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```
57 // reprocess the second char of duplicate
58 } else {
59     temp[k++] = output[i + 1];
60 }
61 }
62 temp[k] = '\0';
63 strcpy(output, temp);
64 }
65 void encrypt(char *plaintext, char *ciphertext) {
66     int i;
67     for (i = 0; plaintext[i] != '\0'; i += 2) {
68         int r1, c1, r2, c2;
69         findPosition(plaintext[i], &r1, &c1);
70         findPosition(plaintext[i + 1], &r2, &c2);
71         if (r1 == r2) {
72             ciphertext[i] = matrix[r1][(c1 + 1) % SIZE];
73             ciphertext[i + 1] = matrix[r2][(c2 + 1) % SIZE];
74         } else if (c1 == c2) {
75             ciphertext[i] = matrix[(r1 + 1) % SIZE][c1];
76             ciphertext[i + 1] = matrix[(r2 + 1) % SIZE][c2];
77         } else {
78             ciphertext[i] = matrix[(r1 + 1) % SIZE][(c2 + 1) % SIZE];
79             ciphertext[i + 1] = matrix[(r2 + 1) % SIZE][(c1 + 1) % SIZE];
80         }
81     }
82 }
```

Output

Clear

Enter keyword: MONARCHY
Enter plaintext: INSTRUMENT

Playfair Matrix:
M O N A R
C H Y B D
E F G I K
L P Q S T
U V W X Z

Prepared Plaintext: INSTRUMENT
Ciphertext: GATLMZCLRQ

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```
1 #include <stdio.h>
2 #include <string.h>
3 #include <ctype.h>
4 #define SIZE 5
5 char matrix[SIZE][SIZE];
6 void prepareKey(char *key, char *result) {
7     int visited[26] = {0};
8     int i, k = 0;
9     for (i = 0; key[i] != '\0'; i++) {
10         char ch = toupper(key[i]);
11         if (ch == 'J') ch = 'I';
12         if (isalpha(ch) && !visited[ch - 'A']) {
13             visited[ch - 'A'] = 1;
14             result[k++] = ch;
15         }
16     }
17     for (i = 0; i < 26; i++) {
18         if (i + 'A' == 'J') continue;
19         if (!visited[i]) {
```

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```
77-     } else {
78-         ciphertext[i] = matrix[r1][c2];
79-         ciphertext[i + 1] = matrix[r2][c1];
80-     }
81- }
82- ciphertext[i] = '\0';
83- }
84- void displayMatrix() {
85-     printf("\nPlayfair Matrix:\n");
86-     for (int i = 0; i < SIZE; i++) {
87-         for (int j = 0; j < SIZE; j++) {
88-             printf("%c ", matrix[i][j]);
89-         }
90-         printf("\n");
91-     }
92- }
93- int main() {
94-     char key[100], keyMatrix[26];
95-     char plaintext[100], preparedText[100], ciphertext[100];
```

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Output

Clear

```
91 }
92 }
93 int main() {
94     char key[100], keyMatrix[26];
95     char plaintext[100], preparedText[100], ciphertext[100];
96     printf("Enter keyword: ");
97     scanf("%s", key);
98     printf("Enter plaintext: ");
99     scanf("%s", plaintext);
100     prepareKey(key, keyMatrix);
101     buildMatrix(keyMatrix);
102     displayMatrix();
103     prepareText(plaintext, preparedText);
104     encrypt(preparedText, ciphertext);
105     printf("\nPrepared Plaintext: %s", preparedText);
106     printf("\nCiphertext: %s\n", ciphertext);
107     return 0;
108 }
109
```

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```
20     result[k++] = i + 'A';
21 }
22 }
23 result[k] = '\0';
24 }
25 void buildMatrix(char *key) {
26     int k = 0;
27     for (int i = 0; i < SIZE; i++)
28         for (int j = 0; j < SIZE; j++)
29             matrix[i][j] = key[k++];
30 }
31 void findPosition(char ch, int *row, int *col) {
32     for (int i = 0; i < SIZE; i++)
33         for (int j = 0; j < SIZE; j++)
34             if (matrix[i][j] == ch) {
35                 *row = i;
36                 *col = j;
37                 return;
38             }
```

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```
39 }
40 void prepareText(char *input, char *output) {
41     int i, j = 0;
42     for (i = 0; input[i] != '\0'; i++) {
43         if (!isalpha(input[i])) continue;
44         char ch = toupper(input[i]);
45         if (ch == 'J') ch = 'I';
46         output[j++] = ch;
47     }
48     output[j] = '\0';
49     char temp[100];
50     int k = 0;
51     for (i = 0; i < j; i += 2) {
52         temp[k++] = output[i];
53         if (i + 1 == j) {
54             temp[k++] = 'X'; // last char no pair
55         } else if (output[i] == output[i + 1]) {
56             temp[k++] = 'X';
57             i--; // reprocess the second char of duplicate
```

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