Abstraction and Paradigms of Programming

Taking User Input in Pair

```
Main(){
Pair<int,string>p;
Cin>>p.first;
Cin>>p.second;
Cout<<p.first<<endl;
Cout<<p.second<<endl;
}
```

Vectors in C++

- Vectors are same as dynamic arrays with the ability to resize itself automatically when an element is inserted or deleted.
- Their storage is handled automatically by the container.
- Vector elements are placed in contiguous storage so that they can be accessed and traversed using iterators. In vectors, data is inserted at the end.

Creating Vectors

```
Main(){
 vector<int>v;
int n;
Cin>>n;
For(int i=0;i<n;i++){
Int x;
Cin>>x;
v.push_back(x);
}
}
```

Printing the elements of a Vector

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

void PrintVec(vector<int> v){
    for(int i=0;i<v.size();i++){
        cout<<v[i]<<endl;
    }
}

int main(){
    vector<int> v;
    int n;
    cin>>n;
    for(int i=0;i<n;i++){
    int x;
    cin>>x;
    v.push_back(x);
    }
    PrintVec(v);

}
```

Size() method to check the size of the vector

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

void PrintVec(vector<int> v){
    cout<<"size : "<<v.size()<<endl;
    for(int i=0;i<v.size();i++){
        cout<<v[i]<<endl;
    }
}

int main(){
    vector<int> v;
    int n;
    cin>>n;
    for(int i=0;i<n;i++){
    int x;
    cin>>x;
    v.push_back(x);
    }
    PrintVec(v);

}
```

Whether the Vector size is actually dynamic?

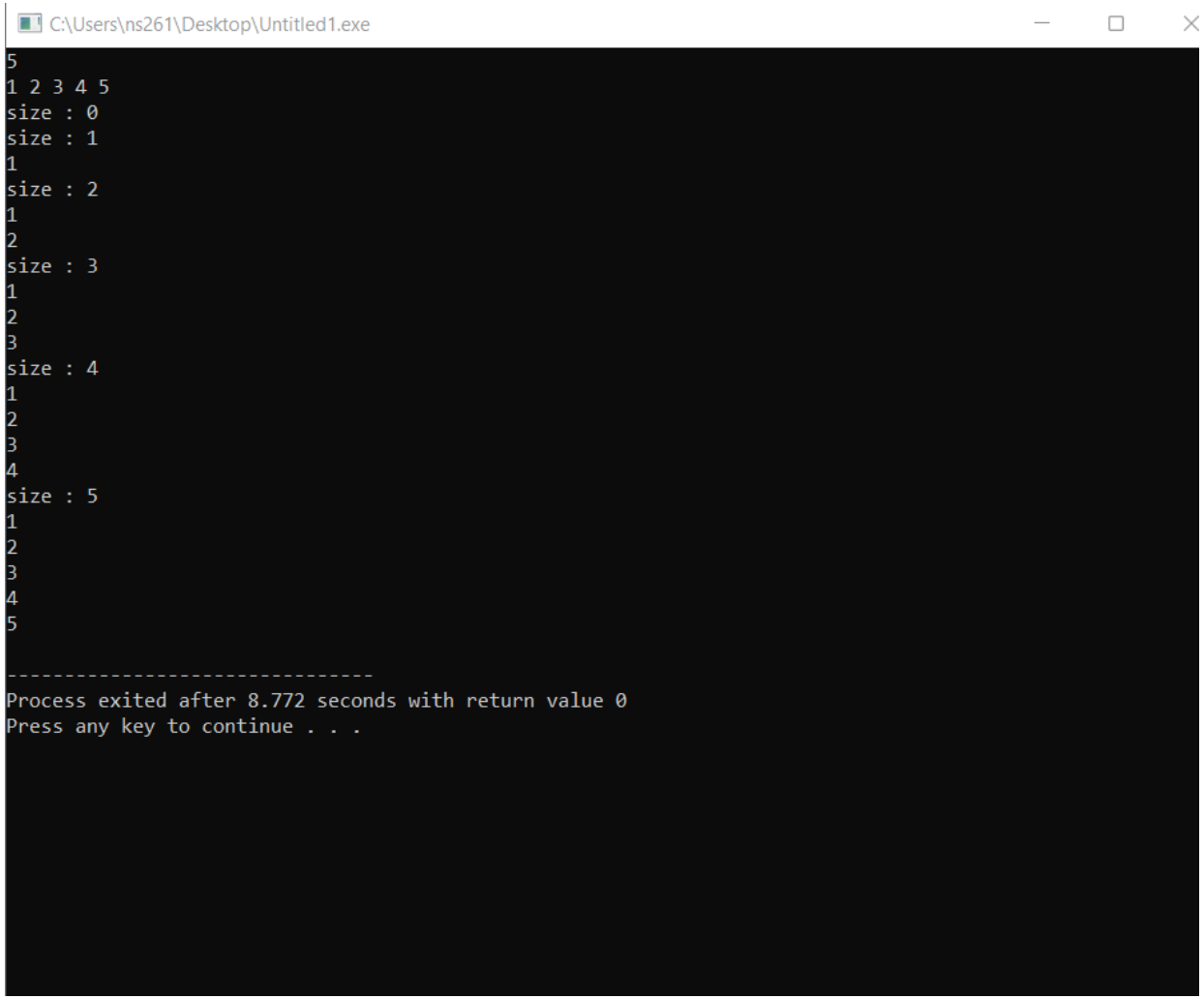
```cpp
#include<iostream>
#include<vector>
using namespace std;

void PrintVec(vector<int> v){
    cout<<"size : "<<v.size()<<endl;
    for(int i=0;i<v.size();i++){
        cout<<v[i]<<endl;
    }
}

int main(){
    vector<int> v;
    int n;
    cin>>n;
    for(int i=0;i<n;i++){
    int x;
    cin>>x;
    PrintVec(v);
    v.push_back(x);
    }
    PrintVec(v);

}
```

