

## Chương 1

//Bai 1

```
#include <iostream>
```

```
using namespace std;
```

// Cau a

```
int a (int n){  
    if (n==1)  
        return n;  
    return n+ a(n-1);  
}
```

// Cau b

```
int b(int n){  
    if (n==1)  
        return n;  
    return n*n+ b(n-1);  
}
```

//Cau c

```
int c(int n){  
    if (n==1)
```

```
        return 1;
        return n*c(n-1);
    }
```

```
int sum(int n){
    if (n==1) return 1;
    return c(n)+ sum (n-1);
}
```

//Cau d

```
long long d(int s, int e) {
    if (s > e) return 1;
    return s * d(s + 1, e);
}

long long sum2(int n) {
    if (n == 1) return 2;
    return d(n, 2*n) + sum2(n - 1);
}
```

```
int main (){
    int n; cin >> n;
    //cau a
```

```

    int m= a(n);
    cout << m << endl;

    //cau b
    int l= b(n);
    cout << l << endl;

    //cau c
    int q= sum(n);
    cout << q << endl;

    //cau d
    int p= sum2 (n);
    cout << p << endl;

    return 0;
}

```

//Bai 2

```

#include <bits/stdc++.h>
using namespace std;

```

//cau a

```

int a(int n){
    if (n==1 || n==2)
        return 1;
    else

```

```
        return a(n-1)+(n-1)*a(n-2);  
    }
```

```
//cau b
```

```
int b(int n) {  
    if (n == 1 || n == 2) {  
        return 1;  
    }  
    int c = 1; //a(n-1)  
    int d = 1; //a(n-2)  
    int sum = 0;  
    for (int i = 3; i <= n; ++i) {  
        sum = c + (i - 1) * d;  
        d = c;  
        c = sum;  
    }  
    return sum;  
}
```

```
int main() {  
    //cau a  
    cout << a(7) << endl;
```

```

    int n; cin >> n;
    //cau b
    cout << a(n) << endl;
    //cau c
    cout << b(n);
    return 0;
}

//Bai 3
#include <iostream>
using namespace std;

//tinh cac gia tri trong tam giac
int pascal(int k, int n) {
    if (n == 0 || n == k)
        return 1;
    else
        return pascal(k - 1, n - 1) + pascal(k - 1, n);
}

//in cac khoang trang
void inspace(int m) {
    if (m == 0)

```

```
return;
```

```
cout << " ";
```

```
inspace(m - 1);
```

```
}
```

```
//in cac so tren hang
```

```
void inso(int k, int n) {
```

```
    if (n > k)
```

```
        return;
```

```
    cout << pascal(k, n) << " ";
```

```
    inso(k, n + 1);
```

```
}
```

```
//in ra tam giac
```

```
void intg(int k, int h) {
```

```
    if (k == h)
```

```
        return;
```

```
    //in khoang trang
```

```
inspace(h - k - 1);
```

```
//in cac so tren hang
```

```
inso(k, 0);
```

```
cout << endl;
```

```
// in hang tiep theo
```

```
intg(k + 1, h);
```

```
}
```

```
int main() {
```

```
    //k hang, n cot, chieu cao h
```

```
    int h;
```

```
    cout << "Nhap chieu cao cua tam giac Pascal: ";
```

```
    cin >> h;
```

```
    intg(0, h);
```

```
    return 0;
```

```
}
```

```
//Bai 4
```

```
#include <bits/stdc++.h>
```

```
using namespace std;
```

```
//Cau a
```

```
float F(float n){
```

```
    if (n==1.0 || n==2.0)
```

```
        return 1.0;
```

```
        return F(n-2)+ F(n-1);
```

```
}
```

```
float S(int n) {
```

```
    if (n == 1)
```

```
        return 1.0 / (1.0 + F(1));
```

```
        return n / (1.0 + F(n)) + S(n-1);
```

```
}
```

```
//Cau b
```

```
float f(float n) {
```

```
    float fi=1.0;
```

```
    float se=1.0;
```

```
    float to;
```

```
    if (n==1 || n==2)
```



```
    return 1;
    for (int i=3; i<=n; i++){
        to= fi+se;
        fi=se;
        se=to;
    }
    return to;
}
```

```
float s(float n){
    float total= 0.0;
    for (int i=0; i<= n; i++){
        total += i / (1.0 + f(i));
    }
    return total;
}
```

```
int main(){
    float n; cin >> n;
    cout << S(n);
    cout << "\n";
    cout << s(n);
}
```

```
        return 0;
    }
```

//Bai 5

```
#include <bits/stdc++.h>
```

```
using namespace std;
```

```
int x(int n){
    if (n==1) // dieu kien dung cua ham de quy
        return 1;
    if (n==2) // dieu kien dung
        return 2;
    return n*(x(n-1)+(x(n-1))/(n-1)); // cong thuc de quy
}
```

```
int main(){
    int n; cin >> n;
    cout << x(n);
    return 0;
}
```

