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/*Implement C++ program to write a class template to represent a generic vector.
Include
following member functions:
a. To create the vector.
b. To modify the value of a given element
c. To multiply by a scalar value
d. To display the vector in the form (10,20,30,...)
*/

#include<iostream>                      //include header file
using namespace std;                    //define scope of program
template<class T>                       //template function
class vector
{
   private : T a,b,c;
             char veci,vecj,veck;
       public:
             vector()
              {
                a=0;
                b=0;
                c=0;
              }

                void accept()  //accepting vector equation
                {
                   cout<<"\nEnter the equation: ";
                   cin>>a>>veci>>b>>vecj>>c>>veck;
                   if(veci!='i'&&vecj!='j'&&veck!='k')
                    {
                        cout<<"\nEnter the equation in the form ai+bj+ck only !!";
                        cout<<"\nEnter again: ";
                        cin>>a>>veci>>b>>vecj>>c>>veck;
                    }
                }
              /*
             void accept()
              {
                 cout<<"\nEnter the coefficient of vector i:";
                 cin>>a;
                 cout<<"\nEnter the coefficient of vector j:";
                 cin>>b;
                 cout<<"\nEnter the coefficient of vector k:";
                 cin>>c;
              }*/
            void display()              //display equation
            {
                 cout<<"Your equation is  : "<<a<<"i+"<<b<<"j+"<<c<<"k"<<endl;

            }
            void mul(T x)               //multiplication by scalar
             {
                a=a*x;
                b=b*x;
                c=c*x;
             }
            void display1()             //display answer
              {
                cout<<"\nYour answer       : "<<a<<"i+"<<b<<"j+"<<c<<"k";
              }
            vector operator+(vector n)   //overloaded '+' operator for addition of
vectors
             {
                  vector temp;
                    temp.a=a+n.a;
                    temp.b=b+n.b;
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                  temp.c=c+n.c;
                 return temp;

            }
           vector operator*(vector s)   //overloaded '*' operator for
multiplication
                {
                        vector t;
                        t.a=((b*(s.c))-(c)*(s.b));
                        t.b=((c*(s.a))-(a)*(s.c));
                        t.c=((a*(s.b))-(b*(s.a)));
                        cout<<"\nV1 X V2 ="<<"("<<t.a<<")i+("<<t.b<<")j
+("<<t.c<<")k"<<endl;
                        return t;
                }
         void mul(vector v11,vector v12)        //multiplication of vector
             {

                   a=v11.a*(v12.a);
                   b=v11.b*(v12.b);
                   c=v11.c*(v12.c);
                cout<<"\nV1.V2 ="<<"("<<a<<")i+("<<b<<")j+("<<c<<")k"<<endl;

             }


};              //end of class
  int main()
  {
        vector<int>v1,v11,v12,v13;      //creating object of class of different
data types
        vector<float>v2,v21,v22;
        vector<double>v3,v31,v32;
       char op,c;
     int op1;
    do
    {    cout<<"\nEnter";
        cout<<"\na: vector addition ";
        cout<<"\nm: vector multiplication";
        cout<<"\ns: Multiplication by scalar value\n";
        cout<<"Enter your opinion\n";
        cin>>op;
           switch(op)
           {
               case 'a':        //addition of vectors
                  {   char opsel;
                      cout<<"\nIf coefficient of vector are ";
                      cout<<"\nIntegers Enter i";
                      cout<<"\nFloat Enter f";
                      cout<<"\nDouble Enter d";
                      cout<<"\n*********************************\n";
                      cout<<"NOTE: USE LOWERCASE LETTER ONLY\n";
                      cout<<"*********************************\n";
                      cout<<"Enter your opinion\n";
                      cin>>opsel;
                         switch(opsel)
                         {
                          case 'i':             //if coefficient of vectors are
integers
                           {

