

BÁO CÁO THỰC HÀNH TUẦN 36
HỌC PHẦN: IT3040 - KỸ THUẬT LẬP TRÌNH - 20221

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Bài thực hành số 2

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Bài 2.1. Viết hàm tính độ dài cạnh huyền của tam giác theo độ hai cạnh góc vuông.

noodle/mod/quiz/review.php?attempt=59118

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Grade 100.00 out of 100.00

Question 1
Correct
Mark 10.00 out of 10.00
Flag question

Bài 2.1. Viết hàm tính độ dài cạnh huyền của tam giác theo độ hai cạnh góc vuông.
For example:

Input	Result
3 4	z = 5.00

Answer: (penalty regime: 10, 20, ... %)

```

1 #include <stdio.h>
2 #include <math.h>
3
4 float get_hypotenuse(float x, float y) {
5     /*
6      * Ho va ten : Brak Lihou
7      * MSSV : 20200836
8      */
9
10    float z = sqrt(x*x + y*y);
11    return z;
12    /*
13     */
14 }
15
16 int main(){
17     float x, y;
18     scanf("%f%f", &x, &y);
19     float z = get_hypotenuse(x, y);
20     printf("z = %.2f\n", z);

```

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```

8     */
9
10    float z = sqrt(x*x + y*y);
11    return z;
12    /*
13     */
14 }
15
16 int main(){
17     float x, y;
18     scanf("%f%f", &x, &y);
19     float z = get_hypotenuse(x, y);
20     printf("z = %.2f\n", z);
21
22     return 0;
23 }

```

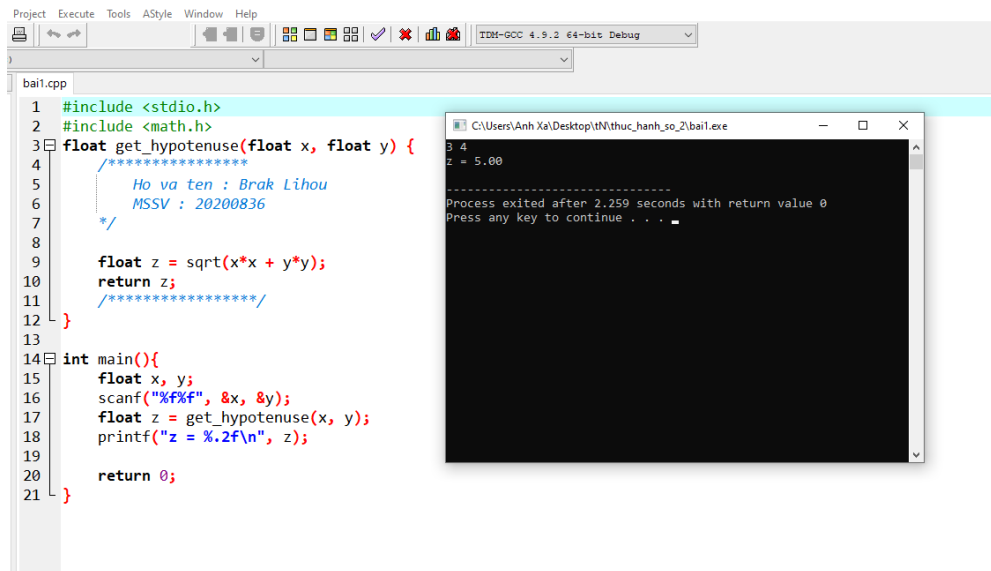
Check

	Input	Expected	Got	
✓	3 4	z = 5.00	z = 5.00	✓
✓	5 6	z = 7.81	z = 7.81	✓

Passed all tests! ✓

Correct
Marks for this submission: 10.00/10.00.

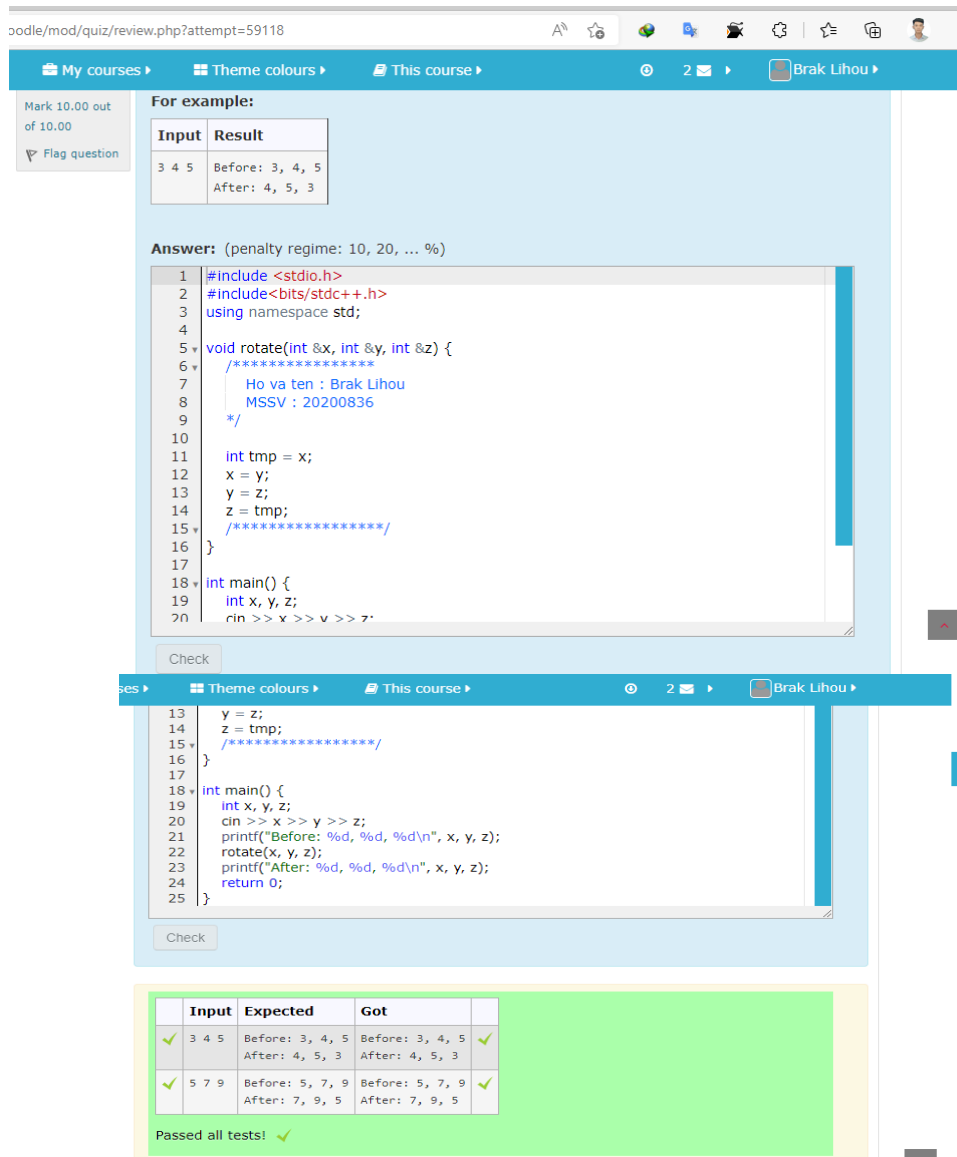
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```
1 #include <stdio.h>
2 #include <math.h>
3 float get_hypotenuse(float x, float y) {
4     /*
5      * Ho va ten : Brak Lihou
6      * MSSV : 20200836
7      */
8
9     float z = sqrt(x*x + y*y);
10    return z;
11    /*
12     *
13     */
14 }
15 int main(){
16     float x, y;
17     scanf("%f%f", &x, &y);
18     float z = get_hypotenuse(x, y);
19     printf("z = %.2f\n", z);
20 }
21 }
```

Output window: 3 4, z = 5.00, Process exited after 2.259 seconds with return value 0.

Bài 2.2. Viết hàm hoán vị vòng tròn 3 biến a, b, c. Sau khi thực hiện hàm, các biến a, b, c tương ứng nhận các giá trị mới b, c, a.