//Bai 6

```
#include<iostream>
```

```
using namespace std;
```

```
int x(int n, int i= 0, int total= 0){
```

```
    if(n == 1 || n == 0) // dieu kien dung cua ham de quy
```

```
        return 1;
```

```
    else{
```

```
        if (i== n){ // dieu kien dung cua chuong trinh tinh tong
```

```
            return total;
```

```
        }
```

```
        total += (n - i) * x(i); //tinh theo cong thuc de quy
```

```
        return x (n, i+1, total); //tang i tinh gia tri
```

```
    }
```

```
    return 0; //khong thoa dieu kien
```

```
}
```

```
int main(){
```

```
    int n;
```

```
    cout << "x" << 7 << " = " << x(7) << endl;
```

```
    cout << "n= ";
```

```
    cin >> n;
```

```
    cout << "x" << n << " = " << x(n) << endl;
```

```
}
```

```
//Bai 7
```

```
#include <bits/stdc++.h>
```

```
using namespace std;
```

```
void nhap (int a[], int n){
```

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

```
        cin >> a[i];
```

```
    }
```

```
}
```

```
//Cau a
```

```
int total (int a[], int n){
```

```
    if (n== 0)
```

```
        return a[0];
```

```
    return a[n]+ total(a, n-1);
```

```
}
```

```
//Cau b
```

```
int daundmax (int a[], int n){
```

```
    if (n==1)
```

```
        return a[0];
```

```
    if (a[n-1]> daundmax (a, n-1))
```

```
    return a[n-1];  
    return daundmax (a, n-1);  
}
```

//Cau c

```
int ktnt (int n, int dau, int cuoi){  
    if (n<= 1) return false;  
    if (cuoi< dau)  
        return 1;  
    if (n%dau==0)  
        return 0;  
    return ktnt (n, dau+1, cuoi);  
}  
  
int sont (int n){  
    return ktnt (n, 2, sqrt(n));  
}
```

```
int count(int a[], int n, int i){  
    if (i==n)  
        return 0;  
    return sont(a[i]) + count(a, n, i+ 1);  
}
```

```

int main(){
    int n; cin >> n;
    int a[n];
    cout << "Nhap mang \n";
    nhap (a, n);
    //Cau a
    cout << "Cau a\n";
    cout << "Tong cua mang la "<< total (a, n) << endl;
    //Cau b
    cout << "Cau b\n";
    cout << "Gia tri lon nhat mang la " << daundmax(a, n) << endl;
    //Cau c
    cout << "Cau c\n";
    cout << "So luong so nguyen to la "<< count (a, n, 0);
    return 0;
}

//Bai 8
#include <iostream>
using namespace std;

//tinh cac gia tri trong tam giac

```

```
int pascal(int k, int n) {  
    if (n == 0 || n == k)  
        return 1;  
    else  
        return pascal(k - 1, n - 1) + pascal(k - 1, n);  
}
```

//in cac khoang trang

```
void inspace(int m) {  
    if (m == 0)  
        return;  
  
    cout << " ";  
    inspace(m - 1);  
}
```

//in cac so tren hang

```
void inso(int k, int n) {  
    if (n > k)  
        return;  
  
    cout << pascal(k, n) << " ";
```

```
    inso(k, n + 1);  
}
```

```
//in ra tam giac
```

```
void intg(int k, int h) {  
    if (k == h)  
        return;
```

```
    //in khoang trang  
    inspace(h - k - 1);
```

```
    //in cac so tren hang  
    inso(k, 0);  
    cout << endl;
```

```
    // in hang tiep theo  
    intg(k + 1, h);  
}
```

```
int main() {  
    //k hang, n cot, chieu cao h
```



```
int h;

cout << "Nhap chieu cao cua tam giac Pascal: ";

cin >> h;

intg(0, h);

return 0;
}
```

## Chương 4

//Bai 1

```
#include <bits/stdc++.h>
```

```
using namespace std;
```

//nhap mang so nguyen

```
void enter (int a[], int n){
    for (int i=0; i<n; i++){
        cin >> a[i];
    }
}
```

//ham xuat mang

```
void print (int a[], int n){
```

```
    for (int i=0; i<n; i++){  
        cout << a[i] << " ";  
    }  
    cout << endl;  
}
```

//Kiem tra so nguyen to

```
bool isprimes (int n){  
    if (n< 2)  
        return false;  
    for (int i=2; i< n; i++){  
        if (n%i==0)  
            return false;  
    }  
    return true;  
}
```

//dem so nguyen to

```
int countprimes (int a[], int n){  
    int cnt=0;  
    for (int i=0; i< n; i++){  
        if (isprimes(a[i])){  
            cnt++;  
        }  
    }  
    return cnt;  
}
```

```
        }  
    }  
    return cnt;  
}
```

