0 0 1
3 1 -74 -44 -4 -1 -65 -3 -6 2
-1 1 -1 -7 -17 -1 3 -2 -1 -5
-30 1 -22 -9 -72 -1 -5 -66 -3 2
-52 -10 -1 -1 -4 -30 0 -4 -1 -7
Please choose operation type(1: A+B, 2: A-B, 3: AxB, 4: A*inverse(B), 5: |A|, 6: |B|, 7: quit):
3
412 203 825 472 864 476 756 700 192 171
193 303 1220 501 678 275 1041 543 490 395
96 33 406 196 364 -406 -229 335 32 10
345 498 1762 494 1412 -35 1068 1403 937 639
1316 157 1122 304 2505 51 388 2132 166 128
480 1209 1490 1398 1890 7246 6751 562 1125 1309
307 93 142 75 147 332 276 115 135 140
374 75 550 261 429 208 402 526 131 51
247 32 -114 -116 199 -84 -88 138 44 68
236 46 509 291 385 499 676 276 72 74
Please choose operation type(1: A+B, 2: A-B, 3: AxB, 4: A*inverse(B), 5: |A|, 6: |B|, 7: quit):
4
The operation you chose is invalid for the given matrices.
Please choose operation type(1: A+B, 2: A-B, 3: AxB, 4: A*inverse(B), 5: |A|, 6: |B|, 7: quit):
5
15013931180
Please choose operation type(1: A+B, 2: A-B, 3: AxB, 4: A*inverse(B), 5: |A|, 6: |B|, 7: quit):
6
2277504818260
Please choose operation type(1: A+B, 2: A-B, 3: AxB, 4: A*inverse(B), 5: |A|, 6: |B|, 7: quit):
7
Thank you!

Process returned 0 (0x0)   execution time : 340.367 s
Press any key to continue.
```

8×5 and 5×8 test

"C:\Users\somay\OneDrive\Documents\c++ projects\project\bin\Debug\project.exe"

```
Please enter dimensions of Matrix A:
8 5
Please enter dimensions of Matrix B:
5 8
Please enter values of Matrix A:
1 2 3 4 5
0 9 3 4 2
3 2 4 3 2
9 0 74 4 3
4 3 4 3 2
4 3 9 7 0
0 7 2 3 5
3 6 5 4 3
Please enter values of Matrix B:
1 2 3 4 5 6 7 8
0 9 8 3 4 2 4 5
7 5 3 0 94 4 3 2
3 4 2 5 4 3 4 5
0 9 3 4 2 6 5 3
Please choose operation type(1: A+B, 2: A-B, 3: AxB, 4: A*inverse(B), 5: |A|, 6: |B|, 7: quit):
1
The operation you chose is invalid for the given matrices.
Please choose operation type(1: A+B, 2: A-B, 3: AxB, 4: A*inverse(B), 5: |A|, 6: |B|, 7: quit):
2
The operation you chose is invalid for the given matrices.
Please choose operation type(1: A+B, 2: A-B, 3: AxB, 4: A*inverse(B), 5: |A|, 6: |B|, 7: quit):
3
34 96 51 50 321 64 65 59
33 130 95 55 338 54 71 77
40 74 49 41 415 59 63 63
539 431 266 68 7023 380 316 249
41 85 60 48 424 67 74 76
88 108 77 60 906 87 95 100
23 130 83 56 238 61 71 69
50 128 89 62 531 80 91 93
Please choose operation type(1: A+B, 2: A-B, 3: AxB, 4: A*inverse(B), 5: |A|, 6: |B|, 7: quit):
4
The operation you chose is invalid for the given matrices.
Please choose operation type(1: A+B, 2: A-B, 3: AxB, 4: A*inverse(B), 5: |A|, 6: |B|, 7: quit):
5
The operation you chose is invalid for the given matrices.
Please choose operation type(1: A+B, 2: A-B, 3: AxB, 4: A*inverse(B), 5: |A|, 6: |B|, 7: quit):
6
The operation you chose is invalid for the given matrices.
Please choose operation type(1: A+B, 2: A-B, 3: AxB, 4: A*inverse(B), 5: |A|, 6: |B|, 7: quit):
7
Thank you!
Process returned 0 (0x0)   execution time : 98.790 s
```

Code