Output


C:\Users\ns261\Desktop\Untitled1.exe
5
1 2 3 4 5
size : 0
size : 1
1
size : 2
1
2
size : 3
1
2
3
size : 4
1
2
3
4
size : 5
1
2
3
4
5

Process exited after 8.772 seconds with return value 0
Press any key to continue . . .

Creating a Vector of Predefined Size

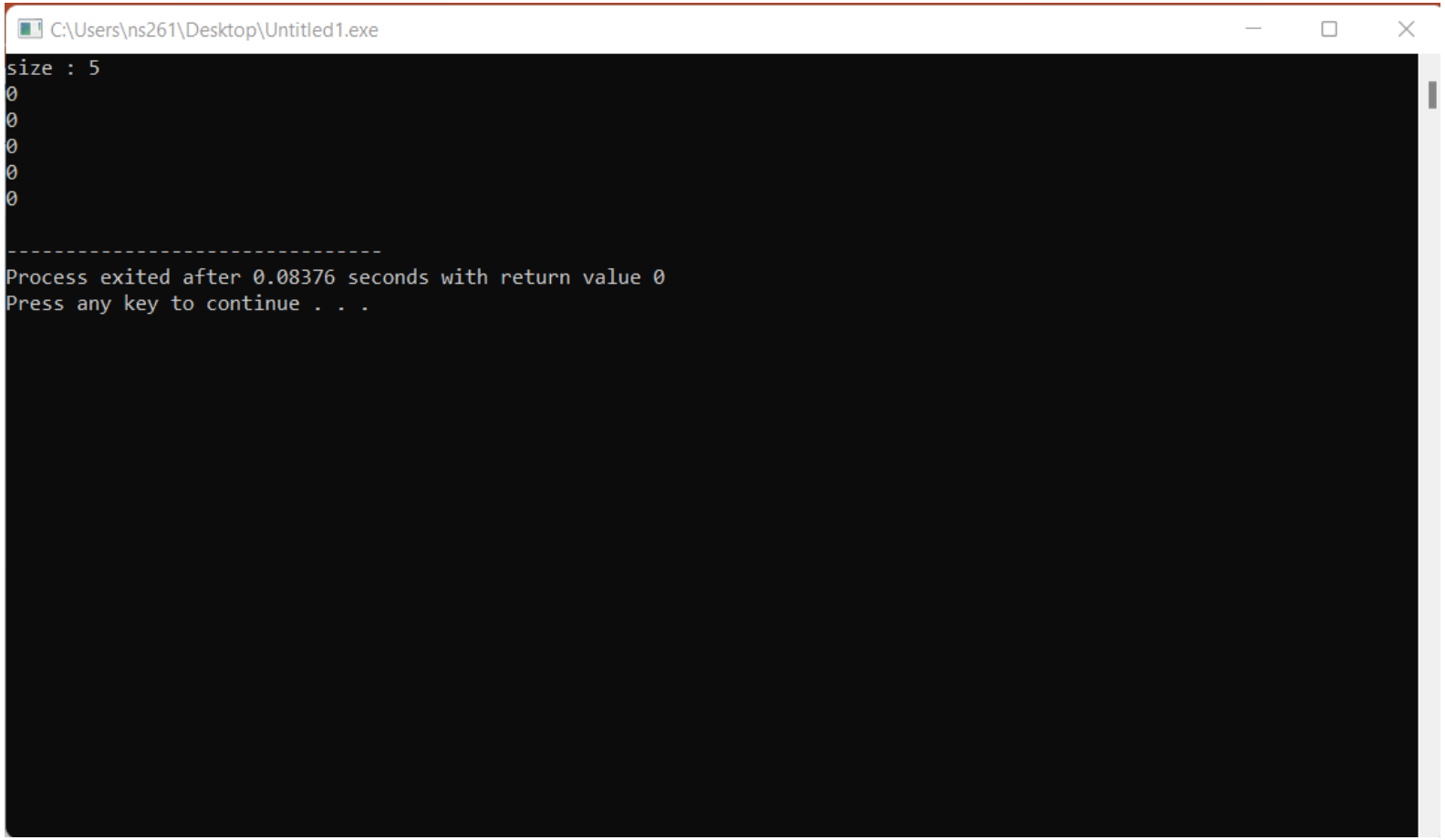
```cpp
#include<iostream>
#include<vector>
using namespace std;

void PrintVec(vector<int> v){
    cout<<"size : "<<v.size()<<endl;
    for(int i=0;i<v.size();i++){
        cout<<v[i]<<endl;
    }
}

int main(){
    vector<int> v(5);
    //v.push_back(x);

    PrintVec(v);
}
```

Output


C:\Users\ns261\Desktop\Untitled1.exe
size : 5
0
0
0
0
0

Process exited after 0.08376 seconds with return value 0
Press any key to continue . . .

Can the predefined size be altered?