// doi cho phan tu

```
void swap (int &a, int &b){  
    int temp= a;  
    a=b;  
    b=temp;  
}
```

//ham sap xep

```
void sort(int arr[], int n)  
{  
    int i, j;  
    bool swapped;  
    for (i = 0; i < n - 1; i++) {  
        swapped = false;  
        for (j = 0; j < n - i - 1; j++) {  
            if (arr[j] > arr[j + 1]) {  
                swap(arr[j], arr[j + 1]);  
            }  
        }  
        if (!swapped) break;  
    }  
}
```

```

        swapped = true;
    }
}
if (swapped == false)
    break;
}
}

```

```

int main(){
    freopen("D:\\C++\\Chapter-4-exercise programing
techniques\\NUM.INP", "r", stdin);

    freopen("D:\\C++\\Chapter-4-exercise programing
techniques\\NUM.OUT", "w", stdout);

    int n;

    cin >> n;

    int a[n];

    enter(a, n);

    cout << countprimes(a, n)<< endl;


    sort(a, n);

    print(a, n);


    return 0;
}

```

```
}
```

```
//Bai 2
```

```
#include <bits/stdc++.h>
```

```
using namespace std;
```

```
int a[100],kq[100], n, kt, m;
```

```
#define Sn for(int i=0; i< n; i++)
```

```
//nhap mang so nguyen
```

```
void enter (){
```

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

```
        cin >> a[i];
```

```
    }
```

```
}
```

```
//ham xuat mang
```

```
void print (){
```

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

```
        cout << a[i] << " ";
```

```
    }
```

```
    cout << endl;
```

```
}
```

```
//cau a) gia tri lon nhat
```

```
int findmax (){
```

```
    int max= 0;
```

```
    Sn{
```

```
        if (max < a[i]){
```

```
            max= a[i];
```

```
        }
```

```
    }
```

```
    return max;
```

```
}
```

```
//cau b)
```

```
//gia tri lon nhat giua 2 so
```

```
int max(int a, int b) {
```

```
    return (a > b) ? a : b;
```

```
}
```

```
//do dai cua chuoi con tang dan dai nhat
```

```
int daycon() {
```

```
    int dainhat = 0; // do dai day con tang dai nhat
```

```

int dodaichuoicon = 0; //do dai day con tang hien tai
Sn {
    if (a[i] <= a[i+ 1]) {
        dodaichuoicon++; // tang chieu dai
    } else if (dodaichuoicon > dainhat){ //cap nhat do dai dai nhat
        dainhat= dodaichuoicon;
        dodaichuoicon = 1; //khi khong thoa a[i] <= a[i+ 1]
    }
}
return dainhat;
}

//cau c
//dem so cap x y co tong bang m
void demtongbangm() {
    int count = 0;
    bool apped[1000][1000] = {false}; // danh dau da xuat hien cap (x, y)

    for (int i = 0; i < n; i++) {
        for (int j = i + 1; j < n; j++) {
            if (a[i] + a[j] == m || a[j] + a[i] == m) {
                if (!apped[a[i]][a[j]] && !apped[a[j]][a[i]]) {

```

```

        count++;
        apped[a[i]][a[j]] = true;
        apped[a[j]][a[i]] = true;
    }
}
}
}

```

```

    cout << count;
}

```

//cau d

//sap xep

```

void sort (){
    int i, j;
    bool swapped;
    for (i=0; i<n-1; i++){
        swapped= false;
        for (j=0; j< n-i-1; j++){
            if (a[j] > a[j+1])
                swap (a[j], a[j+1]);
            swapped= true;
        }
    }
}

```



```

        }
        if (swapped == false){
            break;
        }
    }
}
}

```

```

int main(){
    freopen("D:\\C++\\Chapter-4-exercise programing
    techniques\\NUM.INP", "r", stdin);
    freopen("D:\\C++\\Chapter-4-exercise programing
    techniques\\NUM.OUT", "w", stdout);
    cin >> n;
    enter ();
    //Cau a
    cout << findmax() << endl;
    //Cau b
    cout << daycon() << endl;
    //Cau c
    cin >> m;
    demtongbangm ();
}

```

```
    //Cau d
    sort();
    cout << endl << a[n/2];
    return 0;
}
```

```
//Bai 3
#include <bits/stdc++.h>
using namespace std;

int a[100][100], b[100], c[100], m, n, k;
```

```
//Nhap mang
void nhap(){
    for(int i=0; i<m; i++){
        for (int j=0; j< n; j++){
            cin >> a[i][j];
        }
    }
}
```

```
//xuat mang
```

```
void xuat(){
    for(int i=0; i<m; i++){
        for (int j=0; j< n; j++){
            cout << a[i][j] << " ";
        }
        cout << endl;
    }
}
```

//cau a

//kiem tra so nguyen to

```
bool isprimes (int n){
    if (n< 2){
        return false;
    }
    for (int i=2; i< n; i++){
        if (n%i==0)
            return false;
    }
    return true;
}
```