```
#include <iostream>

#include <math.h>

using namespace std;

long long determinant;

long long determinant_calculator (int n_matrix, long long matrix[10][10]){

determinant = 0;

long long sub_matrix[10][10];

if (n_matrix==1){

determinant = matrix[0][0];

return determinant;

}

else if (n_matrix==2){

determinant = (matrix[0][0]*matrix[1][1])-(matrix[1][0]*matrix[0][1]);

return determinant;

}

// base cases of recursive function

else {

    //int sign=1;

    for (int k = 0; k < n_matrix; k++) {

        int index_rows_sub = 0;

        for (int i = 1; i < n_matrix; i++) {

            int index_colm_sub = 0;

            for (int j = 0; j < n_matrix; j++) {

                if (j == k)

                    continue;

                sub_matrix[index_rows_sub][index_colm_sub] = matrix[i][j];

                index_colm_sub++;

            }

            index_rows_sub++;

        }

        determinant = determinant + (pow(-1, k) * matrix[0][k] * determinant_calculator( n_matrix - 1,sub_matrix ));

    }

}
```

```

        }

    }

return determinant;

}

int main()

{

    int n_rows_A , n_colm_A , n_rows_B , n_colm_B,operation ;

    long long x,y, matrix_A [10][10] , matrix_B [10][10];

    cout << "Please enter dimensions of Matrix A:" << endl;

    cin>> n_rows_A>>n_colm_A;

    cout << "Please enter dimensions of Matrix B:" << endl;

    cin>> n_rows_B>>n_colm_B;

    cout << "Please enter values of Matrix A:" << endl;

    for (int r=0; r<n_rows_A; r++){

        for (int c=0; c<n_colm_A; c++){

            cin>>x;

            matrix_A[r][c]=x;

        }

    }

    /* for (int r=0; r<3; r++){

        for (int c=0; c<3; c++){

            cout << matrix_A[r][c];

        }

    } */

    cout << "Please enter values of Matrix B:" << endl;

    for (int r=0; r<n_rows_B; r++){

        for (int c=0; c<n_colm_B; c++){

            cin>>y;

            matrix_B[r][c]=y;

        }

    }

    do{

```

```

cout << "Please choose operation type(1: A+B, 2: A-B, 3: AxB, 4: A*inverse(B), 5: |A|, 6: |B|, 7: quit):" << endl;
cin>>operation;
switch (operation){
case 1:{
    long long sum[10][10];
    if ((n_rows_A==n_rows_B)&&(n_colm_A==n_colm_B)){
        for (int r=0; r<n_rows_A; r++){
            for (int c=0; c<n_colm_A; c++){
                sum[r][c]=matrix_A[r][c]+matrix_B[r][c];
                if (sum[r][c]>=0){
                    cout<<int(sum[r][c]+0.5)<<" ";
                }
                else if(sum[r][c]<0){ cout<<int(sum[r][c]-0.5)<<" ";}
            }
            cout<<endl;
        }
    }
    else {cout<<"The operation you chose is invalid for the given matrices."<<endl;}
} break;
case 2:{
    float diff[10][10];
    if ((n_rows_A==n_rows_B)&&(n_colm_A==n_colm_B)){
        for (int r=0; r<n_rows_A; r++){
            for (int c=0; c<n_rows_B; c++){
                diff[r][c]=matrix_A[r][c]-matrix_B[r][c];
                if (diff[r][c]>=0){
                    cout<<int(diff[r][c]+0.5)<<" ";
                }
                else if (diff[r][c]<0){ cout<<int(diff[r][c]-0.5)<<" ";}
            }
            cout<<endl;
        }
    }
    else {cout<<"The operation you chose is invalid for the given matrices."<<endl;}
} break;

```

case 3:

```
{float multiply[10][10];

for (int r=0; r<10; r++){

for (int c=0; c<10; c++){

multiply[r][c]=0;