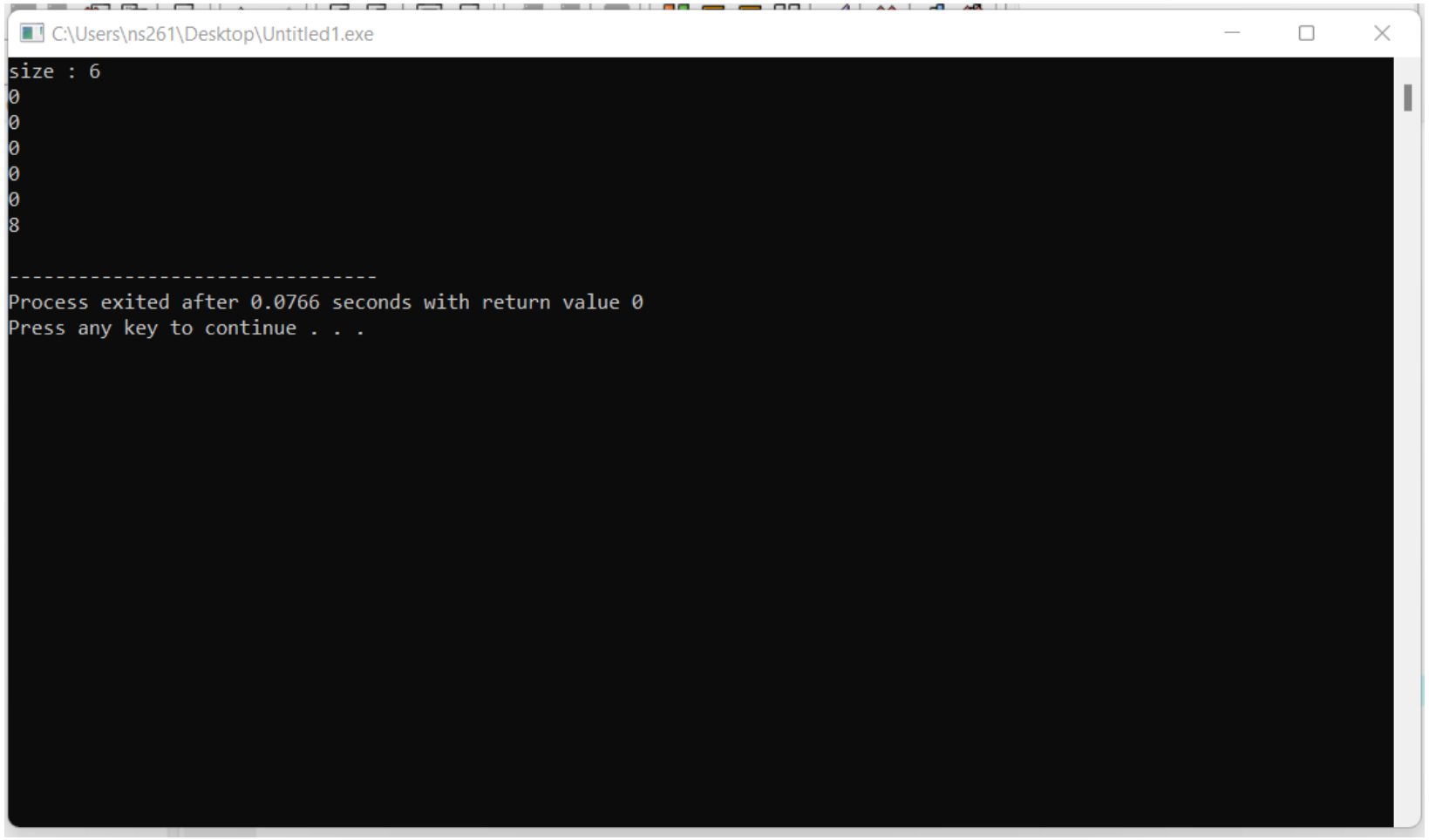
```cpp
#include<iostream>
#include<vector>
using namespace std;

void PrintVec(vector<int> v){
    cout<<"size : "<<v.size()<<endl;
    for(int i=0;i<v.size();i++){
        cout<<v[i]<<endl;
    }
}

int main(){
    vector<int> v(5);
    v.push_back(8);

    PrintVec(v);
}
```

Output


C:\Users\ns261\Desktop\Untitled1.exe
size : 6
0
0
0
0
0
8

Process exited after 0.0766 seconds with return value 0
Press any key to continue . . .

