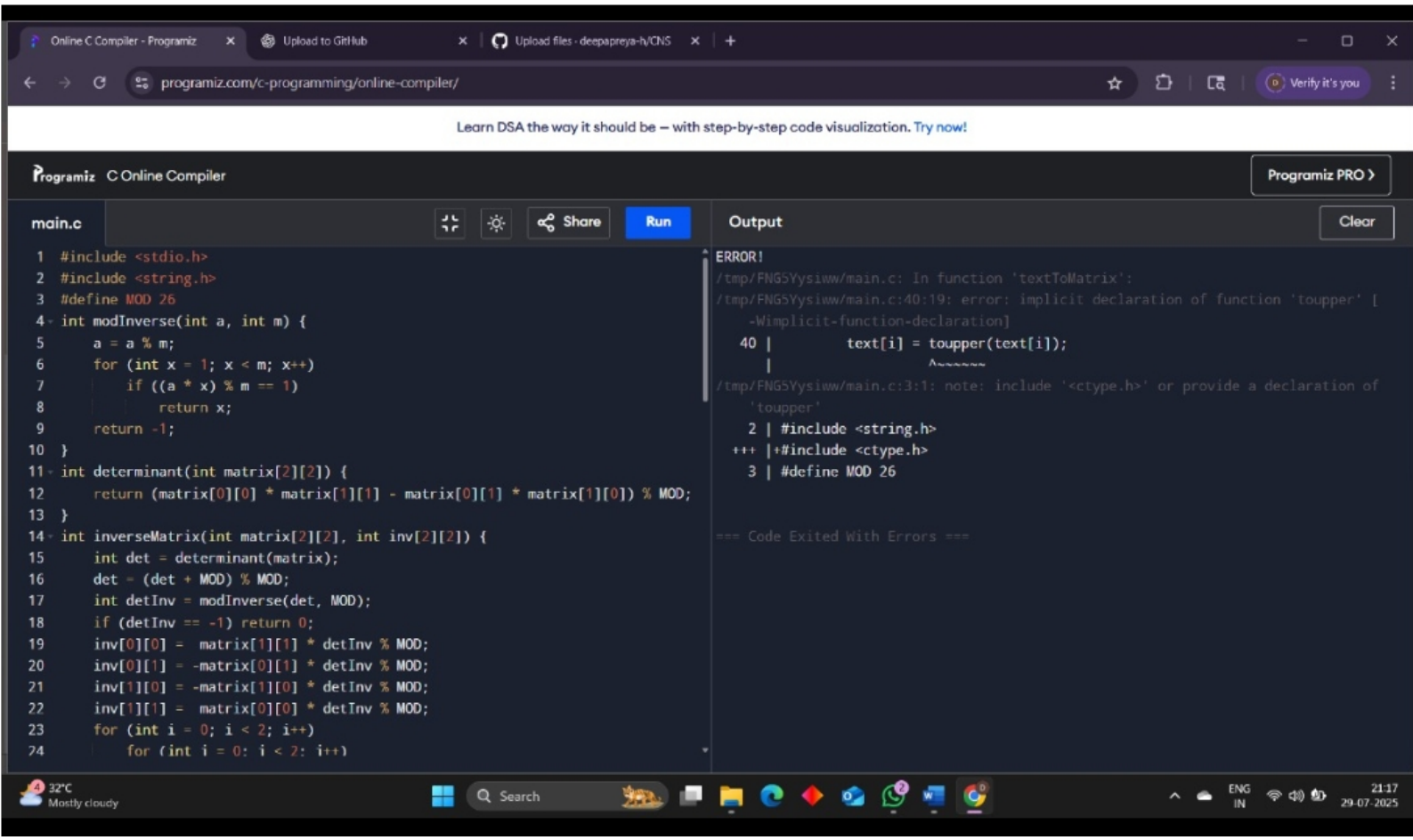
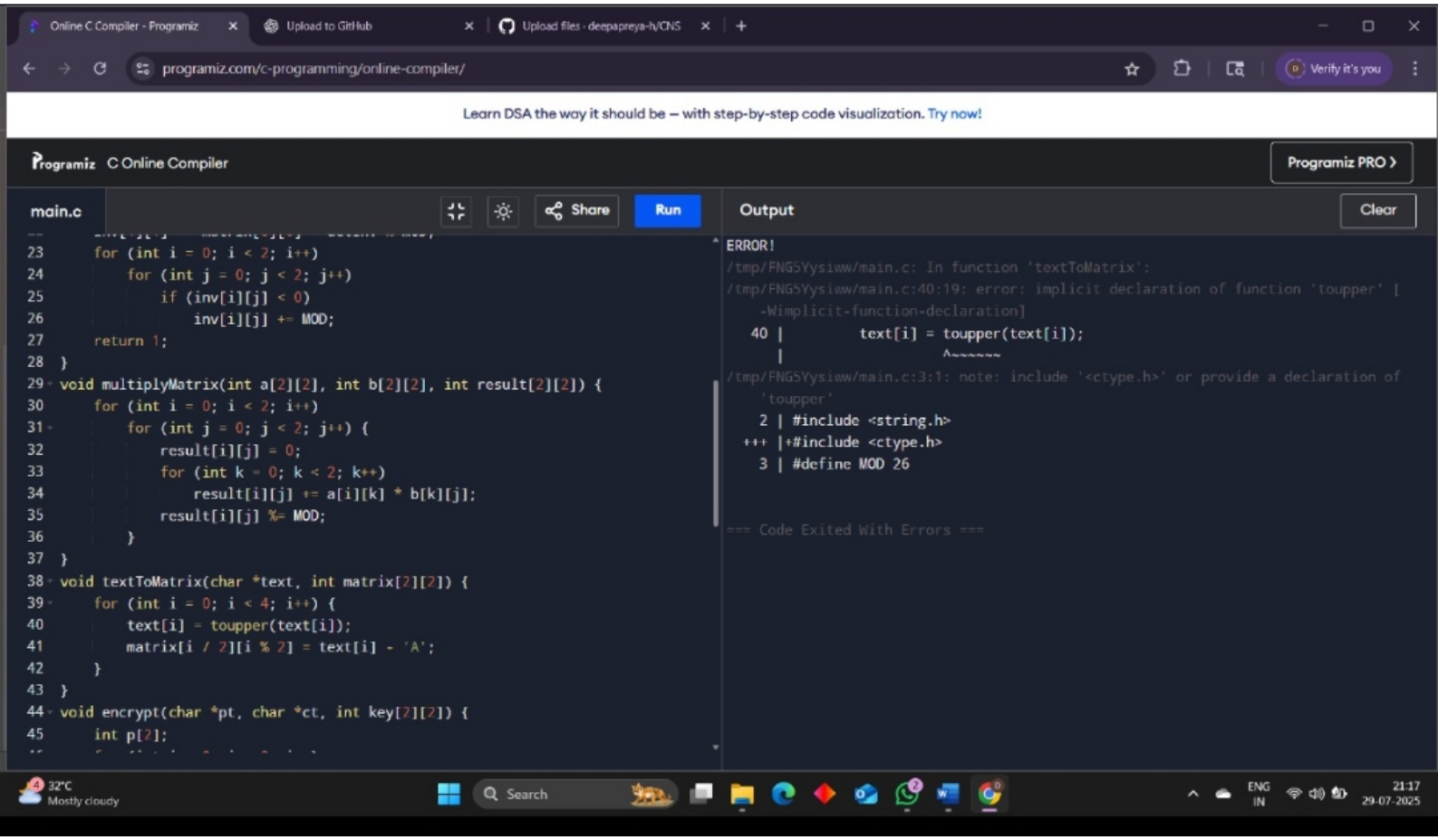
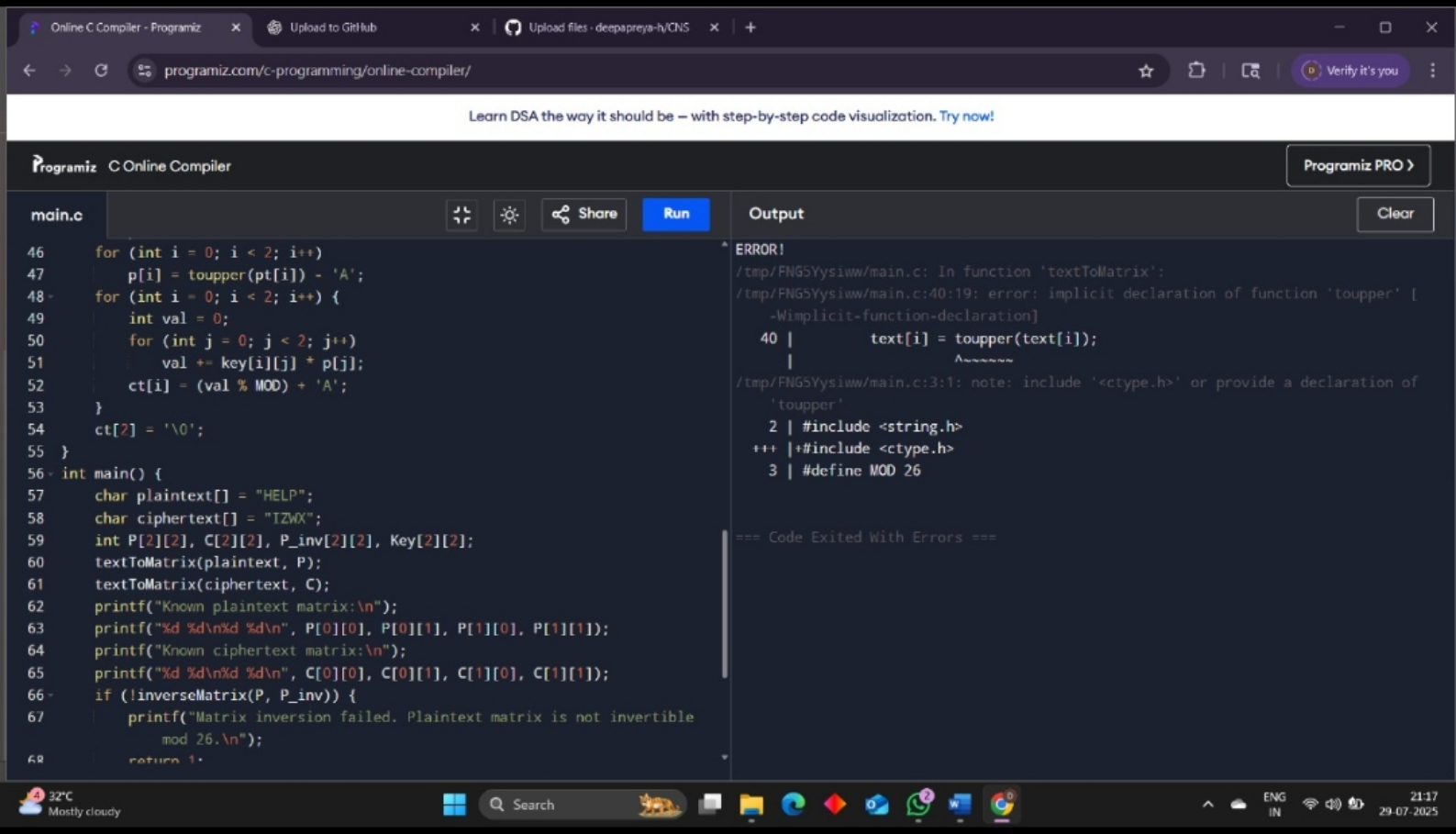

