#include<iostream>

#include<math.h>

using namespace std;

class Vector3D{

double x;

double y;

double z;

public:

void setX(double Xvalue){x=Xvalue;}

double getX(){return x;}

void setY(double Yvalue){y=Yvalue;}

double getY(){return y;}

void setZ(double Zvalue){z=Zvalue;}

double getZ(){return z;}

double magnitude(Vector3D);

double dot(Vector3D,Vector3D);

void cross(Vector3D,Vector3D);

Vector3D(double xvalue,double yvalue,double zvalue)

{

x=xvalue;

y=yvalue;

z=zvalue;

}

Vector3D(){}

Vector3D operator+(Vector3D a){

Vector3D b;

b.x=x+a.x;

b.y=y+a.y;

b.z=z+a.z;

return b;

}

Vector3D operator-(Vector3D a){

Vector3D b;

b.x=x-a.x;

b.y=y-a.y;

b.z=z-a.z;

return b;

}

Vector3D operator\*(Vector3D a){

Vector3D b;

b.x=(y\*a.z)-(a.y\*z);

b.y=(z\*a.x)-(x\*a.z);

b.z=(x\*a.y)-(y\*a.x);

return b;

}

};

double Vector3D::magnitude(Vector3D a)

{

double m;

m=sqrt((a.x\*a.x)+(a.y\*a.y)+(a.z\*a.z));

return m;

}

double Vector3D::dot(Vector3D a,Vector3D b)

{

double d;

d=(a.x\*b.x)+(a.y\*b.y)+(a.z\*b.z);

return d;

}

void Vector3D::cross(Vector3D a,Vector3D b)

{

x=(a.y\*b.z)-(b.y\*a.z);

y=(a.z\*b.x)-(a.x\*b.z);

z=(a.x\*b.y)-(a.y\*b.x);

}

int main()

{

double x1,y1,z1,xvalue,yvalue,zvalue,m,d;

int n,i,j;

cout<<"Enter the number of vectors :"<<endl;

cin>>n;

Vector3D \*A,r,a;

A=(Vector3D \*)malloc(sizeof(Vector3D)\*n);

cout<<"Initialized to 0 :"<<endl;

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

{

A[i].setX(0);

A[i].setY(0);

A[i].setZ(0);

}

cout<<"Initiallizing array of vectors without constructor :"<<endl;

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

{

cout<<"Enter x y z components of vector :"<<i+1<<endl;

cin>>xvalue;

A[i].setX(xvalue);

cin>>yvalue;

A[i].setY(yvalue);

cin>>zvalue;

A[i].setZ(zvalue);

}

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

cout<<"Vector"<<i+1<<"is ("<<A[i].getX()<<"i) + ("<<A[i].getY()<<"j) + ("<<A[i].getZ()<<"k)"<<endl;}

cout<<"Enter the number of vector to find magnitude :"<<endl;

cin>>n;

m=A[0].magnitude(A[n-1]);

cout<<"The magnitude of vector is "<<m<<endl;

cout<<"Enter the number of vector to find dot product of :"<<endl;

cin>>n>>j;

d=A[0].dot(A[n-1],A[j-1]);

cout<<"The dot product of vector is"<<n<<" and vector"<<j<<" is "<<d<<endl;

cout<<"Enter the number of vector to find vector product of :"<<endl;

cin>>n>>j;

r=A[n-1]\*A[j-1];

//r.cross(A[n-1],A[j-1]);

cout<<"The vector product of vector is"<<n<<" and vector"<<j<<" is ("<<r.getX()<<"i) + ("<<r.getY()<<"j) + ("<<r.getZ()<<"k)"<<endl;

cout<<"Enter the number of vector to find addition :"<<endl;

cin>>n>>j;

a=A[n-1]+A[j-1];

cout<<"The addition of the vector is "<<n<<" and vector "<<j<<" is ("<<a.getX()<<"i) + ("<<a.getY()<<"j) + ("<<a.getZ()<<"k)"<<endl;

cout<<"Enter the number of vector to find subtraction :"<<endl;

cin>>n>>j;

a=A[n-1]-A[j-1];

cout<<"The subtraction of the vector is "<<n<<" and vector "<<j<<" is ("<<a.getX()<<"i) + ("<<a.getY()<<"j) + ("<<a.getZ()<<"k)"<<endl;

return 0;

}