Initializing Values in a vector of predefined size

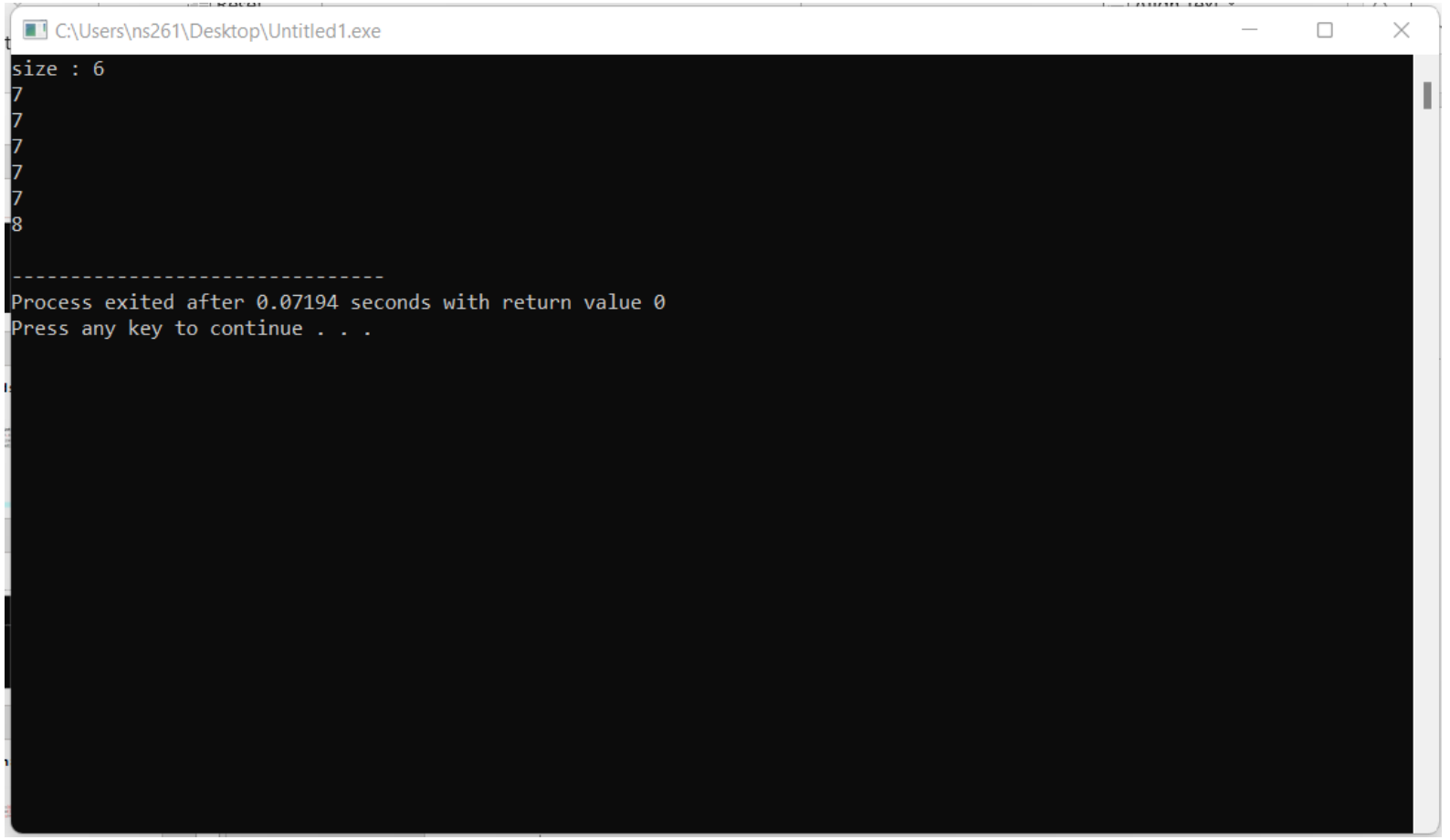
```cpp
#include<iostream>
#include<vector>
using namespace std;

void PrintVec(vector<int> v){
    cout<<"size : "<<v.size()<<endl;
    for(int i=0;i<v.size();i++){
        cout<<v[i]<<endl;
    }
}

int main(){
    vector<int> v(5,7);
    v.push_back(8);

    PrintVec(v);
}
```

Output


C:\Users\ns261\Desktop\Untitled1.exe
size : 6
7
7
7
7
7
8

Process exited after 0.07194 seconds with return value 0
Press any key to continue . . .

pop_back()