Online C Compiler - Programiz
Upload to GitHub
Upload files - deepapreya-h/CNS
programiz.com/c-programming/online-compiler/
Verify it's you
Learn DSA the way it should be — with step-by-step code visualization. Try now!
Programiz C Online Compiler
Programiz PRO
main.c
Share
Run
Output
Clear
#include <stdio.h>
#include <string.h>
#define MOD 26
int modInverse(int a, int m) {
a = a % m;
for (int x = 1; x < m; x++)
if ((a * x) % m == 1)
return x;
return -1;
}
int determinant(int matrix[2][2]) {
return (matrix[0][0] * matrix[1][1] - matrix[0][1] * matrix[1][0]) % MOD;
}
int inverseMatrix(int matrix[2][2], int inv[2][2]) {
int det = determinant(matrix);
det = (det + MOD) % MOD;
int detInv = modInverse(det, MOD);
if (detInv == -1) return 0;
inv[0][0] = matrix[1][1] * detInv % MOD;
inv[0][1] = -matrix[0][1] * detInv % MOD;
inv[1][0] = -matrix[1][0] * detInv % MOD;
inv[1][1] = matrix[0][0] * detInv % MOD;
for (int i = 0; i < 2; i++)
for (int i = 0; i < 2; i++)
ERROR!
/tmp/FNG5Yysiww/main.c: In function 'textToMatrix':
/tmp/FNG5Yysiww/main.c:40:19: error: implicit declaration of function 'toupper' [
-Wimplicit-function-declaration]
40 | text[i] = toupper(text[i]);
| ^~~~~~~
/tmp/FNG5Yysiww/main.c:3:1: note: include '<ctype.h>' or provide a declaration of
'toupper'
2 | #include <string.h>
+++ |+#include <ctype.h>
3 | #define MOD 26
=== Code Exited With Errors ===
32°C
Mostly cloudy
Search
ENG
IN
21:17
29-07-2025


