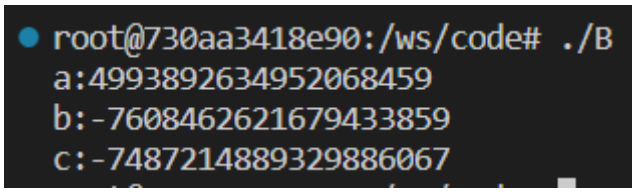
2 Structured Binding

```
#include <iostream>
#include <map>
#include <string>
#include <functional>
template <typename Key, typename Value, typename F>
void update(std::map<Key, Value>& m, F foo) {
    for(auto&& [key,value] : m) value=foo(key);
}
int main() {
    std::map<std::string, long long int> m {
        {"a", 1},
        {"b", 2},
        {"c", 3}
    };
    update(m, [](std::string key) {
        return std::hash<std::string>{}(key);
    });
    for (auto&& [key, value] : m)
        std::cout << key << ":" << value << std::endl;
}
```

运行结果:



3 References

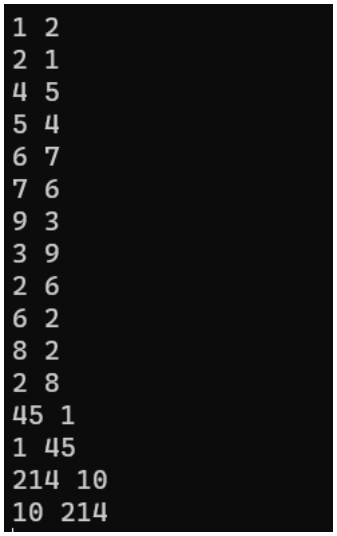
函数:

```
void SWAP(int& x,int& y){ int z=x; x=y,y=z; }
```

测试程序:

```
#include <bits/stdc++.h>
using namespace std;
void SWAP(int& x,int& y){ int z=x; x=y,y=z; }
int main(){
    while(1){
        int a,b;
        cin>>a>>b;
        SWAP(a,b);
        cout<<a<<' '<<b;
    }
}
```

测试：

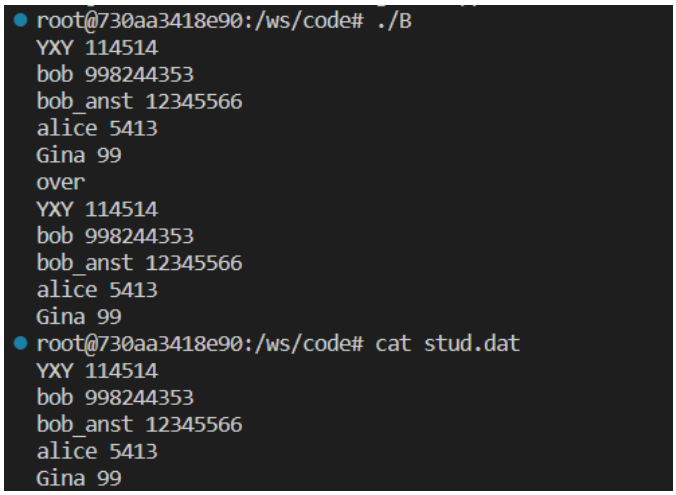


4 Streams

程序：

```
#include <bits/stdc++.h>
using namespace std;
string line;
int main(){
    ofstream out("stud.dat");
    ifstream in("stud.dat");
    while(1){
        getline(cin,line);
        if(line=="over") break;
        out<<line<<endl;
    }
    while(1){
        getline(in,line);
        if(line=="") break;
        cout<<line<<endl;
    }
}
```

测试：

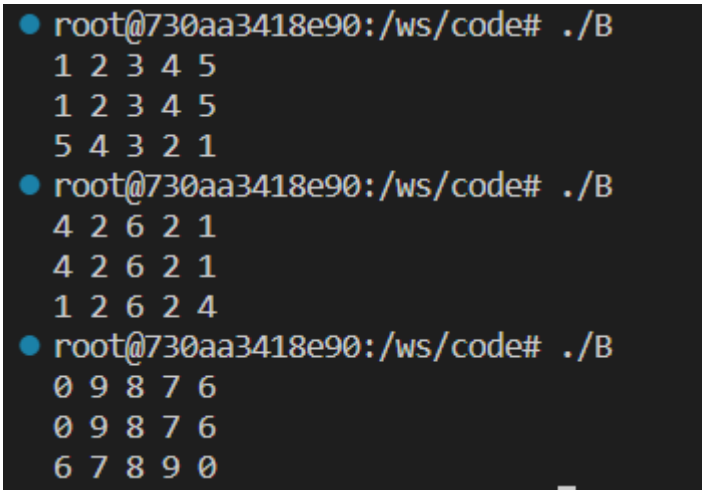


5 STL(Containers)

代码:

```
#include <bits/stdc++.h>
using namespace std;
vector<int> vec;
int main(){
    for(int i=1;i<=5;i++){ int a; cin>>a; vec.push_back(a); }
    vector<int>::iterator iter=vec.begin();
    for(;iter!=vec.end();++iter) cout<<*iter<<' '; cout<<endl;
    vector<int>::reverse_iterator it=vec.rbegin();
    for(;it!=vec.rend();++it) cout<<*it<<' '; cout<<endl;
}
```