//dem so nguyen to

```
int demprimes (){  
    int count= 0;  
    for (int i= 0; i< m; i++){  
        for (int j= 0; j< n; j++){  
            if (isprimes(a[i][j])){  
                count++;  
            }  
        }  
    }  
    return count;  
}
```

//cau b

//tong cac phan tu cua dong

```
void tongdong() {  
    for (int i = 0; i < m; i++) {  
        int sum = 0; // Reset sum for each row  
        for (int j = 0; j < n; j++) {  
            sum += a[i][j];  
        }  
        b[i] = sum; // Store the sum for each row in array b  
    }  
}
```

```
}  
}
```

```
void maxdong () {  
    int max= b[0];  
    for (int i=0; i< m; i++){  
        if (b[i]> max){  
            max= b[i];  
        }  
    }  
    cout << max << endl;  
}
```

//cau c

//tinh tong cot

```
void tongcot() {  
    for (int i = 0; i < n; i++) {  
        int sumcot = 0;  
        for (int j = 0; j < m; j++) {  
            sumcot += a[j][i];  
        }  
    }
```

```

        c[i] = sumcot;
    }
}

```

```

//min cot

```

```

void mincot () {
    int min= c[0];
    for (int i=0; i< n; i++){
        if (c[i]< min){
            min= c[i];
        }
    }
    cout << min << endl;
}

```

```

int main(){
    freopen("D:\\C++\\Chapter-4-exercise programing
techniques\\exer-3-4\\table.inp", "r", stdin);

    freopen("D:\\C++\\Chapter-4-exercise programing
techniques\\exer-3-4\\table.out", "w", stdout);

    cin >> m >> n;

    nhap ();

    //cau a

```

```
int cnt= demprimes ();  
cout << cnt << endl;  
  
//cau b  
tongdong();  
maxdong();  
  
//cau c  
tongcot();  
mincot();  
  
return 0;  
}
```

```
//Bai 4  
  
#include <bits/stdc++.h>  
using namespace std;  
  
int a[100][100], b[100], m, n;  
  
//Nhap mang  
void nhap(){  
    for(int i=0; i<m; i++){
```

```

        for (int j=0; j< n; j++){
            cin >> a[i][j];
        }
    }
}

```

//xuat mang

```

void xuat(){
    for(int i=0; i<m; i++){
        for (int j=0; j< n; j++){
            cout << a[i][j] << " ";
        }
        cout << endl;
    }
}

```

//cau a

//tim phan tu lon nhat

```

int findmax () {
    int max= INT_MIN;
    int count= 0;
    for (int i=0; i< m; i++){

```



```

        int j;
        for (j=0; j< n; j++){
            if (max<= a[i][j])
                max= a[i][j];
        }
    }
    return max;
}

```

//dem so luong phan tu bang max

```

int dem(){
    int max= findmax();
    int count= 0;
    for(int i=0; i< m; i++){
        for (int j=0; j< n; j++){
            if (a[i][j]== max){
                count++;
            }
        }
    }

    return count; // coi phan tu dau tien tim duoc bang max chinh la
max-> khong dem

```

```
}
```

```
//cau b
```

```
//tinh tong cot
```

```
void tongcot() {
```

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

```
        int sumcot = 0;
```

```
        for (int j = 0; j < m; j++) {
```

```
            sumcot += a[j][i];
```

```
        }
```

```
        cout << sumcot << " ";
```

```
    }
```

```
    cout << endl;
```

```
}
```

```
//cau c
```

```
//kiem tra so nguyen to
```

```
bool isprimes (int n){
```

```
    if (n < 2)
```

```
        return false;
```

```
    for (int i=2; i< sqrt(n); i++){
```

```
        if (n%i==0)
```

```

        return false;
    }
    return true;
}

void timmax (){
    int sum;
    for (int i=0; i< m; i++){
        sum= 0; // khoi tao gia tri va tra tong ve 0 khi tinh tong hinh
        //vuong tiep theo
        for (int j=0; j< n; j++){
            if (isprimes(a[i][j])&& isprimes(a[i][j+1])&&
            isprimes(a[i+1][j+1])&& isprimes(a[i+1][j])){ // neu phan tu cua hinh
            //vuong la so nguyen to
                sum= a[i][j]+a[i][j+1]+a[i+1][j]+a[i+1][j+1]; //
                //tong cac phan tu cua hinh vuong
                b[i]= sum; // day tong vao chuoi de so sanh
            }
        }
    }
    //tim tong lon nhat
    int max= b[0];

```

```

        for (int i=1; i< m; i++){
            if (max< b[i]){
                max= b[i];
            }
        }
        cout << max;
    }