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

void PrintVec(vector<int> v){
    cout<<"size : "<<v.size()<<endl;
    for(int i=0;i<v.size();i++){
        cout<<v[i]<<endl;
    }
}

int main(){
    vector<int> v;
    v.push_back(8);
    v.push_back(7);

    PrintVec(v);
}
```

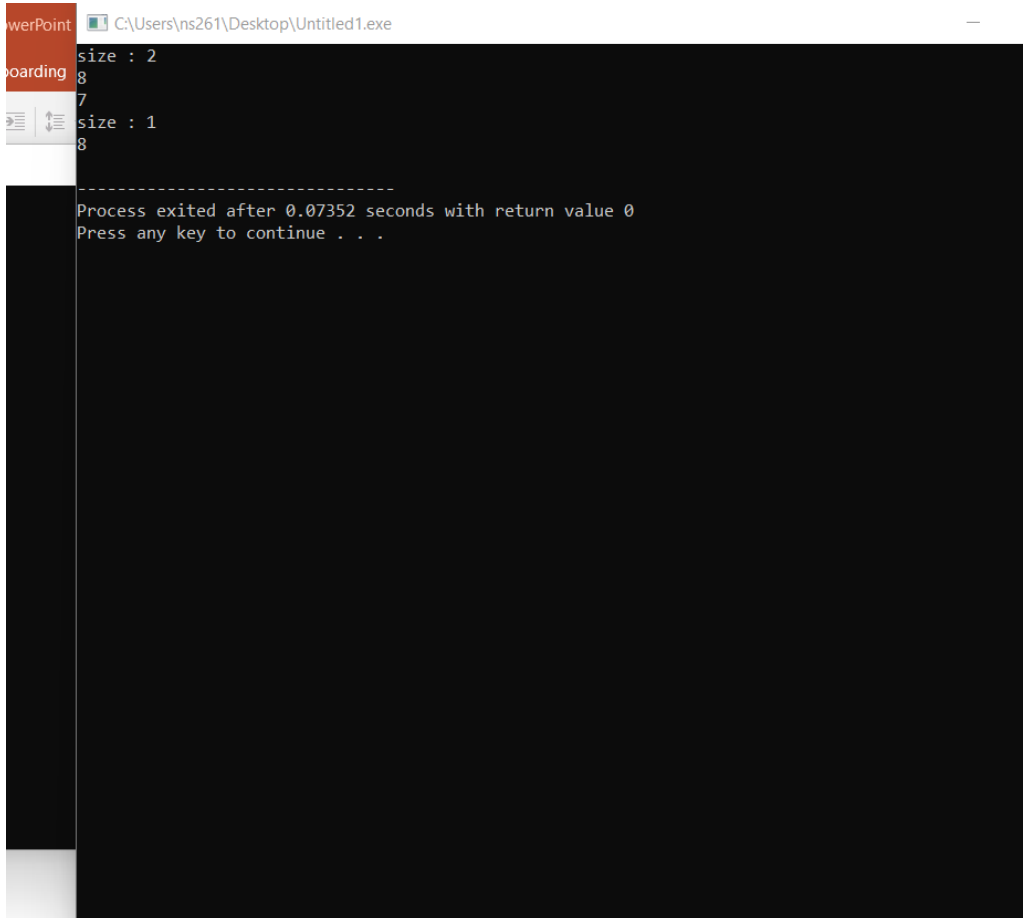
```cpp
#include<iostream>
#include<vector>
using namespace std;

void PrintVec(vector<int> v){
    cout<<"size : "<<v.size()<<endl;
    for(int i=0;i<v.size();i++){
        cout<<v[i]<<endl;
    }
}

int main(){
    vector<int> v;
    v.push_back(8);
    v.push_back(7);


    PrintVec(v);
    v.pop_back();
    PrintVec(v);
}
```

Output


werPoint
oarding
C:\Users\ns261\Desktop\Untitled1.exe
size : 2
8
7
size : 1
8

Process exited after 0.07352 seconds with return value 0
Press any key to continue . . .

Copying a vector

Vector<int> v2=v;