}

}

if (n_colm_A==n_rows_B){

for (int r=0; r<n_rows_A; r++){//number of rows in a should be equal no of columns in b??

for (int c=0; c<n_colm_B; c++){

for (int m=0;m<n_colm_A;m++){

multiply[r][c]+=matrix_A[r][m]*matrix_B[m][c];

}

if (multiply[r][c]>=0){

cout<<int(multiply[r][c]+0.5)<<" ";}

else if (multiply[r][c]<0){ cout<<int(multiply[r][c]-0.5)<<" ";}

}

cout<<endl;

}

}

else {cout<<"The operation you chose is invalid for the given matrices."<<endl;}

} break;
```

case 4:

```
{

long long dete = determinant_calculator(n_colm_B, matrix_B);

float inverse_B[3][3];

if (dete!=0 && (n_rows_A==3) && (n_rows_B == 3) && (n_colm_A == 3) && (n_colm_B == 3)){

inverse_B[0][0]=(matrix_B[1][1]*matrix_B[2][2]-matrix_B[1][2]*matrix_B[2][1])/double(dete);

inverse_B[0][1]= -(matrix_B[0][1]*matrix_B[2][2]-matrix_B[0][2]*matrix_B[2][1])/double(dete);

inverse_B[0][2]= (matrix_B[0][1]*matrix_B[1][2]-matrix_B[0][2]*matrix_B[1][1])/double(dete);

inverse_B[1][0]= -(matrix_B[1][0]*matrix_B[2][2]-matrix_B[1][2]*matrix_B[2][0])/double(dete);

inverse_B[1][1]= (matrix_B[0][0]*matrix_B[2][2]-matrix_B[0][2]*matrix_B[2][0])/double(dete);

inverse_B[1][2]= -(matrix_B[0][0]*matrix_B[1][2]-matrix_B[0][2]*matrix_B[1][0])/double(dete);
```

```

inverse_B[2][0]= (matrix_B[1][0]*matrix_B[2][1]-matrix_B[1][1]*matrix_B[2][0])/double(dete);
inverse_B[2][1]= - (matrix_B[0][0]*matrix_B[2][1]-matrix_B[0][1]*matrix_B[2][0])/double(dete);
inverse_B[2][2]= (matrix_B[1][1]*matrix_B[0][0]-matrix_B[1][0]*matrix_B[0][1])/double(dete);

```

```

float multiply_inverse[10][10];
for (int r=0; r<10; r++){
    for (int c=0; c<10; c++){
        multiply_inverse[r][c]=0;
    }
}

if (n_colm_A==n_rows_B){
    for (int r=0; r<n_rows_A; r++){//number of rows in a should be equal no of columns in b??
        for (int c=0; c<n_colm_B; c++){
            for (int m=0;m<n_colm_A;m++){
                multiply_inverse[r][c]+=matrix_A[r][m]*inverse_B[m][c];
            }
            if (multiply_inverse[r][c]>=0){
                cout<<int(multiply_inverse[r][c]+0.5)<<" ";
            }
            else if (multiply_inverse[r][c]<0){ cout<<int(multiply_inverse[r][c]-0.5)<<" ";}
        }
        cout<<endl;
    }
}

else {cout<<"The operation you chose is invalid for the given matrices."<<endl;}
} break;

case 5:

{if (n_colm_A == n_rows_A)

    { long long det_A = determinant_calculator(n_colm_A, matrix_A);

    cout << det_A <<endl;

    }

    else {cout<<"The operation you chose is invalid for the given matrices."<<endl;}

}break;

```

case 6:

```
{if (n_colm_B == n_rows_B)
    {long long det_B = determinant_calculator(n_colm_B, matrix_B);
    cout << det_B << endl;
    }
else {cout << "The operation you chose is invalid for the given matrices." << endl;}
```

```
}break;
```

case 7:

break;

default:

```
{cout << "The operation you chose is invalid for the given matrices." << endl;
}
}
```

```
}while (operation<7);
```

```
cout << "Thank you!" << endl;
```

return 0;

```
}
```


Thank you