```

```

int main(){
    freopen("D:\\C++\\Chapter-4-exercise programing
techniques\\exer-3-4\\table.inp", "r", stdin);

    freopen("D:\\C++\\Chapter-4-exercise programing
techniques\\exer-3-4\\table.out", "w", stdout);

    cin >> m >> n;

    nhap ();

    //cau a
    cout << findmax() << " " << dem() << endl;

    //cau b
    tongcot();

    //cau c
    timmax();

    return 0;
}

```

```
//Bai 5
```

```
#include <bits/stdc++.h>
```

```
using namespace std;
```

```
int a[100][100], b[100], m, n;
```

```
//Nhap mang
```

```
void nhap(){
```

```
    for(int i=0; i<m; i++){
```

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

```
            cin >> a[i][j];
```

```
        }
```

```
    }
```

```
}
```

```
//xuat mang
```

```
void xuat(){
```

```
    for(int i=0; i<m; i++){
```

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

```
            cout << a[i][j] << " ";
```

```
        }
```

```

        cout << endl;
    }
}

//cau a
void timmin (){
    //tim phan tu nho nhat
    for (int i=0; i< m; i++){
        int min= INT_MAX; // gan min= gia tri lon nhat
        for (int j=0; j< n; j++){
            if (min> a[i][j]){
                min= a[i][j];
            }
        }
        b[i]= min; // dua min vao b[i]
    }
}

```

```

//tim phan tu lon nhat trong cac phan tu nho nhat
int max= INT_MIN; //gan max= gia tri nho nhat
for (int i= 0; i< m; i++){
    if (max< b[i]){
        max= b[i];
    }
}

```

```

        }
    }
    cout << max << endl;
}

```

//cau b

```

void timvitrinhonhat() {
    int khoangcachnhonhat = INT_MAX; //khoang cach nho nhat
    int i1, j1, i2, j2; //vi tri 2 diem co khaong cach nho nhat
    for(int i = 0; i < m; i++) {
        for(int j = 0; j < n; j++) {
            //so sanh voi cac phan tu con lai trong cung hang
            for(int l = j + 1; l < n; l++) {
                int khoang_cach = abs(a[i][j] - a[i][l]);
                if(khoangcachnhonhat > khoang_cach) {
                    khoangcachnhonhat = khoang_cach;
                    i1 = i; j1 = j; i2 = i; j2 = l;
                }
            }
        }
        //so sanh voi cac han ben duoi
        for(int k = i + 1; k < m; k++) {
            for(int l = 0; l < n; l++) {

```

```

        int khoang_cach = abs(a[i][j] - a[k][l]);
        if(khoangcachnhonhat > khoang_cach) {
            khoangcachnhonhat = khoang_cach;
            i1 = i; j1 = j; i2 = k; j2 = l;
        }
    }
}
}
}

cout << khoangcachnhonhat << " " << i1 + 1 << " " << j1 + 1 << " " <<
i2 + 1 << " " << j2 + 1 << endl;
}

```

```

int main(){

    freopen("D:\\C++\\Chapter-4-exercise programing
    techniques\\exer-5-6\\TABLE.INP", "r", stdin);

    freopen("D:\\C++\\Chapter-4-exercise programing
    techniques\\exer-5-6\\TABLE.OUT", "w", stdout);

    cin >> m >> n;

    nhap ();

    cout << "CAU a: ";

    timmin();

    cout << "CAU b: ";
}

```



```
    timvitrinhonhat();  
    return 0;  
}
```

//Bai 6

```
#include <bits/stdc++.h>
```

```
using namespace std;
```

```
int a[100][100], k[100], b[100][100], c[100][100], d[100], e[100], m, n;
```

```
void nhap (){
```

```
    for (int i=0; i< m; i++){
```

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

```
            cin >> a[i][j];
```

```
        }
```

```
    }
```

```
}
```

//cau a

```
void findsum () {
```

```
    for (int i=0; i< m; i++){
```

```
        int min= a[0][0];
```

```

        for (int j=1; j< n; j++){
            if (a[i][j]< min){
                min= a[i][j];
            }
        }
        k[i]= min;
    }
    int sum= 0;
    for (int i=0; i< m; i++){
        for (int j= 0; j< n; j++){
            b[i][j]= a[i][j]* k[i];
            sum+= b[i][j];
        }
    }
    cout << sum << endl;
}

```

//cau b

//kiem tra so nguyen toii

```

bool snt (int n){
    if (n< 2)
        return false;

```

```
    for (int i=2; i<= sqrt(n); i++){
        if (n%i== 0)
            return false;
    }
    return true;
}
```

//chuyen ve so nguyen to truoc num

```
int truoc (int num){
    if (num< 2){
        return 2;
    }
}
```

```
for (int i = num - 1; i > 1; i--) {
    bool isprime = true;
    for (int j = 2; j <= sqrt(i); j++) {
        if (i % j == 0) {
            isprime = false;
            break;
        }
    }
}

if (isprime) {
```

```
        return i;
    }
}
return 1; // Neu khong tim thay so nguyen nho hon
}
```