For example:

Input	Result
3 4 5	Before: 3, 4, 5 After: 4, 5, 3

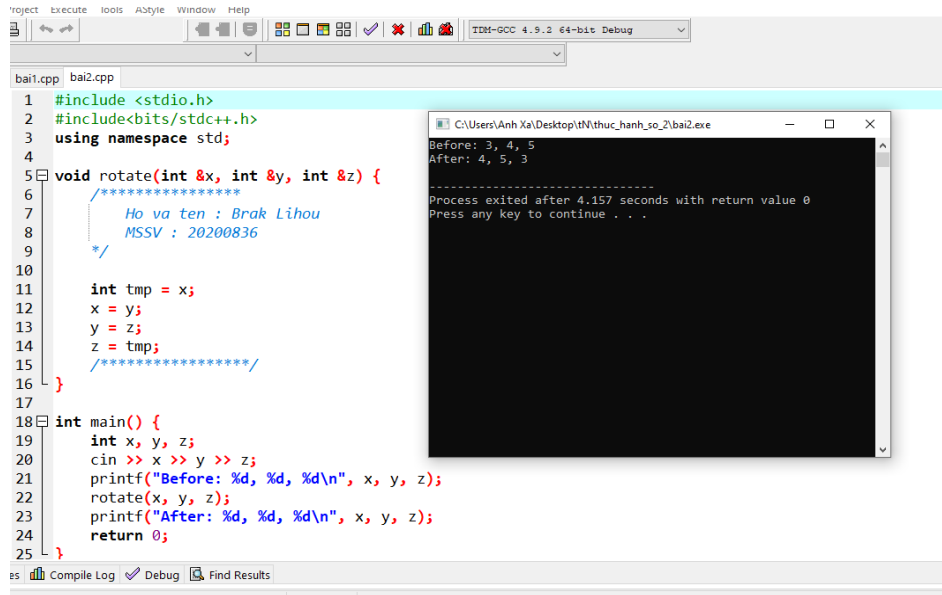
Answer: (penalty regime: 10, 20, ... %)

```
1 #include <stdio.h>
2 #include <bits/stdc++.h>
3 using namespace std;
4
5 void rotate(int &x, int &y, int &z) {
6     /*
7      * Ho va ten : Brak Lihou
8      * MSSV : 20200836
9      */
10
11     int tmp = x;
12     x = y;
13     y = z;
14     z = tmp;
15 }
16
17 int main() {
18     int x, y, z;
19     cin >> x >> y >> z;
20     printf("Before: %d, %d, %d\n", x, y, z);
21     rotate(x, y, z);
22     printf("After: %d, %d, %d\n", x, y, z);
23     return 0;
24 }
```

	Input	Expected	Got	
✓	3 4 5	Before: 3, 4, 5 After: 4, 5, 3	Before: 3, 4, 5 After: 4, 5, 3	✓
✓	5 7 9	Before: 5, 7, 9 After: 7, 9, 5	Before: 5, 7, 9 After: 7, 9, 5	✓

Passed all tests! ✓

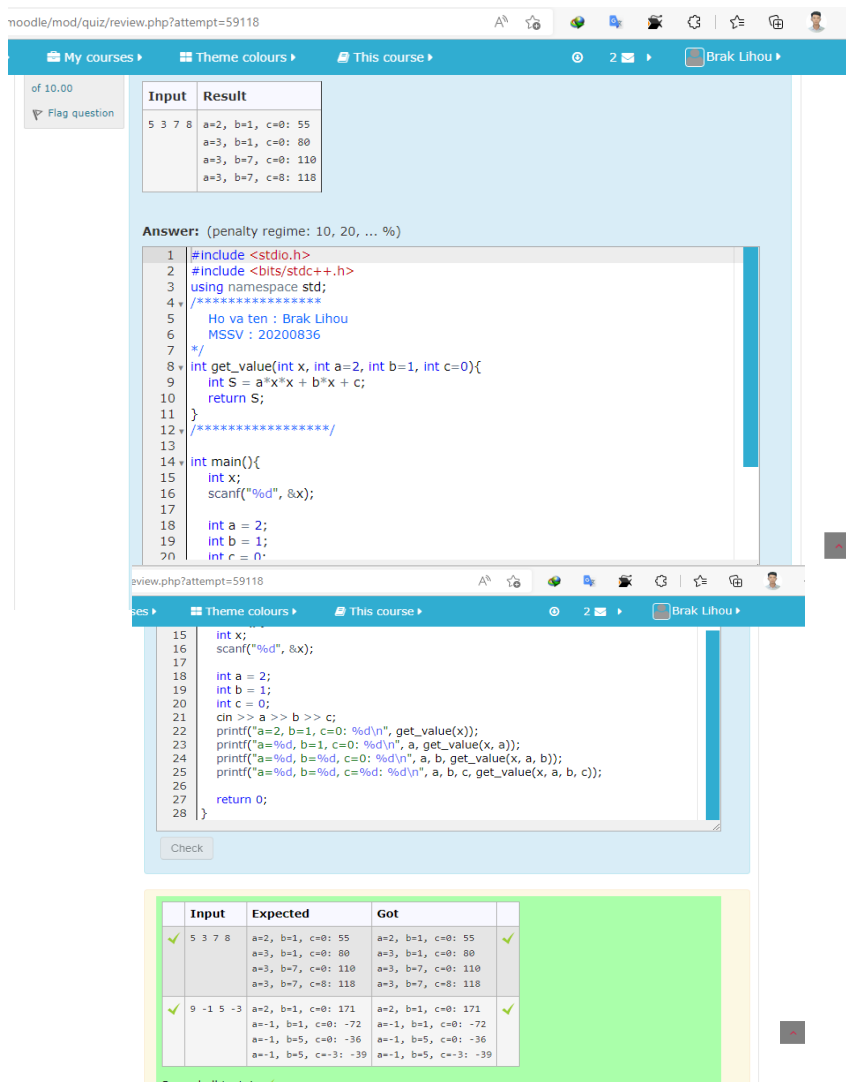
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```
1 #include <stdio.h>
2 #include <bits/stdc++.h>
3 using namespace std;
4
5 void rotate(int &x, int &y, int &z) {
6     /*****
7      *   Ho va ten : Brak Lihou
8      *   MSSV : 20200836
9      */
10
11     int tmp = x;
12     x = y;
13     y = z;
14     z = tmp;
15     /*****/
16 }
17
18 int main() {
19     int x, y, z;
20     cin >> x >> y >> z;
21     printf("Before: %d, %d, %d\n", x, y, z);
22     rotate(x, y, z);
23     printf("After: %d, %d, %d\n", x, y, z);
24     return 0;
25 }
```

Before: 3, 4, 5
After: 4, 5, 3
Process exited after 4.157 seconds with return value 0
Press any key to continue . . .

Bài 2.3. Viết chương trình yêu cầu nhập giá trị cho số nguyên x nhỏ hơn 100. In ra giá trị ax^2+bx+c với a, b, c định sẵn.



Input Result

Input	Result
5 3 7 8	a=2, b=1, c=0: 55 a=3, b=1, c=0: 80 a=3, b=7, c=0: 110 a=3, b=7, c=8: 118

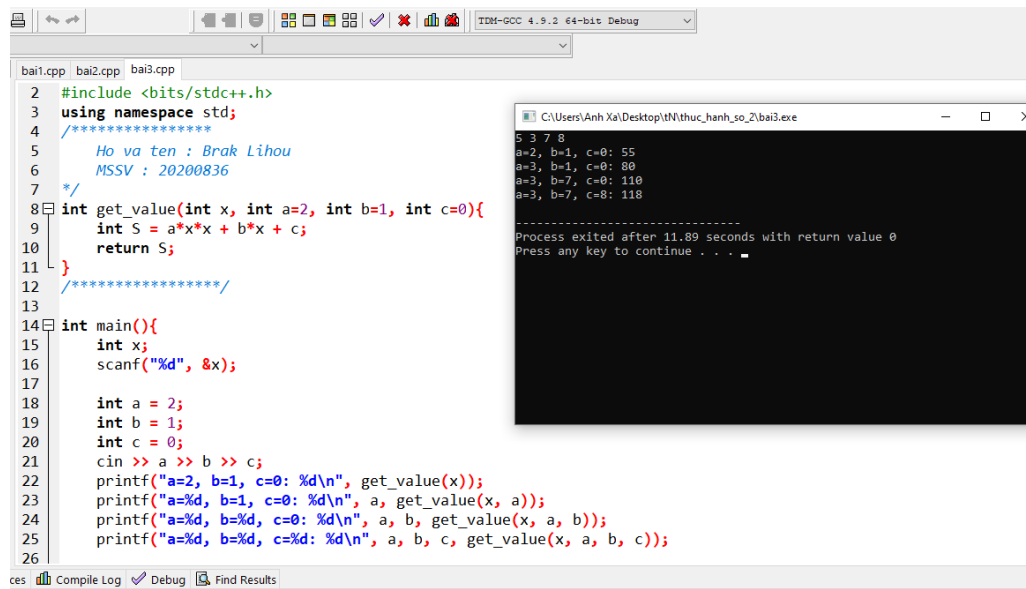
Answer: (penalty regime: 10, 20, ... %)