Online C Compiler - Programiz
Upload to GitHub
Upload files · deepapreya-h/CNS
programiz.com/c-programming/online-compiler/
Verify it's you
Learn DSA the way it should be — with step-by-step code visualization. Try now!
Programiz C Online Compiler
Programiz PRO
main.c
Share
Run
Output
Clear
for (int i = 0; i < 2; i++)
for (int j = 0; j < 2; j++)
if (inv[i][j] < 0)
inv[i][j] += MOD;
return 1;
}
void multiplyMatrix(int a[2][2], int b[2][2], int result[2][2]) {
for (int i = 0; i < 2; i++)
for (int j = 0; j < 2; j++) {
result[i][j] = 0;
for (int k = 0; k < 2; k++)
result[i][j] += a[i][k] * b[k][j];
result[i][j] %= MOD;
}
}
void textToMatrix(char *text, int matrix[2][2]) {
for (int i = 0; i < 4; i++) {
text[i] = toupper(text[i]);
matrix[i / 2][i % 2] = text[i] - 'A';
}
}
void encrypt(char *pt, char *ct, int key[2][2]) {
int p[2];
ERROR!
/tmp/FNG5Yysiww/main.c: In function 'textToMatrix':
/tmp/FNG5Yysiww/main.c:40:19: error: implicit declaration of function 'toupper' [
-Wimplicit-function-declaration]
40 | text[i] = toupper(text[i]);
| ^~~~~~~
/tmp/FNG5Yysiww/main.c:3:1: note: include '<ctype.h>' or provide a declaration of
'toupper'
2 | #include <string.h>
+++ |+#include <ctype.h>
3 | #define MOD 26
=== Code Exited With Errors ===
32°C
Mostly cloudy
Search
ENG
IN
21:17
29-07-2025