测试:



6 Linear Algebra library

```
root@730aa3418e90:/ws/LinearAlgebra/build# ./main
RUNNING TESTS ...
[==========] Running 24 tests from 1 test suite.
[----------] Global test environment set-up.
[----------] 24 tests from LinearAlgebraTest
[ RUN      ] LinearAlgebraTest.ZEROS
[       OK ] LinearAlgebraTest.ZEROS (0 ms)
[ RUN      ] LinearAlgebraTest.ONES
[       OK ] LinearAlgebraTest.ONES (0 ms)
[ RUN      ] LinearAlgebraTest.RANDOM1
random matrix [-5, 7)
-3.379 0.327 -0.384 6.609
-3.387 3.326 2.109 -0.534
5.071 -0.556 2.695 4.401
3.295 -1.011 1.684 -1.236

[       OK ] LinearAlgebraTest.RANDOM1 (0 ms)
[ RUN      ] LinearAlgebraTest.RANDOM2
[       OK ] LinearAlgebraTest.RANDOM2 (0 ms)
[ RUN      ] LinearAlgebraTest.MULTIPLY1
[       OK ] LinearAlgebraTest.MULTIPLY1 (0 ms)
[ RUN      ] LinearAlgebraTest.MULTIPLY2
[       OK ] LinearAlgebraTest.MULTIPLY2 (0 ms)
[ RUN      ] LinearAlgebraTest.MULTIPLY3
[       OK ] LinearAlgebraTest.MULTIPLY3 (0 ms)
[ RUN      ] LinearAlgebraTest.MULTIPLY4
[       OK ] LinearAlgebraTest.MULTIPLY4 (0 ms)
[ RUN      ] LinearAlgebraTest.SUM1
[       OK ] LinearAlgebraTest.SUM1 (0 ms)
[ RUN      ] LinearAlgebraTest.SUM2
[       OK ] LinearAlgebraTest.SUM2 (0 ms)
[ RUN      ] LinearAlgebraTest.TRANSPOSE
[       OK ] LinearAlgebraTest.TRANSPOSE (0 ms)
[ RUN      ] LinearAlgebraTest.MINOR1
[       OK ] LinearAlgebraTest.MINOR1 (0 ms)
[ RUN      ] LinearAlgebraTest.MINOR2
[       OK ] LinearAlgebraTest.MINOR2 (0 ms)
[ RUN      ] LinearAlgebraTest.DETERMINANT1
[       OK ] LinearAlgebraTest.DETERMINANT1 (0 ms)
[ RUN      ] LinearAlgebraTest.DETERMINANT2
[       OK ] LinearAlgebraTest.DETERMINANT2 (0 ms)
[ RUN      ] LinearAlgebraTest.INVERSE1
```

```
[       OK ] LinearAlgebraTest.DETERMINANT1 (0 ms)
[ RUN      ] LinearAlgebraTest.DETERMINANT2
[       OK ] LinearAlgebraTest.DETERMINANT2 (0 ms)
[ RUN      ] LinearAlgebraTest.INVERSE1
[       OK ] LinearAlgebraTest.INVERSE1 (0 ms)
[ RUN      ] LinearAlgebraTest.INVERSE2
[       OK ] LinearAlgebraTest.INVERSE2 (0 ms)
[ RUN      ] LinearAlgebraTest.CONCATENATE1
[       OK ] LinearAlgebraTest.CONCATENATE1 (0 ms)
[ RUN      ] LinearAlgebraTest.CONCATENATE2
[       OK ] LinearAlgebraTest.CONCATENATE2 (0 ms)
[ RUN      ] LinearAlgebraTest.ERO_SWAP
[       OK ] LinearAlgebraTest.ERO_SWAP (0 ms)
[ RUN      ] LinearAlgebraTest.ERO_MULTIPLY
[       OK ] LinearAlgebraTest.ERO_MULTIPLY (0 ms)
[ RUN      ] LinearAlgebraTest.ERO_SUM
[       OK ] LinearAlgebraTest.ERO_SUM (0 ms)
[ RUN      ] LinearAlgebraTest.UPPER_TRIANGULAR1
[       OK ] LinearAlgebraTest.UPPER_TRIANGULAR1 (0 ms)
[ RUN      ] LinearAlgebraTest.BONUS
[       OK ] LinearAlgebraTest.BONUS (0 ms)
[----------] 24 tests from LinearAlgebraTest (1 ms total)

[----------] Global test environment tear-down
[==========] 24 tests from 1 test suite ran. (1 ms total)
[  PASSED  ] 24 tests.
<<<SUCCESS>>>
root@730aa3418e90:/ws/LinearAlgebra/build#
```