```
1 #include <stdio.h>
2 #include <bits/stdc++.h>
3 using namespace std;
4 /*****/
5 Ho va ten : Brak Lihou
6 MSSV : 20200836
7 /*****/
8 int get_value(int x, int a=2, int b=1, int c=0){
9     int S = a*x*x + b*x + c;
10    return S;
11 }
12 /*****/
13
14 int main(){
15     int x;
16     scanf("%d", &x);
17
18     int a = 2;
19     int b = 1;
20     int c = 0;
21     cin >> a >> b >> c;
22     printf("a=2, b=1, c=0: %d\n", get_value(x));
23     printf("a=%d, b=1, c=0: %d\n", a, get_value(x, a));
24     printf("a=%d, b=%d, c=0: %d\n", a, b, get_value(x, a, b));
25     printf("a=%d, b=%d, c=%d: %d\n", a, b, c, get_value(x, a, b, c));
26
27     return 0;
28 }
```

	Input	Expected	Got	
✓	5 3 7 8	a=2, b=1, c=0: 55 a=3, b=1, c=0: 80 a=3, b=7, c=0: 110 a=3, b=7, c=8: 118	a=2, b=1, c=0: 55 a=3, b=1, c=0: 80 a=3, b=7, c=0: 110 a=3, b=7, c=8: 118	✓
✓	9 -1 5 -3	a=2, b=1, c=0: 171 a=-1, b=1, c=0: -72 a=-1, b=5, c=0: -36 a=-1, b=5, c=-3: -39	a=2, b=1, c=0: 171 a=-1, b=1, c=0: -72 a=-1, b=5, c=0: -36 a=-1, b=5, c=-3: -39	✓

Passed all tests!

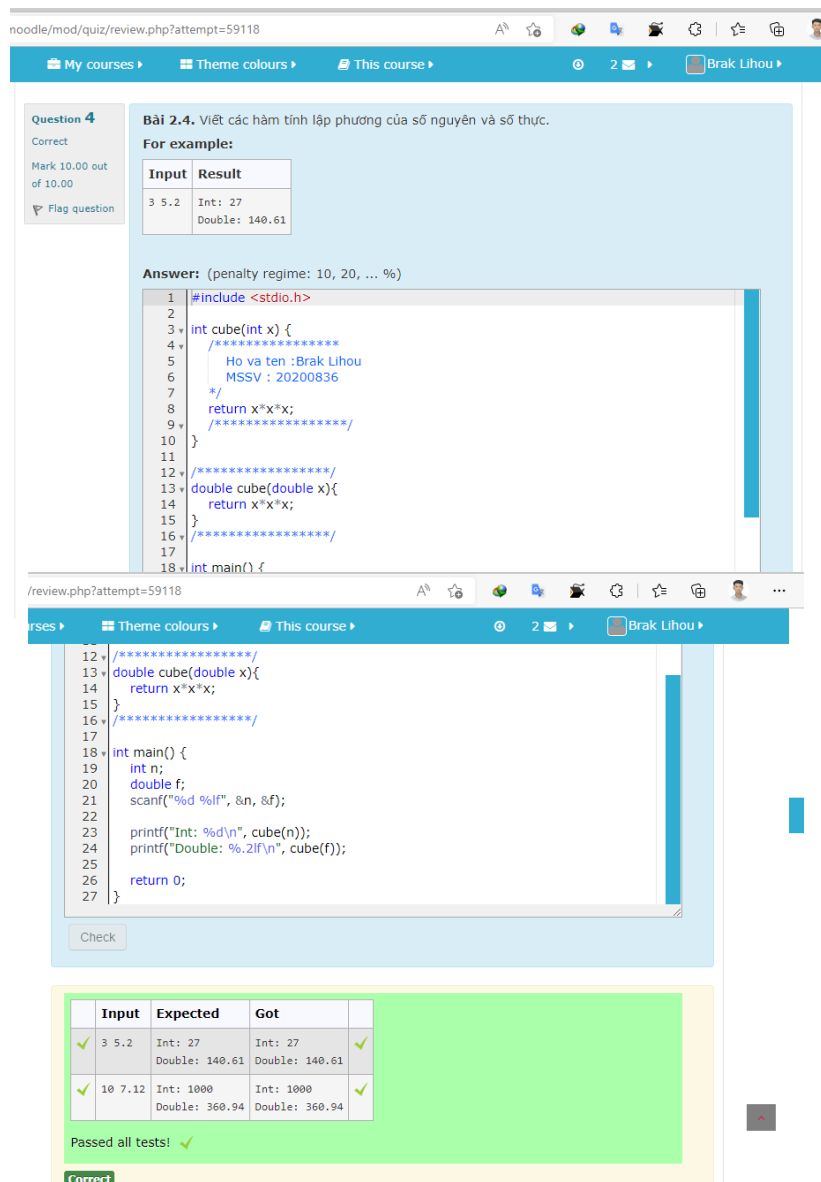
Báo Cao Thực hành buổi 2-Brak Lihou (20200836)



```
1 #include <bits/stdc++.h>
2 using namespace std;
3
4 /*****
5  Ho va ten : Brak Lihou
6  MSSV : 20200836
7  */
8 int get_value(int x, int a=2, int b=1, int c=0){
9     int S = a*x*x + b*x + c;
10    return S;
11 }
12 /*****/
13
14 int main(){
15     int x;
16     scanf("%d", &x);
17
18     int a = 2;
19     int b = 1;
20     int c = 0;
21     cin >> a >> b >> c;
22     printf("a=2, b=1, c=0: %d\n", get_value(x));
23     printf("a=%d, b=1, c=0: %d\n", a, get_value(x, a));
24     printf("a=%d, b=%d, c=0: %d\n", a, b, get_value(x, a, b));
25     printf("a=%d, b=%d, c=%d: %d\n", a, b, c, get_value(x, a, b, c));
26 }
```

```
5 3 7 8
a=2, b=1, c=0: 55
a=3, b=1, c=0: 80
a=3, b=7, c=0: 110
a=3, b=7, c=8: 118
-----
Process exited after 11.89 seconds with return value 0
Press any key to continue . . .
```

Bài 2.4. Viết các hàm tính lập phương của số nguyên và số thực



Question 4
Correct
Mark 10.00 out of 10.00
Flag question

Bài 2.4. Viết các hàm tính lập phương của số nguyên và số thực.
For example:

Input	Result
3 5.2	Int: 27 Double: 140.61

Answer: (penalty regime: 10, 20, ... %)

```
1 #include <stdio.h>
2
3 int cube(int x) {
4     /*****
5      Ho va ten :Brak Lihou
6      MSSV : 20200836
7      */
8     return x*x*x;
9     /*****/
10 }
11
12 /*****/
13 double cube(double x){
14     return x*x*x;
15 }
16 /*****/
17
18 int main() {
19     int n;
20     double f;
21     scanf("%d %lf", &n, &f);
22
23     printf("Int: %d\n", cube(n));
24     printf("Double: %.2lf\n", cube(f));
25
26     return 0;
27 }
```

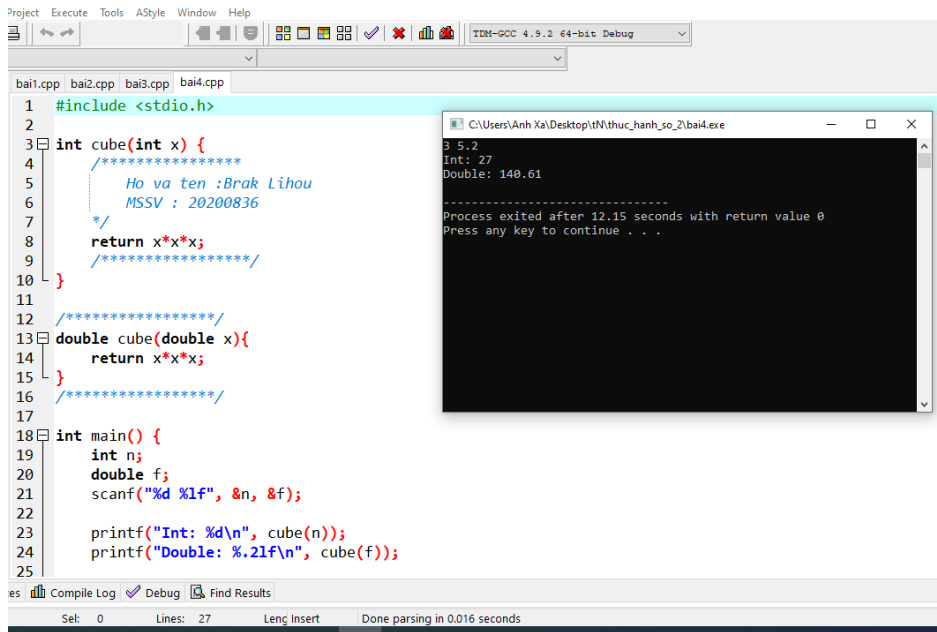
Check

	Input	Expected	Got	
✓	3 5.2	Int: 27 Double: 140.61	Int: 27 Double: 140.61	✓
✓	10 7.12	Int: 1000 Double: 360.94	Int: 1000 Double: 360.94	✓

Passed all tests! ✓

Correct

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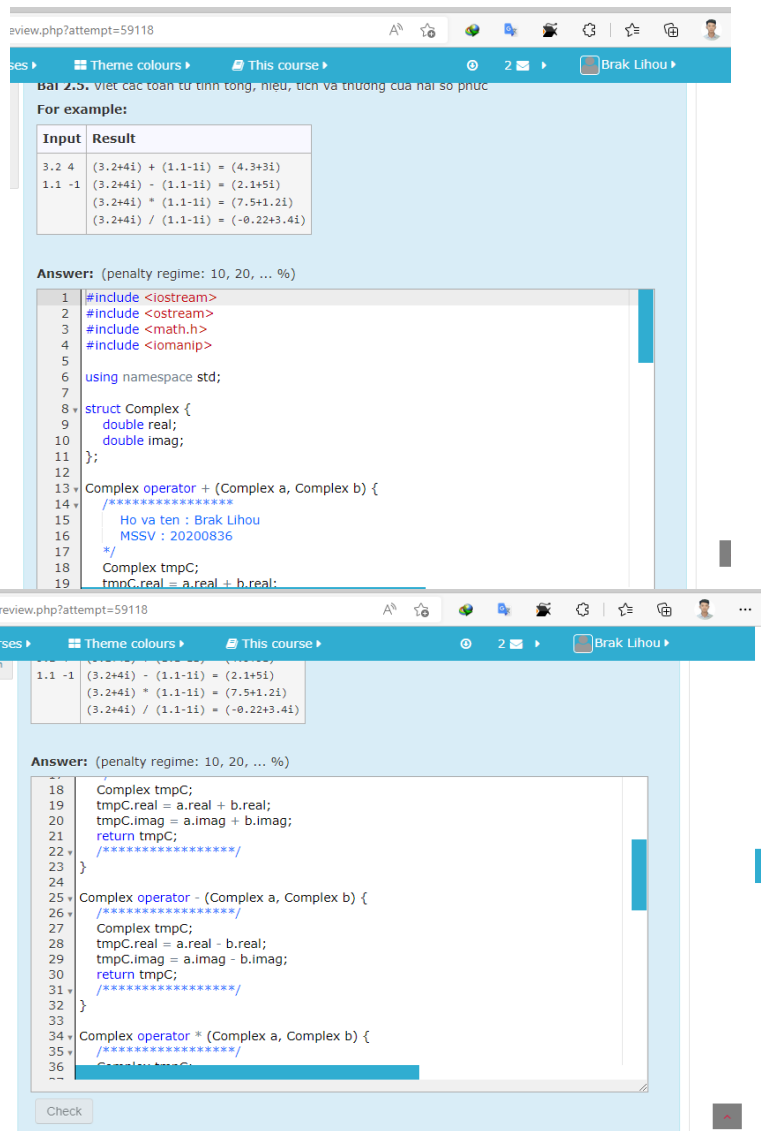


The screenshot shows a C++ IDE with a file named `bai4.cpp`. The code defines a `cube` function for both `int` and `double` types. The `main` function takes an integer `n` and a double `f` as input and prints the results of `cube(n)` and `cube(f)`. The output window shows the program's execution with the following output:

```
3 5.2
Int: 27
Double: 140.61

-----
Process exited after 12.15 seconds with return value 0
Press any key to continue . . .
```

Bài 2.5. Viết các toán tử tính tổng, hiệu, tích và thương của hai số phức



The screenshot shows a C++ IDE with a file named `review.php?attempt=59118`. The code defines a `Complex` struct and implements the addition, subtraction, multiplication, and division of complex numbers. The output window shows the program's execution with the following output:

```
3 5.2 4 (3.2+4i) + (1.1-1i) = (4.3+3i)
1.1 -1 (3.2+4i) - (1.1-1i) = (2.1+5i)
(3.2+4i) * (1.1-1i) = (7.5+1.2i)
(3.2+4i) / (1.1-1i) = (-0.22+3.4i)
```

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view.php?attempt=59118

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1.1 -1 $(3.2+4i) - (1.1-1i) = (2.1+5i)$
 $(3.2+4i) * (1.1-1i) = (7.5+1.2i)$
 $(3.2+4i) / (1.1-1i) = (-0.22+3.4i)$

Answer: (penalty regime: 10, 20, ... %)

```

31 //*****
32 }
33
34 Complex operator * (Complex a, Complex b) {
35 //*****
36 Complex tmpC;
37 tmpC.real = a.real * b.real - a.imag * b.imag;
38 tmpC.imag = a.real * b.imag + a.imag * b.real;
39 return tmpC;
40 //*****
41 }
42
43 Complex operator / (Complex a, Complex b) {
44 //*****
45 Complex tmpC;
46 Complex inverse;
47 inverse.real = b.real;
48 inverse.imag = -b.imag;
49
50 tmpC = a * inverse;
51 tmpC.real = tmpC.real / (b.real * b.real + b.imag * b.imag);
52 tmpC.imag = tmpC.imag / (b.real * b.real + b.imag * b.imag);
53 return tmpC;
54 //*****
55 }
56
57 ostream& operator << (ostream& out, const Complex &a) {
58 out << '(' << std::setprecision(2) << a.real << (a.imag >= 0 ? '+' : '-') << std::setprecision(2) << a.imag << 'i' << endl;
59 return out;
60 }
61
62 int main() {
63 double real_a, real_b, img_a, img_b;
64 cin >> real_a >> img_a;
65 cin >> real_b >> img_b;
66
67 Complex a(real_a, img_a);
68 Complex b(real_b, img_b);
69
70 cout << a << " + " << b << " = " << a + b << endl;
71 cout << a << " - " << b << " = " << a - b << endl;
72 cout << a << " * " << b << " = " << a * b << endl;
73 cout << a << " / " << b << " = " << a / b << endl;
74
75 return 0;
76 }

```

Check

view.php?attempt=59118

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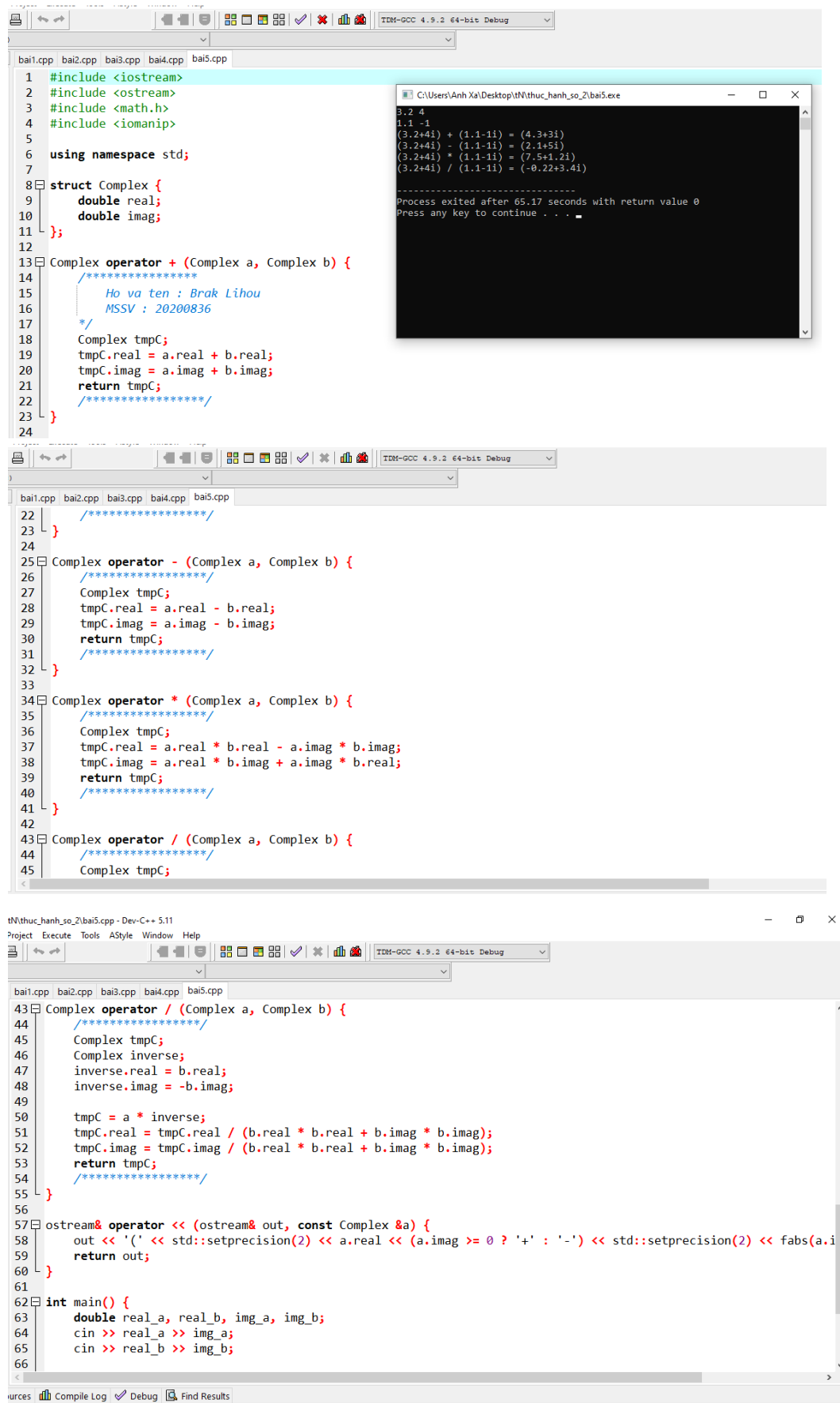
3.2 4 $(3.2+4i) + (1.1-1i) = (4.3+3i)$
1.1 -1 $(3.2+4i) - (1.1-1i) = (2.1+5i)$
 $(3.2+4i) * (1.1-1i) = (7.5+1.2i)$
 $(3.2+4i) / (1.1-1i) = (-0.22+3.4i)$

5.5 2 $(5.5+2i) + (3-1.5i) = (8.5+0.5i)$
3 -1.5 $(5.5+2i) - (3-1.5i) = (2.5+3.5i)$
 $(5.5+2i) * (3-1.5i) = (20-2.2i)$
 $(5.5+2i) / (3-1.5i) = (1.2+1.3i)$

Passed all tests! ✓

	Input	Expected	Got	
✓	3.2 4	$(3.2+4i) + (1.1-1i) = (4.3+3i)$	$(3.2+4i) + (1.1-1i) = (4.3+3i)$	✓
	1.1 -1	$(3.2+4i) - (1.1-1i) = (2.1+5i)$	$(3.2+4i) - (1.1-1i) = (2.1+5i)$	
		$(3.2+4i) * (1.1-1i) = (7.5+1.2i)$	$(3.2+4i) * (1.1-1i) = (7.5+1.2i)$	
		$(3.2+4i) / (1.1-1i) = (-0.22+3.4i)$	$(3.2+4i) / (1.1-1i) = (-0.22+3.4i)$	
✓	5.5 2	$(5.5+2i) + (3-1.5i) = (8.5+0.5i)$	$(5.5+2i) + (3-1.5i) = (8.5+0.5i)$	✓
	3 -1.5	$(5.5+2i) - (3-1.5i) = (2.5+3.5i)$	$(5.5+2i) - (3-1.5i) = (2.5+3.5i)$	
		$(5.5+2i) * (3-1.5i) = (20-2.2i)$	$(5.5+2i) * (3-1.5i) = (20-2.2i)$	
		$(5.5+2i) / (3-1.5i) = (1.2+1.3i)$	$(5.5+2i) / (3-1.5i) = (1.2+1.3i)$	

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The image shows a C++ IDE with two windows. The top window displays the implementation of complex number operators in `bai5.cpp`. The bottom window shows the output of the program, which includes the results of various complex number operations and the program's exit message.

