**Question 1:**

#include <stdio.h>

int binarySearch(int arr[], int n, int x) {

int low = 0, high = n - 1;

while (low <= high) {

int mid = (low + high) / 2;

if (arr[mid] == x) return mid;

else if (arr[mid] < x) low = mid + 1;

else high = mid - 1;

}

return -1;

}

int main() {

int n;

printf("Enter number of elements: ");

scanf("%d", &n);

int arr[n];

printf("Enter elements in sorted order:\n");

for (int i = 0; i < n; i++) scanf("%d", &arr[i]);

int x;

printf("Enter element to search: ");

scanf("%d", &x);

int result = binarySearch(arr, n, x);

if (result == -1) printf("Element not found\n");

else printf("Element found at index %d\n", result);

return 0;

}

**Question 2:**

#include <stdio.h>

int main() {

int arr[] = {64, 34, 25, 12, 22, 11, 90};

int n = sizeof(arr)/sizeof(arr[0]);

for (int i = 0; i < n - 1; i++) {

for (int j = 0; j < n - i - 1; j++) {

if (arr[j] > arr[j + 1]) {

int temp = arr[j];

arr[j] = arr[j + 1];

arr[j + 1] = temp;

}

}

}

printf("Sorted array: ");

for (int i = 0; i < n; i++) printf("%d ", arr[i]);

return 0;

}

**Question 3:**

#include <stdio.h>

int findMissingLinear(int arr[], int n) {

for (int i = 0; i < n - 1; i++) {

if (arr[i] != i + 1) return i + 1;

}

return n;

}

int findMissingBinary(int arr[], int n) {

int low = 0, high = n - 1;

while (low <= high) {

int mid = (low + high) / 2;

if (arr[mid] == mid + 1) low = mid + 1;

else high = mid - 1;

}

return low + 1;

}

int main() {

int n;

printf("Enter n: ");

scanf("%d", &n);

int arr[n - 1];

printf("Enter %d elements in sorted order:\n", n - 1);

for (int i = 0; i < n - 1; i++) scanf("%d", &arr[i]);

printf("Missing number (Linear): %d\n", findMissingLinear(arr, n));

printf("Missing number (Binary): %d\n", findMissingBinary(arr, n));

return 0;

}

**Question 4 (a):**

#include <stdio.h>

#include <string.h>

int main() {

char s1[100], s2[50];

printf("Enter first string: ");

gets(s1);

printf("Enter second string: ");

gets(s2);

strcat(s1, s2);

printf("Concatenated string: %s", s1);

return 0;

}

**(b):**

#include <stdio.h>

#include <string.h>

int main() {

char s[100];

printf("Enter string: ");

gets(s);

int n = strlen(s);

for (int i = n - 1; i >= 0; i--) printf("%c", s[i]);

return 0;

}

**(c):**

#include <stdio.h>

#include <string.h>

int main() {

char s[100], res[100];

printf("Enter string: ");

gets(s);

int j = 0;

for (int i = 0; s[i]; i++) {

char c = s[i];

if (!(c=='a'||c=='e'||c=='i'||c=='o'||c=='u'||c=='A'||c=='E'||c=='I'||c=='O'||c=='U'))

res[j++] = c;

}

res[j] = '\0';

printf("String without vowels: %s", res);

return 0;

}

**(d):**

#include <stdio.h>

#include <string.h>

int main() {

int n;

printf("Enter number of strings: ");

scanf("%d", &n);

char arr[n][50];

for (int i = 0; i < n; i++) scanf("%s", arr[i]);

for (int i = 0; i < n - 1; i++) {

for (int j = i + 1; j < n; j++) {

if (strcmp(arr[i], arr[j]) > 0) {

char temp[50];

strcpy(temp, arr[i]);

strcpy(arr[i], arr[j]);

strcpy(arr[j], temp);

}

}

}

printf("Sorted strings:\n");

for (int i = 0; i < n; i++) printf("%s\n", arr[i]);

return 0;