//chuyen ve so nguyen to sau num

```
int sau (int num){
    for (int i = num + 1; ; i++) {
        bool isprime = true;
        for (int j = 2; j <= sqrt(i); j++) {
            if (i % j == 0) {
                isprime = false;
                break;
            }
        }
        if (isprime) {
            return i;
        }
    }
}
```

//kiem tra khoang cach tu num toi so truoc va so sau coi so nao lon hon  
va tra ve theo dieu kien

```
int check (int num){  
    int be = truoc(num);  
    int af = sau(num);  
    if (num - be <= af - num) {  
        return be;  
    } else {  
        return af;  
    }  
}
```

//chuyen doi va in ra mang

```
void chuyen (){  
    int sum= 0;  
    for (int i=0; i< m; i++){  
        for (int j=0; j< n; j++){  
            c[i][j]= check(a[i][j]);  
            sum+= c[i][j];  
        }  
    }  
    cout<< sum << endl;
```

```
}
```

```
//cau c
```

```
// max dong, min cot
```

```
void cauc() {
```

```
    int x, y; // luu toa do phan tu yen ngua
```

```
    int maxdong;
```

```
    for (int i=0; i< m; i++){ // tim max dong
```

```
        maxdong= a[i][0];
```

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

```
            if (a[i][j]> maxdong){
```

```
                maxdong= a[i][j];
```

```
            }
```

```
        }
```

```
        d[i]= maxdong; // day maxdong vao d
```

```
    }
```

```
    for (int i=0; i< n; i++){ // tim min cot
```

```
        int mincot= a[0][i];
```

```
        for (int j= 1; j< m; j++){
```

```
            if (mincot> a[j][i]){
```

```
                mincot= a[j][i];
```



```
    cin >> m >> n;
    nhap();
    //cau a
    cout << "CAU a: ";
    findsum();
    //cau b
    cout << "CAU b: ";
    chuyen ();
    //cau c
    cout << "CAU c: ";
    cauc();
    return 0;
}
```

```
//Bai 7
```

```
#include <iostream>
using namespace std;
```

```
string s;
```

```
void demkitu () {
```

```
    int dem[256]= {0}; //luu so lan xuat hien cua phan tu
```



```

for (int i= 0; i< s.length(); i++){
    if (s[i]== ' '){
        continue; //neu la ki tu trong thi chuyen sang lan lap
        tiep theo
    }
    dem[s[i]]++; // tang so lan xuat hien cua ki tu s[i]
}

//in ra ki tu thu i va so lan xuat hien cua no
for (int i= 0; i< 256; i++){
    if (dem[i]!= 0){
        cout << char(i) << " " << dem[i] << " ";
    }
}
}

```

```

int main(){
    freopen("D:\\C++\\Chapter-4-exercise programing
    techniques\\exer-7\\input.txt", "r", stdin);

    freopen("D:\\C++\\Chapter-4-exercise programing
    techniques\\exer-7\\output.txt", "w", stdout);
}

```

```
        getline (cin, s);
    demkitu();
    return 0;
}
```

//Bai 8

```
#include <bits/stdc++.h>
using namespace std;
```

```
struct Ps {
    int tu;
    int mau;
};
```

```
void nhap (Ps* ps, int n) {
    for (int i=0; i< n; i++){
        cin >> ps[i].tu;
        cin >> ps[i].mau;
    }
}
```

//cau a

//dem phan so nho hon 1

```
void caua (Ps* ps, int n){  
    int count= 0;  
    for (int i= 0; i< n; i++){  
        if (ps[i].tu/ps[i].mau< 1){  
            count++;  
        }  
    }  
    cout << count << endl;  
}
```

//cau b

//dem so phan so tu chia het cho mau

```
void caub (Ps* ps, int n){  
    int count= 0;  
    for (int i=0; i< n; i++){  
        if (ps[i].tu%ps[i].mau== 0){  
            count++;  
        }  
    }  
    cout << count << endl;  
}
```

```
//cau c
```

```
//kiem tra so nguyen to
```

```
bool isprime(int n){  
    if (n< 2){  
        return false;  
    }  
    for (int i=2; i<= sqrt(n); i++){  
        if (n%i==0)  
            return false;  
    }  
    return true;  
}
```

```
//dem so phan so tu va mau so deu la so nguyen to
```

```
int cauc (Ps* ps, int n){  
    int count= 0;  
    bool found;  
    for (int i=0; i< n; i++){  
        if (isprime (ps[i].tu)){  
            found= true;  
            if (!isprime(ps[i].mau)){
```

```

        found= false;
    }
    if (found== true){
        count++;
    }
}
}
return count;
}

```

//cau d

//phan so co gia tri lon nhat

```

void phansomax (Ps* ps, int n){
    float maxps= 0.0; // gia tri lon nhat
    int x; // luu toa do phan so
    for (int i=0; i< n; i++){
        float thuong= float (ps[i].tu)/ ps[i].mau;
        if (maxps < thuong){
            maxps= thuong;
            x= i;
        }
    }
}