```
1 #include <iostream>
2 #include <ostream>
3 #include <math.h>
4 #include <iomanip>
5
6 using namespace std;
7
8 struct Complex {
9     double real;
10    double imag;
11};
12
13 Complex operator + (Complex a, Complex b) {
14    /*
15     * Ho va ten : Brak Lihou
16     * MSSV : 20200836
17     */
18    Complex tmpC;
19    tmpC.real = a.real + b.real;
20    tmpC.imag = a.imag + b.imag;
21    return tmpC;
22}
23
24
25 Complex operator - (Complex a, Complex b) {
26    /*
27     *
28     */
29    Complex tmpC;
30    tmpC.real = a.real - b.real;
31    tmpC.imag = a.imag - b.imag;
32    return tmpC;
33}
34
35 Complex operator * (Complex a, Complex b) {
36    /*
37     *
38     */
39    Complex tmpC;
40    tmpC.real = a.real * b.real - a.imag * b.imag;
41    tmpC.imag = a.real * b.imag + a.imag * b.real;
42    return tmpC;
43}
44
45 Complex operator / (Complex a, Complex b) {
46    /*
47     *
48     */
49    Complex tmpC;
50    Complex inverse;
51    inverse.real = b.real;
52    inverse.imag = -b.imag;
53    tmpC = a * inverse;
54    tmpC.real = tmpC.real / (b.real * b.real + b.imag * b.imag);
55    tmpC.imag = tmpC.imag / (b.real * b.real + b.imag * b.imag);
56    return tmpC;
57}
58
59 ostream& operator << (ostream& out, const Complex &a) {
60    out << '(' << std::setprecision(2) << a.real << (a.imag >= 0 ? '+' : '-') << std::setprecision(2) << fabs(a.imag) << 'i' << endl;
61    return out;
62}
63
64 int main() {
65    double real_a, real_b, img_a, img_b;
66    cin >> real_a >> img_a;
67    cin >> real_b >> img_b;
```

The output window shows the following results:

```
3.2 4
1.1 -1
(3.2+4i) + (1.1-1i) = (4.3+3i)
(3.2+4i) - (1.1-1i) = (2.1+5i)
(3.2+4i) * (1.1-1i) = (7.5+1.2i)
(3.2+4i) / (1.1-1i) = (-0.22+3.4i)
Process exited after 65.17 seconds with return value 0
Press any key to continue . . .
```


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```
\t\thuc_hanh_so_2\bai5.cpp - Dev-C++ 5.11
Project Execute Tools AStyle Window Help
TDM-GCC 4.9.2 64-bit Debug

bai1.cpp bai2.cpp bai3.cpp bai4.cpp bai5.cpp
53 return tmpC;
54 /*****/
55 }
56
57 ostream& operator << (ostream& out, const Complex &a) {
58 out << '(' << std::setprecision(2) << a.real << (a.imag >= 0 ? '+' : '-') << std::setprecision(2) << fabs(a.i
59 return out;
60 }
61
62 int main() {
63 double real_a, real_b, img_a, img_b;
64 cin >> real_a >> img_a;
65 cin >> real_b >> img_b;
66
67 Complex a{real_a, img_a};
68 Complex b{real_b, img_b};
69
70 cout << a << " + " << b << " = " << a + b << endl;
71 cout << a << " - " << b << " = " << a - b << endl;
72 cout << a << " * " << b << " = " << a * b << endl;
73 cout << a << " / " << b << " = " << a / b << endl;
74
75 return 0;
76 }
```

Bài 2.6. Giả thuyết Collatz: bắt đầu từ số dương n bất kỳ, nếu n chẵn thì chia 2, nếu lẻ thì nhân 3 cộng 1, giả thuyết cho rằng ta luôn đi đến $n=1$.

Hãy viết chương trình mô phỏng lại quá trình biến đổi để kiểm chứng giả thuyết với giá trị của n nhập từ bàn phím.

```
Answer: (penalty regime: 10, 20, ... %)
1 #include <stdio.h>
2 void print(int n) {
3     printf("n=%d\n", n);
4 }
5
6 int mul3plus1(int n) {
7     return n * 3 + 1;
8 }
9
10 int div2(int n) {
11     return n / 2;
12 }
13
14 void simulate(int n, /*****/ int (*odd)(int), int (*even)(int), void (*output)(int)) {
15     (*output)(n);
16     if (n == 1) return;
17     if (n % 2 == 0) {
18         n = (*even)(n);
19     } else {
20         n = (*odd)(n);
21     }
22     simulate(n, odd, even, output);
23 }
24
25 int main() {
26     int (*odd)(int) = NULL;
27     int (*even)(int) = NULL;
28
29     /*****/
30     Ho va ten : Brak Lihou
31     MSSV : 20200836
32     */
33 }
```

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```
view.php?attempt=59118
Theme colours This course 2 Brak Lihou
28
29
30 /******
31  Ho va ten : Brak Lihou
32  MSSV : 20200836
33  */
34 odd = mul3plus1;
35 even = div2;
36 /******
37
38 int n;
39 scanf("%d", &n);
40 simulate(n, odd, even, print);
41
42 return 0;
43 }
```

	Input	Expected	Got	
✓	19	n=19 n=58 n=29 n=88 n=44 n=22 n=11 n=34 n=17	n=19 n=58 n=29 n=88 n=44 n=22 n=11 n=34 n=17	✓

```
Project Execute Tools AStyle Window Help
C:\Users\Anh.Xa\Desktop\tn(thuc_hanh_so_2)\bai6.exe
bai1.cpp bai2.cpp bai3.cpp bai4.cpp bai5.cpp bai6.cpp
1 #include <stdio.h>
2 void print(int n) {
3     printf("n=%d\n", n);
4 }
5
6 int mul3plus1(int n) {
7     return n * 3 + 1;
8 }
9
10 int div2(int n) {
11     return n / 2;
12 }
13
14 void simulate(int n, /******/ int (*odd)(int), int (*even)(int), void (*output)(int)/******/
15 (*output)(n);
16 if (n == 1) return;
17 if (n % 2 == 0) {
18     n = (*even)(n);
19 } else {
20     n = (*odd)(n);
21 }
22 simulate(n, odd, even, output);
23 }
24
25 int main() {
26     int (*odd)(int) = NULL;
27     int (*even)(int) = NULL;
28
29     /******
30     Ho va ten : Brak Lihou
31     MSSV : 20200836
32     */
33     odd = mul3plus1;
34     even = div2;
35     /******
36
37     int n;
38     scanf("%d", &n);
39     simulate(n, odd, even, print);
40
41     return 0;
42 }
```

Bài 2.7. Viết hàm tính tổng các phần tử trong hai mảng.

Yêu cầu sử dụng function template để cho phép hàm làm việc với các mảng số nguyên lẫn số thực.

noodle/mod/quiz/review.php?attempt=59118

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Correct
Mark 10.00 out of 10.00
Flag question

Yêu cầu sử dụng function template để cho phép hàm làm việc với các mảng số nguyên lẫn số thực.

For example:

Input	Result
5	31 31.4

Answer: (penalty regime: 10, 20, ... %)