}

**(e):**

#include <stdio.h>

#include <ctype.h>

int main() {

char c;

printf("Enter character: ");

scanf(" %c", &c);

printf("Lowercase: %c", tolower(c));

return 0;

}

**Question 5 (a):**

#include <stdio.h>

int main() {

int n;

printf("Enter size of matrix: ");

scanf("%d", &n);

int diag[n];

printf("Enter diagonal elements:\n");

for (int i = 0; i < n; i++) scanf("%d", &diag[i]);

printf("Matrix:\n");

for (int i = 0; i < n; i++) {

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

if (i == j) printf("%d ", diag[i]);

else printf("0 ");

}

printf("\n");

}

return 0;

}

**(b):**

#include <stdio.h>

int main() {

int n;

printf("Enter size: ");

scanf("%d", &n);

int tri[3\*n - 2];

printf("Enter elements row-wise (only 3 diagonals):\n");

for (int i = 0; i < 3\*n - 2; i++) scanf("%d", &tri[i]);

printf("Matrix:\n");

int k = 0;

for (int i = 0; i < n; i++) {

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

if (j == i || j == i-1 || j == i+1) printf("%d ", tri[k++]);

else printf("0 ");

}

printf("\n");

}

return 0;

}

**(c):**

#include <stdio.h>

int main() {

int n;

printf("Enter size: ");

scanf("%d", &n);

int lower[n\*(n+1)/2];

printf("Enter lower triangular elements:\n");

for (int i = 0; i < n\*(n+1)/2; i++) scanf("%d", &lower[i]);

printf("Matrix:\n");

int k = 0;

for (int i = 0; i < n; i++) {

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

if (j <= i) printf("%d ", lower[k++]);

else printf("0 ");

}

printf("\n");

}

return 0;

}

**(d):**

#include <stdio.h>

int main() {

int n;

printf("Enter size: ");

scanf("%d", &n);

int upper[n\*(n+1)/2];

printf("Enter upper triangular elements:\n");

for (int i = 0; i < n\*(n+1)/2; i++) scanf("%d", &upper[i]);

printf("Matrix:\n");

int k = 0;

for (int i = 0; i < n; i++) {

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

if (j >= i) printf("%d ", upper[k++]);

else printf("0 ");

}

printf("\n");

}

return 0;

}

**(e):**

#include <stdio.h>

int main() {

int n;

printf("Enter size: ");

scanf("%d", &n);

int sym[n\*(n+1)/2];

printf("Enter lower triangular (including diagonal):\n");

for (int i = 0; i < n\*(n+1)/2; i++) scanf("%d", &sym[i]);

printf("Matrix:\n");

int k = 0;

for (int i = 0; i < n; i++) {

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

if (j <= i) {

printf("%d ", sym[k++]);

} else {

int index = j\*(j+1)/2 + i;

printf("%d ", sym[index]);

}

}

printf("\n");

}

return 0;

}

**Question 6 (a):**

#include <stdio.h>

int main() {

int r, c, n;

printf("Enter rows, cols, non-zero elements: ");

scanf("%d %d %d", &r, &c, &n);

int mat[n][3];

printf("Enter row col value:\n");

for (int i = 0; i < n; i++) scanf("%d %d %d", &mat[i][0], &mat[i][1], &mat[i][2]);

int trans[n][3];

for (int i = 0; i < n; i++) {

trans[i][0] = mat[i][1];

trans[i][1] = mat[i][0];

trans[i][2] = mat[i][2];

}

printf("Transpose triplet:\n");

for (int i = 0; i < n; i++) printf("%d %d %d\n", trans[i][0], trans[i][1], trans[i][2]);

return 0;