```

```

        cout << ps[x].tu << "/" << ps[x].mau << endl;
    }

//cau e
//phan so nho hon 1 lon nhat
void phanson1max (Ps* ps, int n){
    float max= 0.0; // gia tri lon nhat
    int x= 0; //toa do phan so lon nhat
    for (int i= 0; i< n; i++){
        if (ps[i].tu/ ps[i].mau< 1&& max < float (ps[i].tu)/ ps[i].mau){
            max= float (ps[i].tu)/ ps[i].mau; //cap nhat gia tri
            //cua max
            x= i; //cap nhat toa do phan so lon nhat
        }
    }
    cout << ps[x].tu << "/" << ps[x].mau << " ";
}

```

```

//phan so lon hon 1 nho nhat
void phansol1min (Ps* ps, int n){
    float min= INT_MAX; //gia tri nho nhat
    int y= 0; //toa do phan tu gia tri nho nhat

```

```

    for (int i= 0;i< n; i++){
        if (ps[i].tu/ps[i].mau >= 1 && float (ps[i].tu)/ps[i].mau< min){
            min= float (ps[i].tu)/ ps[i].mau; //cap nhat gia tri
nho nhat
            y= i; // cap nhat toa do gia tri nho nhat
        }
    }
    cout << ps[y].tu << "/" << ps[y].mau << endl;
}

```

//cau f

// tìm uoc chung lon nhat

```

int ucln (int &a, int &b){
    if (a== 0 || b== 0){
        return a+b;
    }
    while (a != b){
        if (a> b){
            a= a-b;
        } else {
            b= b-a;
        }
    }
}

```

```

    }
    return a;
}

```

//demphan so toi gian

```

void demphansotoigian (Ps* ps, int n){
    int count= 0;
    for (int i= 0; i< n; i++){
        //ucln la 1 tuc la hai phan so da toi gian
        if (ucln (ps[i].tu, ps[i].mau) == 1 || ucln (ps[i].tu, ps[i].mau)==
1){
            count++;
        }
    }
    cout << count << endl;
}

```

//cau g

//tinh trung binh cong

```

float trbcong(Ps ps[],int n){
    float tong=0.0;

```



```

        for(int i=0 ;i< n;i++){
            tong+=(float)(ps[i].tu)/ps[i].mau;
        }
        return (float)tong/n;
    }
}

```

```

int main(){
    freopen("D:\\C++\\Chapter-4-exercise programing
    techniques\\exer-8\\fraction.txt", "r", stdin) ;

    freopen("D:\\C++\\Chapter-4-exercise programing
    techniques\\exer-8\\fraction.out", "w", stdout);

    int n; cin >> n;

    Ps* ps= new Ps[n];

    nhap (ps, n);
    caua(ps, n);
    caub (ps, n);
    cout << cauc (ps, n) << endl;
    cout << "cau d" << endl;
    phansomax (ps, n);
    phanson1max (ps, n);
    phansol1min (ps, n);
    float e= trbcong (ps, n);
}

```

```

        demphansotoigian (ps, n);
        cout << e;

        return 0;
    }

//Bai 9
#include <bits/stdc++.h>
using namespace std;

//tinh do dai cua chuoi
int strlen (char s[]){
    int i= 0;
    while (1){
        if (s[i]== '\0'){ //gap ki tu ket thuc chuoi
            return i;
        }
        i++;
    }
}

//tim tu ben phai

```

```

string findright(char s[]) {
    string kq = "";
    for (int i = strlen(s) - 1; i >= 0; i--) {
        if (s[i] != ' ') {
            kq = s[i] + kq; //gep s[i] cho kq va gan cho kq
        } else {
            break;
        }
    }
    return kq;
}

```

//dem do dai cua 1 cuoi

```

int count(char str[]) {
    if (strlen(str) == 0) {
        return 0;
    }
}

```

```

int cnt = 1;
for (int i = 0; i < strlen(str); i++) {
    if (str[i] == ' ') {
        cnt++;
    }
}

```

```

    }
}
return cnt;
}

```

```

int main() {
    freopen("D:\\C++\\Chapter-4-exercise programing techniques\\exer-
9\\str.inp", "r", stdin);

    freopen("D:\\C++\\Chapter-4-exercise programing techniques\\exer-
9\\str.out", "w", stdout);

    int n; cin >> n; cin.ignore();

    char s[256];

    int sum= 0;

    cout << "CAU a:" << endl;

    for (int i= 0; i< n; ++i){
        cin.getline (s, 256);

        //cau a

        cout << findright(s) << endl;

        sum+= count(s); // tong do cua tat ca cac chuoi
    }

    //cau b

    cout << "CAU b:" << endl;
}