Online C Compiler - Programiz
Upload to GitHub
Upload files - deepapreya-h/CNS
programiz.com/c-programming/online-compiler/
Verify it's you
Learn DSA the way it should be — with step-by-step code visualization. Try now!
Programiz C Online Compiler
Programiz PRO
main.c
Share
Run
Output
Clear
for (int i = 0; i < 2; i++)
p[i] = toupper(pt[i]) - 'A';
for (int i = 0; i < 2; i++) {
int val = 0;
for (int j = 0; j < 2; j++)
val += key[i][j] * p[j];
ct[i] = (val % MOD) + 'A';
}
ct[2] = '\0';
}
int main() {
char plaintext[] = "HELP";
char ciphertext[] = "IZWX";
int P[2][2], C[2][2], P_inv[2][2], Key[2][2];
textToMatrix(plaintext, P);
textToMatrix(ciphertext, C);
printf("Known plaintext matrix:\n");
printf("%d %d\n%d %d\n", P[0][0], P[0][1], P[1][0], P[1][1]);
printf("Known ciphertext matrix:\n");
printf("%d %d\n%d %d\n", C[0][0], C[0][1], C[1][0], C[1][1]);
if (!inverseMatrix(P, P_inv)) {
printf("Matrix inversion failed. Plaintext matrix is not invertible
mod 26.\n");
ERROR!
/tmp/FNG5Yysiww/main.c: In function 'textToMatrix':
/tmp/FNG5Yysiww/main.c:40:19: error: implicit declaration of function 'toupper' [
-Wimplicit-function-declaration]
40 | text[i] = toupper(text[i]);
| ^~~~~~~
/tmp/FNG5Yysiww/main.c:3:1: note: include '<ctype.h>' or provide a declaration of
'toupper'
2 | #include <string.h>
+++ |+#include <ctype.h>
3 | #define MOD 26
=== Code Exited With Errors ===
32°C
Mostly cloudy
Search
ENG
IN
21:17
29-07-2025