```

1 #include <iostream>
2 using namespace std;
3 /******
4  Ho va ten : Brak Lihou
5  MSSV : 20200836
6  */
7 template <typename T>
8
9 T arr_sum(T a[], int n, T b[], int m){
10     T sum;
11     for(int i=0; i<n; i++)
12         sum += a[i];
13     for(int i=0; i<m; i++)
14         sum += b[i];
15     return sum;
16 }
17 /******
18
19 int main() {
20     int val;

```

Check

quiz/review.php?attempt=59118

courses Theme colours This course 2 Brak Lihou

Input	Expected	Got
5	31 31.4	

Answer: (penalty regime: 10, 20, ... %)

```

16 }
17 /******
18
19 int main() {
20     int val;
21     cin >> val;
22
23     {
24         int a[] = {3, 2, 0, val};
25         int b[] = {5, 6, 1, 2, 7};
26         cout << arr_sum(a, 4, b, 5) << endl;
27     }
28
29     {
30         double a[] = {3.0, 2.0, 0, val * 1.0};
31         double b[] = {5, 6.1, 1, 2.3, 7};
32         cout << arr_sum(a, 4, b, 5) << endl;
33     }
34     return 0;
35 }

```

Check

```

32 }
33
34     return 0;
35 }

```

Check

	Input	Expected	Got	
✓	5	31 31.4	31 31.4	✓
✓	17	43 43.4	43 43.4	✓

Passed all tests! ✓

Correct

Báo Cao Thực hành buổi 2-Brak Lihou (20200836)

The image shows a C++ IDE with two windows. The top window displays the source code for a template function `arr_sum` and its usage in `main`. The bottom window shows the execution output, which includes the values of the arrays and the result of the function call.

```
1 #include <iostream>
2 using namespace std;
3 /*****
4  Ho va ten : Brak Lihou
5  MSSV : 20200836
6  */
7 template <typename T>
8
9 T arr_sum(T a[], int n, T b[], int m){
10     T sum;
11     for(int i=0; i<n; i++)
12         sum += a[i];
13     for(int i=0; i<m; i++)
14         sum += b[i];
15     return sum;
16 }
17 /*****/
18
19 int main() {
20     int val;
21     cin >> val;
22
23     {
24         int a[] = {3, 2, 0, val};
25         int b[] = {5, 6, 1, 2, 7};
26     }
```

Execution Output:

```
5
31
31.4
-----
Process exited after 13.6 seconds with return value 0
Press any key to continue . . .
```

```
12     sum += a[i];
13     for(int i=0; i<m; i++)
14         sum += b[i];
15     return sum;
16 }
17 /*****/
18
19 int main() {
20     int val;
21     cin >> val;
22
23     {
24         int a[] = {3, 2, 0, val};
25         int b[] = {5, 6, 1, 2, 7};
26         cout << arr_sum(a, 4, b, 5) << endl;
27     }
28     {
29         double a[] = {3.0, 2, 0, val * 1.0};
30         double b[] = {5, 6.1, 1, 2.3, 7};
31         cout << arr_sum(a, 4, b, 5) << endl;
32     }
33
34     return 0;
35 }
```

Bài 2.8. Viết hàm so sánh cho thuật toán sắp xếp.

moodle/mod/quiz/review.php?attempt=59118

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Correct
Mark 10.00 out of 10.00
Flag question

For example:

Input	Result
-10 -5	9 8 15 1 3 7 10 -5 2 3 4 -10

Answer: (penalty regime: 10, 20, ... %)

```

1 #include <iostream>
2 #include <vector>
3 #include <algorithm>
4 #include <numeric>
5
6 using namespace std;
7
8 int main() {
9     /*
10      * Ho va ten : Brak Lihou
11      * MSSV : 20200836
12      */
13     int val1, val2;
14
15     cin >> val1 >> val2;
16     vector< vector<int> > a = {
17         {1, 3, 7},
18         {2, 3, 4, val1},
19         {9, 8, 15},
20     }

```

moodle/mod/quiz/review.php?attempt=59118

My courses Theme colours This course 2 Brak Lihou

Correct
Mark 10.00 out of 10.00
Flag question

For example:

Input	Result
-10 -5	9 8 15 1 3 7 10 -5 2 3 4 -10

Answer: (penalty regime: 10, 20, ... %)

```

16 vector< vector<int> > a = {
17     {1, 3, 7},
18     {2, 3, 4, val1},
19     {9, 8, 15},
20     {10, val2},
21 };
22
23 sort(a.begin(), a.end(), [](vector<int> p, vector<int> q)->bool{
24     return accumulate(p.begin(), p.end(), 0) > accumulate(q.begin(), q.end(), 0);
25 });
26
27 for (const auto &v : a) {
28     for (int it : v) {
29         cout << it << ' ';
30     }
31     cout << endl;
32 }
33 return 0;
34 }

```

	Input	Expected	Got	
✓	-10 -5	9 8 15 1 3 7 10 -5 2 3 4 -10	9 8 15 1 3 7 10 -5 2 3 4 -10	✓
✓	100 -100	2 3 4 100 9 8 15 1 3 7 10 -100	2 3 4 100 9 8 15 1 3 7 10 -100	✓

Passed all tests! ✓

Correct

Made for this subcategory: 10.00/10.00

```

1 #include <iostream>
2 #include <vector>
3 #include <algorithm>
4 #include <numeric>
5
6 using namespace std;
7
8 int main() {
9     /*
10      * Ho va ten : Brak Lihou
11      * MSSV : 20200836
12      */
13     int val1, val2;
14
15     cin >> val1 >> val2;
16     vector< vector<int> > a = {
17         {1, 3, 7},
18         {2, 3, 4, val1},
19         {9, 8, 15},
20         {10, val2},
21     };
22
23     sort(a.begin(), a.end(), [](vector<int> p, vector<int> q)->bool{
24         return accumulate(p.begin(), p.end(), 0) > accumulate(q.begin(), q.end(), 0);
25     });
26
27     for (const auto &v : a) {
28         for (int it : v) {
29             cout << it << ' ';
30         }
31         cout << endl;
32     }
33     return 0;
34 }

```

Console Output:

```

-10 -5
9 8 15
1 3 7
10 -5
2 3 4 -10

...Program finished with exit code 0
Press ENTER to exit console.

```

Bài 2.9. Tính hàm sigmoid

Dưới đây cung cấp đoạn code đơn giản để tính hàm sigmoid theo công thức trực tiếp. Hãy viết hàm tính xấp xỉ sigmoid(x) đến độ chính xác 10^{-6} và có tốc độ nhanh hơn ít nhất 30% so với code đơn giản.

Gợi ý: sử dụng kỹ thuật "chuẩn bị trước" như trong slide.

The image shows two screenshots of a C++ code editor interface, likely from a course platform. The top screenshot displays a simple implementation of the sigmoid function using the formula $\frac{1}{1 + \exp(-x)}$. The bottom screenshot shows a more complex and optimized implementation using a precalculated table and a range-based approximation.

Top Screenshot Code:

```
1 #include <vector>
2 #include <algorithm>
3 #include <cmath>
4 #include <ctime>
5 #include <algorithm>
6 #include <cstdio>
7 #include <iostream>
8 using namespace std;
9 const int LIMIT = 100;
10 const int NUM_ITER = 100000;
11 const int NUM_INPUTS = NUM_ITER * 100;
12 double sigmoid_slow(double x) {
13     return 1.0 / (1.0 + exp(-x));
14 }
15 double x[NUM_INPUTS];
16 void prepare_input() {
17     const int PRECISION = 1000000;
18     const double RANGE = LIMIT / 20.0;
19     for (int i = 0; i < NUM_INPUTS; ++i) {
```

Bottom Screenshot Code:

```
18 const double RANGE = LIMIT / 20.0;
19 for (int i = 0; i < NUM_INPUTS; ++i) {
20     x[i] = RANGE * (rand() % PRECISION - rand() % PRECISION) / PRECISION;
21 }
22 #define MAX_N 100000
23 #define denta 0.0001
24 double sigmoid[MAX_N];
25 const double start = -5.0;
26 const double stop = 5.0;
27 void precalc() {
28     double foo = start;
29     for (int i = 0; i < MAX_N; ++i) {
30         sigmoid[i] = sigmoid_slow(foo);
31         foo += denta;
32     }
33 }
34 inline double sigmoid_fast(double x) {
```

The image displays three sequential screenshots of a C++ code submission interface, likely from a platform like LeetCode or a similar coding challenge site. The interface includes a header with the URL 'view.php?attempt=59118', a navigation bar with 'Theme colours' and 'This course', and a user profile 'Brak Lihou'.

Top Screenshot: Shows the 'Input' and 'Result' table with the input '1.5' and result '0.82'. The 'Answer' section indicates a 'penalty regime: 10, 20, ... %'. The code snippet shows a benchmark function that calculates the sigmoid of a vector of doubles. The code is partially visible, showing lines 34 to 53.

Middle Screenshot: Shows the same 'Input' and 'Result' table. The 'Answer' section indicates a 'penalty regime: 10, 20, ... %'. The code snippet shows a benchmark function that calculates the sigmoid of a vector of doubles. The code is partially visible, showing lines 51 to 70.

Bottom Screenshot: Shows the same 'Input' and 'Result' table. The 'Answer' section indicates a 'penalty regime: 10, 20, ... %'. The code snippet shows a benchmark function that calculates the sigmoid of a vector of doubles. The code is partially visible, showing lines 68 to 86.

Báo Cao Thực hành buổi 2-Brak Lihou (20200836)

ooodle/mod/quiz/review.php?attempt=59118

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Mark 20.00 out of 20.00

Flag question

Hãy viết hàm tính xấp xỉ sigmoid(x) đến độ chính xác 10⁻⁶ và có tốc độ nhanh hơn ít nhất 30% so với code đơn giản.

Gợi ý: sử dụng kỹ thuật "chuẩn bị trước" như trong slide.

For example:

Input	Result
1.5	0.82 Correct answer! Your code is faster at least 30%!

Answer: (penalty regime: 10, 20, ... %)

```
83 precalc();
84
85 vector<double> a, b;
86 double slow = benchmark(sigmoid_slow, a);
87 double fast = benchmark(sigmoid_fast, b);
88
89 double xval;
90 scanf("%lf", &xval);
91 printf("%.2f\n", sigmoid_fast(xval));
92
93 if (is_correct(a, b) && (slow/fast > 1.3)) {
94     printf("Correct answer! Your code is faster at least 30%%!\n");
95 } else {
96     printf("Correct answer! Your code is faster at least 30%%!\n");
97 }
98
99 return 0;
100 }
101
```

	Input	Expected	Got
✓	1.5	0.82 Correct answer! Your code is faster at least 30%!	0.82 Correct answer! Your code is faster at least 30%!
✓	2.15	0.90 Correct answer! Your code is faster at least 30%!	0.90 Correct answer! Your code is faster at least 30%!

Passed all tests! ✓

Correct

Marks for this submission: 20.00/20.00.

Project Execute Tools AStyle Window Help

TDM-GCC 4.9.2 64-bit Debug

bai1.cpp bai2.cpp bai3.cpp bai4.cpp bai5.cpp bai6.cpp bai7.cpp bai8.cpp bai9.cpp

```
1 #include <vector>
2 #include <algorithm>
3 #include <cmath>
4 #include <ctime>
5 #include <algorithm>
6 #include <cstdio>
7 #include <iostream>
8 using namespace std;
9 const int LIMIT = 100;
10 const int NUM_ITER = 100000;
11 const int NUM_INPUTS = NUM_ITER * 100;
12 double sigmoid_slow(double x) {
13     return 1.0 / (1.0 + exp(-x));
14 }
15 double x[NUM_INPUTS];
16 void prepare_input() {
17     const int PRECISION = 1000000;
18     const double RANGE = LIMIT / 20.0;
19     for (int i = 0; i < NUM_INPUTS; ++i) {
20         x[i] = RANGE * (rand() % PRECISION - rand() % PRECISION) / PRECISION;
21     }
22 }
23 #define MAX_N 100000
24 #define denta 0.0001
25 double sigmoid[MAX_N];
```

C:\Users\Anh Xa\Desktop\thuc_hanh_so_2\bai9.exe

```
1.5
0.82
Correct answer! Your code is faster at least 30%!
-----
Process exited after 4.939 seconds with return value 0
Press any key to continue . . .
```

Báo Cao Thực hành buổi 2-Brak Lihou (20200836)

```
tNthuc_hanh_so_2\bai9.cpp - Dev-C++ 5.11
Project Execute Tools AStyle Window Help
IDM-GCC 4.9.2 64-bit Debug

bai1.cpp bai2.cpp bai3.cpp bai4.cpp bai5.cpp bai6.cpp bai7.cpp bai8.cpp bai9.cpp
22 }
23 #define MAX_N 100000
24 #define denta 0.0001
25 double sigmoid[MAX_N];
26 const double start = -5.0;
27 const double stop = 5.0;
28 void precalc() {
29
30     double foo = start;
31     for(int i=0; i<MAX_N; i++){
32         sigmoid[i] = sigmoid_slow(foo);
33         foo += denta;
34     }
35 }
36 inline double sigmoid_fast(double x) {
37     if(x < start) return 0.0;
38     if(x > stop) return 1.0;
39     int i = floor((x - start) / denta);
40     return sigmoid[i] + ((sigmoid[i+1] - sigmoid[i]) * (x - start - i*denta)) / (denta);
41 }
42 double benchmark(double (*calc)(double), vector<double> &result) {
43     const int NUM_TEST = 20;
44
45     double taken = 0;
46     result = vector<double>();
47
48     int input_id = 0;
49     clock_t start = clock();
50     for (int t = 0; t < NUM_TEST; ++t) {
51         double sum = 0;
52         for (int i = 0; i < NUM_ITER; ++i) {
53             double v = fabs(calc(x[input_id]));
54             sum += v;
55             if (t == 0) result.push_back(v);
56             if ((++input_id) == NUM_INPUTS) input_id = 0;
57         }
58     }
59     clock_t finish = clock();
60     taken = (double)(finish - start);
61     return taken;
62 }
63
64 bool is_correct(const vector<double> &a, const vector<double> &b) {
65     const double EPS = 1e-6;
66
67     if (a.size() != b.size()) return false;
68     for (unsigned int i = 0; i < a.size(); ++i) {
69         if (fabs(a[i] - b[i]) > EPS) {
70             return false;
71         }
72     }
73     return true;
74 }
75
76 int main() {
77     /*
78     Ho va ten : Brak Lihou
79     MSSV : 20200836
80     */
81     prepare_input();
82     precalc();
83
84     vector<double> a, b;
85     double slow = benchmark(sigmoid_slow, a);
86     double fast = benchmark(sigmoid_fast, b);
87
88     double xval;
89     scanf("%lf", &xval);
90     printf("%.2f \n", sigmoid_fast(xval));
91
92     if (is_correct(a, b) && (slow/fast > 1.3)) {
93         printf("Correct answer! Your code is faster at least 30%%!\n");
94     }
```

```
t:\thuc_hanh_so_2\bai9.cpp - Dev-C++ 5.11
Project Execute Tools AStyle Window Help
TDM-GCC 4.9.2 64-bit Debug

bai1.cpp bai2.cpp bai3.cpp bai4.cpp bai5.cpp bai6.cpp bai7.cpp bai8.cpp bai9.cpp
78
79  /*
80  Ho va ten : Brak Lihou
81  MSSV : 20200836
82  */
83  prepare_input();
84  precalc();
85
86  vector<double> a, b;
87  double slow = benchmark(sigmoid_slow, a);
88  double fast = benchmark(sigmoid_fast, b);
89
90  double xval;
91  scanf("%lf", &xval);
92  printf("%.2f \n", sigmoid_fast(xval));
93
94  if (is_correct(a, b) && (slow/fast > 1.3)) {
95      printf("Correct answer! Your code is faster at least 30%%!\n");
96  } else {
97      printf("Correct answer! Your code is faster at least 30%%!\n");
98  }
99
100  return 0;
101 }
```

Bài tập về nhà

Bài tập 11: Tính tích hai đa thức

Cho 2 đa thức $A(x)$ và $B(x)$ tương ứng có bậc NN và MM . Hãy tính ma trận tích $C(x) = A(x) * B(x)$ có bậc $N+M-1$.