                              v11.accept();
                              v11.display();
                              v12.accept();
                              v12.display();
                              v13=v11+v12;
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                                v13.display1();
                              }break;
                             case 'f':             //if coefficient of vectors are
floats
                                {
                                   v2.accept();
                                   v2.display();
                                   v21.accept();
                                   v21.display();
                                   v22=v2+v21;
                                   v22.display1();
                                }break;
                             case 'd':             //for double
                                {
                                   v3.accept();
                                   v3.display();
                                   v31.accept();
                                   v31.display();
                                   v32=v3+v31;
                                   v32.display1();
                                }break;
                          }
                       }break;
                    case 'm':                      //multiplication of vecors
                    {    char op2;
                    int op3;
                             cout<<"\nEnter\n";
                            cout<<"\nd: Dot product of vectors\nc: Cross product of
vectors";
                             cout<<"Enter your opinion\n";
                            cin>>op2;
                               switch(op2)
                                 {
                                    case 'c':         //cross product of vectors
                                        {
                                              char opsel;
                                             cout<<"\nIf coefficient of vector are ";
                                             cout<<"\nIntegers Enter i";
                                             cout<<"\nFloat Enter f";
                                             cout<<"\nDouble Enter d";
                                              cout<<"\n*****************************
\n";
                                              cout<<"NOTE: USE LOWERCASE LETTER ONLY\n";
                                              cout<<"*****************************\n";
                                               cout<<"Enter your opinion\n";
                                             cin>>opsel;
                                               switch(opsel)
                                               {
                                                case 'i':             //if coefficient
of vectors are integers
                                                 {
                                                    v11.accept();
                                                    v11.display();
                                                    v12.accept();
                                                    v12.display();
                                                    v13=v11*v12;
                                                 }break;
                                                case 'f':             //if coefficient
of vectors are floats
                                                   {
                                                      v2.accept();
                                                       v2.display();
                                                       v21.accept();
                                                       v21.display();
                                                       v22=v2*v21;
                                                   }break;
```

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                                        case 'd':              //for double
                                            {
                                              v3.accept();
                                              v3.display();
                                              v31.accept();
                                              v31.display();
                                              v32=v3*v31;
                                            }break;
                                       }
                                  }break;
                             case 'd':          //dot product of vectors
                                   {
                                       char opsel;
                                      cout<<"\nIf coefficient of vector are ";
                                      cout<<"\nIntegers Enter i";
                                      cout<<"\nFloat Enter f";
                                      cout<<"\nDouble Enter d";
                           cout<<"\n*********************************\n";
                           cout<<"NOTE: USE LOWERCASE LETTER ONLY\n";
                           cout<<"*********************************\n";
                                       cout<<"Enter your opinion\n";
                                      cin>>opsel;
                                        switch(opsel)
                                        {
                                         case 'i':             //if coefficient
of vectors are integers
                                           {
                                              v11.accept();
                                              v11.display();
                                              v12.accept();
                                              v12.display();
                                              v13.mul(v11,v12);
                                           }break;
                                         case 'f':             //if coefficient
of vectors are float
                                              {
                                                 v2.accept();
                                                  v2.display();
                                                  v21.accept();
                                                  v21.display();
                                                   v22.mul(v2,v21);
                                              }break;
                                        case 'd':             //for double
                                            {
                                              v3.accept();
                                              v3.display();
                                              v31.accept();
                                              v31.display();
                                              v32.mul(v3,v31);
                                            }break;
                                        }
                                      }break;
                           }

                     }break;
                case 's':          //multiplication by scalar value
                {       cout<<"\nEnter\n";
                        cout<<"\ni: integer scalar value";
                        cout<<"\nd: double scalar value";
                        cout<<"\nf: float scalar value\n";
                         cout<<"Enter your opinion\n";
                        cin>>op;
               switch(op)
                  {
                    case 'i':      //if coefficient scalar multiple is integer
                      {    int x;
```

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                        v1.accept();
                        v1.display();
                        cout<<"\nEnter value of scalar multiple:";
                        cin>>x;
                        v1.mul(x);
                        v1.display1();
                    }break;
                case 'f':       //if coefficient scalar multiple is float
                    {   float x;
                        v2.accept();
                        v2.display();
                        cout<<"\nEnter value of scalar multiple:";
                        cin>>x;
                        v2.mul(x);
                        v2.display1();
                     }break;
                case 'd':       //for double
                    {   double x;
                        v3.accept();
                        v3.display();
                        cout<<"\nEnter value of scalar multiple:";
                        cin>>x;
                        v3.mul(x);
                        v3.display1();
                    }break;
                }