programiz.com/c-programming/online-compiler/

Learn DSA the way it should be — with step-by-step code visualization. Try now!

Programiz C Online Compiler

Programiz PRO ›

main.c

Share Run

```c
    char plaintext[] = "HELP";
    char ciphertext[] = "IZWX";
    int P[2][2], C[2][2], P_inv[2][2], Key[2][2];
    textToMatrix(plaintext, P);
    textToMatrix(ciphertext, C);
    printf("Known plaintext matrix:\n");
    printf("%d %d\n%d %d\n", P[0][0], P[0][1], P[1][0], P[1][1]);
    printf("Known ciphertext matrix:\n");
    printf("%d %d\n%d %d\n", C[0][0], C[0][1], C[1][0], C[1][1]);
    if (!inverseMatrix(P, P_inv)) {
        printf("Matrix inversion failed. Plaintext matrix is not invertible
            mod 26.\n");
        return 1;
    }
    multiplyMatrix(C, P_inv, Key);
    printf("Recovered Key Matrix:\n");
    printf("%d %d\n%d %d\n", Key[0][0], Key[0][1], Key[1][0], Key[1][1]);
    char test[] = "HI";
    char encrypted[3];
    encrypt(test, encrypted, Key);
    printf("Test Encryption of '%s': %s\n", test, encrypted);
    return 0;
}
```

Output

Clear

```
ERROR!
/tmp/FNG5Yysiww/main.c: In function 'textToMatrix':
/tmp/FNG5Yysiww/main.c:40:19: error: implicit declaration of function 'toupper' [
    -Wimplicit-function-declaration]
   40 |         text[i] = toupper(text[i]);
      |                   ^~~~~~~
/tmp/FNG5Yysiww/main.c:3:1: note: include '<ctype.h>' or provide a declaration of
    'toupper'
    2 | #include <string.h>
  +++ |+#include <ctype.h>
    3 | #define MOD 26


=== Code Exited With Errors ===
```

32°C Mostly cloudy

Search

ENG IN

21:17 29-07-2025