```

```
        cout << sum;
    return 0;
}
```

```
//Bai 10
```

```
#include <iostream>
```

```
#include <string>
```

```
using namespace std;
```

```
//ki tu la chu cai
```

```
bool isalpha (char s){
```

```
    return (s >= 'a' && s <= 'z') || (s >= 'A' && s <= 'Z');
```

```
}
```

```
// Câu a
```

```
// tìm từ dài nhất
```

```
string tudainhat(string &str) {
```

```
    string tudainhat = "";
```

```
    string tudangxet = "";
```

```
    for (char ch : str) {
```

```

    if (isalpha(ch)) { //kiem tra ki tu do la chu cai khong
        tudangxet += ch; //ghep tudangxet voi ch
    } else {
        if (tudangxet.length() > tudainhat.length()) {
            tudainhat = tudangxet;
        }
        tudangxet = "";
    }
}

//so sanh do dai chuoai
if (tudangxet.length() > tudainhat.length()) {
    tudainhat = tudangxet;
}

return tudainhat;
}

```

// Câu b

//tim tu ben phai

```

string tubenphai(string s) {
    string kq = "";
    for (int i = s.length(); i >= 0; i--) {
        if (s[i] != ' ') {

```

```

        kq = s[i] + kq;
    } else { // sau khi gap ki tu khoang trang thi dung
        break;
    }
}
return kq;
}

```

//tim tu ben trai

```

string tubentrai(string s) {
    string kq = "";
    for (int i = 0; i < s.length(); i++) {
        if (s[i] != ' ' || i == s.length() - 1) {
            kq += s[i];
        } else { // sau khi gap ki tu khoang trang thi dung
            break;
        }
    }
    return kq;
}

```

// Câu c

```

// Chuoi dai nhat
void chuoidainhat(string s, string& dainhat) {
    if (s.length() > dainhat.length()) {
        dainhat = s;
    } else if (s.length() == dainhat.length()) { //chuoi bang chuoi dai nhat
        thi in ra luon chuoi do
        cout << dainhat << endl;
        cout << s << endl;
    }
}

```

```

// Câu d
// dem so luong phan tu cua moi chuoi
int demtu (string s) {
    int count = 1;
    for (int i = 0; i < s.length(); i++) {
        if (s[i] == ' ') {
            count++;
        }
    }
    return count;
}

```



// Câu e

// đếm số lượng từ your

```
int demtucandem(string s, string tucandem) {
```

```
    int count = 0;
```

```
    if (tucandem.length() == 0) { //nếu chuỗi rỗng
```

```
        return 0;
```

```
}
```

```
for (int i = 0; i < s.length(); i++) {
```

```
    if (s[i] == tucandem[0]) { //ki từ thứ i giống với từ "y"
```

```
        bool datimthay = true;
```

```
        for (int j = 0; j < tucandem.length(); j++) { //so sánh ki từ sau i với
```

your

```
            if (s[i + j] != tucandem[j]) {
```

```
                datimthay = false; // ki từ sau i khác your
```

```
                break;
```

```
            }
```

```
        }
```

```
        if (datimthay) { // từ giống từ your
```

```
            count++;
```

```
        }
```

```
    }  
}  
return count;  
}
```

```
int main() {  
    freopen("D:\\C++\\Chapter-4-exercise programing techniques\\exer-  
10\\STR.INP", "r", stdin);  
    freopen("D:\\C++\\Chapter-4-exercise programing techniques\\exer-  
10\\STR.OUT", "w", stdout);
```

```
    int n;  
    cin >> n;  
    cin.ignore();
```

```
    string s[1000];
```

```
    int size= 0; // kich thuoc cua chuoi
```

```
    //nhap chuoi va tang kich thuoc tung chuoi
```

```
    for (int i= 0; i< n && size < 1000; i++){  
        getline (cin, s[size++]);  
    }
```

```
//cau a. tu dai nhat
cout << "CAU a:" << endl;
for (int i = 0; i < size;i++){
    cout << tudainhat(s[i]) << endl;
}
```

```
//cau b. tu ben trai va tu ben phai
cout << "CAU b:" << endl;
for (int i= 0; i< size; i++){
    cout << tubentrai(s[i]) << " " << tubenphai(s[i]) << endl;
}
```

```
//cau c. chuoi dai nhat
cout << "CAU c" << endl;
string dainhat; // chuoi dai nhat
dainhat = "";
for (int i= 0; i< size; i++){
    chuoidainhat(s[i], dainhat);
}
cout << dainhat << endl;
```

```
//cau d. so luong tu trong n chuoi
cout << "CAU d:" << endl;
int soluongchu= 0;
int soluongtuyour= 0;
for (int i= 0; i< n; i++){
    soluongchu+= demtu(s[i]);
    soluongtuyour+= demtucandem(s[i], "your");
}
cout << soluongchu <<endl;
```

```
//cau e. so luong tu "your"
cout << "CAU e:" << endl;
cout << soluongtuyour<< endl;
return 0;
}
```