          }
         }
         cout<<"\nContinue(Y/N)";              //if user want to continue
         cin>>c;
        }while(c=='Y'||c=='y');

   return 0;
  }  //end of program


  /* OUTPUT
  dell@ghe1de-saurabh16-12-99:~/Desktop/oops_assignment$ g++ ass5oops.cpp
dell@ghe1de-saurabh16-12-99:~/Desktop/oops_assignment$ ./a.out
_
Enter
a: vector addition
m: vector multiplication
s: Multiplication by scalar value
Enter your opinion
a

If coefficient of vector are
Integers Enter i
Float Enter f
Double Enter d
*********************************
NOTE: USE LOWERCASE LETTER ONLY
*********************************
Enter your opinion
i

Enter the equation: 5i+6j+3k
Your equation is  : 5i+6j+3k

Enter the equation: 6i+9k+2k
Your equation is  : 6i+9j+2k

Your answer       : 11i+15j+5k
Continue(Y/N)y
```

```
Enter
a: vector addition
m: vector multiplication
s: Multiplication by scalar value
Enter your opinion
m

Enter

d: Dot product of vectors
c: Cross product of vectorsEnter your opinion
d

If coefficient of vector are
Integers Enter i
Float Enter f
Double Enter d
*********************************
NOTE: USE LOWERCASE LETTER ONLY
*********************************
Enter your opinion
i

Enter the equation: 5i+6j+3k
Your equation is  : 5i+6j+3k

Enter the equation: 9i+5j+6k
Your equation is  : 9i+5j+6k

V1.V2 =(45)i+(30)j+(18)k

Continue(Y/N)y

Enter
a: vector addition
m: vector multiplication
s: Multiplication by scalar value
Enter your opinion
s

Enter

i: integer scalar value
d: double scalar value
f: float scalar value
Enter your opinion
i

Enter the equation: 5i+6j+3k
Your equation is  : 5i+6j+3k

Enter value of scalar multiple:2

Your answer       : 10i+12j+6k
Continue(Y/N)y

Enter
a: vector addition
m: vector multiplication
s: Multiplication by scalar value
Enter your opinion
a

If coefficient of vector are
Integers Enter i
```

```
Float Enter f
Double Enter d
*******************************
NOTE: USE LOWERCASE LETTER ONLY
*******************************
Enter your opinion
f

Enter the equation: 5.3i+6.4j+9.8k
Your equation is  : 5.3i+6.4j+9.8k

Enter the equation: 6.2i+9.3j+6.3k
Your equation is  : 6.2i+9.3j+6.3k

Your answer       : 11.5i+15.7j+16.1k
Continue(Y/N)y

Enter
a: vector addition
m: vector multiplication
s: Multiplication by scalar value
Enter your opinion
m

Enter

d: Dot product of vectors
c: Cross product of vectorsEnter your opinion
c

If coefficient of vector are
Integers Enter i
Float Enter f
Double Enter d
*******************************
NOTE: USE LOWERCASE LETTER ONLY
*******************************
Enter your opinion
f

Enter the equation: 5.6i+8j+9.8k
Your equation is  : 5.6i+8j+9.8k

Enter the equation: 9.3i+6j+9k
Your equation is  : 9.3i+6j+9k

V1 X V2 =(13.2)i+(40.74)j+(-40.8)k

Continue(Y/N)y

Enter
a: vector addition
m: vector multiplication
s: Multiplication by scalar value
Enter your opinion
s

Enter

i: integer scalar value
d: double scalar value
f: float scalar value
Enter your opinion
f

Enter the equation: 5i+6j+3k
```

```
Your equation is  : 5i+6j+3k

Enter value of scalar multiple:2.3

Your answer       : 11.5i+13.8j+6.9k
Continue(Y/N)y

Enter
a: vector addition
m: vector multiplication
s: Multiplication by scalar value
Enter your opinion
s

Enter

i: integer scalar value
d: double scalar value
f: float scalar value
Enter your opinion
d

Enter the equation: 5i+6j+9k
Your equation is  : 5i+6j+9k

Enter value of scalar multiple:3.55454

Your answer       : 17.7727i+21.3272j+31.9909k
Continue(Y/N)n
  */
```