}

**(b):**

#include <stdio.h>

int main() {

int n1, n2;

printf("Enter non-zero elements of first matrix: ");

scanf("%d", &n1);

int a[n1][3];

printf("Enter row col value:\n");

for (int i = 0; i < n1; i++) scanf("%d %d %d", &a[i][0], &a[i][1], &a[i][2]);

printf("Enter non-zero elements of second matrix: ");

scanf("%d", &n2);

int b[n2][3];

for (int i = 0; i < n2; i++) scanf("%d %d %d", &b[i][0], &b[i][1], &b[i][2]);

int c[n1+n2][3], k = 0, i = 0, j = 0;

while (i < n1 && j < n2) {

if (a[i][0] == b[j][0] && a[i][1] == b[j][1]) {

c[k][0] = a[i][0];

c[k][1] = a[i][1];

c[k][2] = a[i][2] + b[j][2];

i++; j++; k++;

} else if (a[i][0] < b[j][0] || (a[i][0]==b[j][0] && a[i][1] < b[j][1])) {

c[k][0] = a[i][0]; c[k][1] = a[i][1]; c[k][2] = a[i][2];

i++; k++;

} else {

c[k][0] = b[j][0]; c[k][1] = b[j][1]; c[k][2] = b[j][2];

j++; k++;

}

}

while (i < n1) { c[k][0]=a[i][0]; c[k][1]=a[i][1]; c[k][2]=a[i][2]; i++; k++; }

while (j < n2) { c[k][0]=b[j][0]; c[k][1]=b[j][1]; c[k][2]=b[j][2]; j++; k++; }

printf("Resultant matrix triplet:\n");

for (int x = 0; x < k; x++) printf("%d %d %d\n", c[x][0], c[x][1], c[x][2]);

return 0;

}

**(c):**

#include <stdio.h>

int main() {

int n1, n2;

printf("Enter non-zero elements of first matrix: ");

scanf("%d", &n1);

int a[n1][3];

printf("Enter row col value:\n");

for (int i = 0; i < n1; i++) scanf("%d %d %d", &a[i][0], &a[i][1], &a[i][2]);

printf("Enter non-zero elements of second matrix: ");

scanf("%d", &n2);

int b[n2][3];

for (int i = 0; i < n2; i++) scanf("%d %d %d", &b[i][0], &b[i][1], &b[i][2]);

int c[n1\*n2][3], k = 0;

for (int i = 0; i < n1; i++) {

for (int j = 0; j < n2; j++) {

if (a[i][1] == b[j][0]) {

int row = a[i][0];

int col = b[j][1];

int val = a[i][2] \* b[j][2];

int found = 0;

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

if (c[x][0]==row && c[x][1]==col) {

c[x][2] += val;

found = 1;

break;

}

}

if (!found) {

c[k][0] = row;

c[k][1] = col;

c[k][2] = val;

k++;

}

}

}

}

printf("Resultant matrix triplet:\n");

for (int i = 0; i < k; i++) printf("%d %d %d\n", c[i][0], c[i][1], c[i][2]);

return 0;

}

**Question 7:**

#include <stdio.h>

int main() {

int n;

printf("Enter number of elements: ");

scanf("%d", &n);

int arr[n];

printf("Enter elements:\n");

for (int i = 0; i < n; i++) scanf("%d", &arr[i]);

int count = 0;

for (int i = 0; i < n - 1; i++) {

for (int j = i + 1; j < n; j++) {

if (arr[i] > arr[j]) count++;

}

}

printf("Number of inversions: %d\n", count);

return 0;

}

**Question 8:**

#include <stdio.h>

int main() {

int n;

printf("Enter number of elements: ");

scanf("%d", &n);

int arr[n];

printf("Enter elements:\n");

for (int i = 0; i < n; i++) scanf("%d", &arr[i]);

int count = 0;

for (int i = 0; i < n; i++) {

int unique = 1;

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

if (arr[i] == arr[j]) {

unique = 0;

break;

}

}

if (unique) count++;

}

printf("Total distinct elements: %d\n", count);

return 0;

}