# Assignment 2: Matrix Multiplication

#include <stdio.h>  
#include <stdlib.h>  
  
int\*\* createMatrix(int rows, int cols) {  
 int\*\* matrix = (int\*\*)malloc(rows \* sizeof(int\*));  
 for (int i = 0; i < rows; i++) {  
 matrix[i] = (int\*)malloc(cols \* sizeof(int));  
 }  
 return matrix;  
}  
  
void inputMatrix(int\*\* matrix, int rows, int cols) {  
 printf("Enter matrix elements (%d x %d):\n", rows, cols);  
 for (int i = 0; i < rows; i++) {  
 for (int j = 0; j < cols; j++) {  
 scanf("%d", &matrix[i][j]);  
 }  
 }  
}  
  
int\*\* multiplyMatrices(int\*\* A, int\*\* B, int r1, int c1, int c2) {  
 int\*\* C = createMatrix(r1, c2);  
 for (int i = 0; i < r1; i++) {  
 for (int j = 0; j < c2; j++) {  
 C[i][j] = 0;  
 for (int k = 0; k < c1; k++) {  
 C[i][j] += A[i][k] \* B[k][j];  
 }  
 }  
 }  
 return C;  
}  
  
void displayMatrix(int\*\* matrix, int rows, int cols) {  
 printf("Result Matrix (%d x %d):\n", rows, cols);  
 for (int i = 0; i < rows; i++) {  
 for (int j = 0; j < cols; j++) {  
 printf("%d ", matrix[i][j]);  
 }  
 printf("\n");  
 }  
}  
  
int main() {  
 int r1, c1, r2, c2;  
  
 printf("Enter rows and columns of Matrix A: ");  
 scanf("%d%d", &r1, &c1);  
 printf("Enter rows and columns of Matrix B: ");  
 scanf("%d%d", &r2, &c2);  
  
 if (c1 != r2) {  
 printf("Matrix multiplication not possible: Columns of A must equal rows of B.\n");  
 return 1;  
 }  
  
 int\*\* A = createMatrix(r1, c1);  
 int\*\* B = createMatrix(r2, c2);  
  
 printf("\nMatrix A:\n");  
 inputMatrix(A, r1, c1);  
  
 printf("\nMatrix B:\n");  
 inputMatrix(B, r2, c2);  
  
 int\*\* C = multiplyMatrices(A, B, r1, c1, c2);  
  
 printf("\n");  
 displayMatrix(C, r1, c2);  
  
 for (int i = 0; i < r1; i++) free(A[i]);  
 for (int i = 0; i < r2; i++) free(B[i]);  
 for (int i = 0; i < r1; i++) free(C[i]);  
 free(A);  
 free(B);  
 free(C);  
  
 return 0;  
}