```
rg/moodle/mod/vpl/forms/submissionview.php?id=1815&userid=14482
My courses Theme colours This course 2 Brak Lihou
Description Submission Edit Submission view
Grade
Reviewed on Monday, 30 May 2022, 9:46 PM by Automatic grade
grade: 100.00 / 100.00
Assessment report[-]
[+]Kết quả chạy chương trình:
Submitted on Monday, 30 May 2022, 5:00 PM (Download)
bai11.cpp
1 #include<bits/stdc++.h>
2 using namespace std;
3
4 typedef complex<double> base;
5 typedef vector<base> vb;
6
7 void input(int &n, int &m, vb &x, vb &y){
8     cin >> n;
9     for(int i=0; i<=n; i++){
10         int tmp;
11         cin >> tmp;
12         base mycomplex(tmp,0);
13         x.push_back(mycomplex);
14     }
15
16     cin >> m;
17     for(int i=0; i<=m; i++){
18         int tmp;
19         cin >> tmp;
20         base mycomplex(tmp,0);
21         y.push_back(mycomplex);
22     }
23 }
```

Báo Cao Thực hành buổi 2-Brak Lihou (20200836)

The image displays a C++ code submission and its execution. The top section shows two snippets of code from a submission page, and the bottom section shows a full IDE view with a main.cpp file and a terminal window.

Snippet 1 (Top):

```
16
17 cin >> m;
18 for(int i=0; i<=m; i++){
19     int tmp;
20     cin >> tmp;
21
22     base mycomplex(tmp,0);
23     y.push_back(mycomplex);
24 }
25
26
27 void fft(vb &a, bool revert){
28     int n = (int)a.size();
29
30     for(int i=1, j=0; i<n; i++){
31         int bit = n >> 1;
32         while(j >= bit){
33             j -= bit;
34             bit = bit >> 1;
35         }
36         j += bit;
37         if (i < j)
38             swap(a[i], a[j]);
39     }
40
41     for(int len=2; len<=n; len<=1){
42         double ang = 2*M_PI/len;
43         if(revert==1) ang=-ang;
44         complex<double> wlen(cos(ang), sin(ang));
45         for(int i=0; i<n; i+=len){
46             complex<double> w(1);
47             for(int j=0; j<len/2; j++){
48                 complex<double> u = a[i+j], v = a[i+j+len/2] * w;
49                 a[i+j] = u + v;
50                 a[i+j+len/2] = u - v;
51                 w = w * wlen;
52             }
53         }
54     }
55     if(revert==1)
56         for(int i=0; i<n; i++)
57             a[i] /= n;
58 }
59
```

Snippet 2 (Middle):

```
59
60 int multiPly(int n, int m, vb x, vb y){
61     int p = 1;
62     while(p < max(n, m)) p=p<<1;
63     p=p<<1;
64     x.resize(p);
65     y.resize(p);
66
67     fft(x, false);
68     fft(y, false);
69
70     vector<base> h(p);
71     for(int i=0; i<p; i++){
72         h[i] = x[i]*y[i];
73     }
74     fft(h, true);
75
76     int res = (int)(real(h[0])+0.5);
77     for(int i=1; i<p; i++){
78         res = res + (int)(real(h[i])+0.5);
79     }
80
81     return res;
82 }
83
84 int main(){
85     int n, m;
86     vector<base> x, y;
87     input(n, m, x, y);
88     cout << multiPly(n, m, x, y);
89 }
90
```

Full IDE View (Bottom):

The IDE shows a project named "bai1.cpp" with a file named "bai11.cpp". The code in "bai11.cpp" is as follows:

```
1 #include<bits/stdc++.h>
2 using namespace std;
3
4 typedef complex<double> base;
5 typedef vector<base> vb;
6
7 void input(int &n, int &m, vb &x, vb &y){
8     cin >> n;
9     for(int i=0; i<=n; i++){
10         int tmp;
11         cin >> tmp;
12
13         base mycomplex(tmp,0);
14         x.push_back(mycomplex);
15     }
16
17     cin >> m;
18     for(int i=0; i<=m; i++){
19         int tmp;
20         cin >> tmp;
21
22         base mycomplex(tmp,0);
23         y.push_back(mycomplex);
24     }
25 }
```

The terminal window shows the output of the program:

```
C:\Users\Anh Xa\Desktop\thuc_hanh_so_2\bai11.exe
3 83 86 77 15
4 93 35 86 92 49
20731
-----
Process exited after 32.42 seconds with return value 0
Press any key to continue . . .
```

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```
N\thuc_hanh_so_2\bai11.cpp - [Executing] - Dev-C++ 5.11
Project Execute Tools AStyle Window Help
TDM-GCC 4.9.2 64-bit Debug

bai1.cpp bai2.cpp bai3.cpp bai4.cpp bai5.cpp bai6.cpp bai7.cpp bai8.cpp bai9.cpp bai11.cpp
25 }
26
27 void fft(vb & a, bool revert){
28     int n = (int)a.size();
29
30     for(int i=1, j=0; i<n; ++i){
31         int bit = n >> 1;
32         while(j<bit){
33             j = j - bit;
34             bit = bit >> 1;
35         }
36         j = j + bit;
37         if (i < j)
38             swap (a[i], a[j]);
39     }
40
41     for(int len=2; len<=n; len<=1){
42         double ang = 2*M_PI/len;
43         if(revert==1) ang=-ang;
44         complex<double> wlen (cos(ang), sin(ang));
45         for (int i=0; i<n; i+=len) {
46             complex<double> w (1);
47             for (int j=0; j<len/2; ++j) {
48                 complex<double> u = a[i+j], v = a[i+j+len/2] * w;
49                 a[i+j] = u + v;
50                 a[i+j+len/2] = u - v;
51                 w = w * wlen;
52             }
53         }
54     }
55     if(revert==1)
56         for(int i=0; i<n; ++i)
57             a[i] /=n;
58 }
59
60 int multiPly(int n, int m, vb x, vb y){
61     int p = 1;
62     while(p < max (n, m)) p=p<<1;
63     p=p<<1;
64     x.resize(p);
65     y.resize(p);
66
67     fft(x, false);
68     fft(y, false);
69
70     vector<base> h(p);
71     for (int i=0; i<p; i++)
72         h[i] =x[i]*y[i];
73
74     fft (h, true);
75
76     int res = (int)(real(h[0])+0.5);
77     for (int i=1; i<=p; i++){
78         res = res ^ (int)(real(h[i])+0.5);
79     }
80
81     return res;
82 }
83
84 int main(){
85     int n, m;
86     vector<base> x,y;
87     input(n,m,x,y);
88     cout << multiPly(n,m,x,y);
89 }
```

```
N\thuc_hanh_so_2\bai11.cpp - [Executing] - Dev-C++ 5.11
Project Execute Tools AStyle Window Help
TDM-GCC 4.9.2 64-bit Debug

bai1.cpp bai2.cpp bai3.cpp bai4.cpp bai5.cpp bai6.cpp bai7.cpp bai8.cpp bai9.cpp bai11.cpp
46     complex<double> w (1);
47     for (int j=0; j<len/2; ++j) {
48         complex<double> u = a[i+j], v = a[i+j+len/2] * w;
49         a[i+j] = u + v;
50         a[i+j+len/2] = u - v;
51         w = w * wlen;
52     }
53 }
54 }
55 if(revert==1)
56     for(int i=0; i<n; ++i)
57         a[i] /=n;
58 }
59
60 int multiPly(int n, int m, vb x, vb y){
61     int p = 1;
62     while(p < max (n, m)) p=p<<1;
63     p=p<<1;
64     x.resize(p);
65     y.resize(p);
66
67     fft(x, false);
68     fft(y, false);
69
70     vector<base> h(p);
71     for (int i=0; i<p; i++)
72         h[i] =x[i]*y[i];
73
74     fft (h, true);
75
76     int res = (int)(real(h[0])+0.5);
77     for (int i=1; i<=p; i++){
78         res = res ^ (int)(real(h[i])+0.5);
79     }
80
81     return res;
82 }
83
84 int main(){
85     int n, m;
86     vector<base> x,y;
87     input(n,m,x,y);
88     cout << multiPly(n,m,x,y);
89 }
```

```
N\thuc_hanh_so_2\bai11.cpp - [Executing] - Dev-C++ 5.11
Project Execute Tools AStyle Window Help
TDM-GCC 4.9.2 64-bit Debug

bai1.cpp bai2.cpp bai3.cpp bai4.cpp bai5.cpp bai6.cpp bai7.cpp bai8.cpp bai9.cpp bai11.cpp
66
67     fft(x, false);
68     fft(y, false);
69
70     vector<base> h(p);
71     for (int i=0; i<p; i++)
72         h[i] =x[i]*y[i];
73
74     fft (h, true);
75
76     int res = (int)(real(h[0])+0.5);
77     for (int i=1; i<=p; i++){
78         res = res ^ (int)(real(h[i])+0.5);
79     }
80
81     return res;
82 }
83
84 int main(){
85     int n, m;
86     vector<base> x,y;
87     input(n,m,x,y);
88     cout << multiPly(n,m,x,y);
89 }
```

es Compile Log Debug Find Results

1 Cal: 0 1 inec: 80 1 en insert Done narciss in 0.031 seconds

Bài tập 12: Map Sort

Hôm nay, cô giáo giao cho An một câu hỏi học búa. Cô cho một danh sách với mỗi phần tử có dạng <key, value> và yêu cầu An sắp xếp danh sách đó giảm dần theo giá trị value. Nếu 2 phần tử có value giống nhau thì sắp xếp giảm dần theo key.

Hãy viết một chương trình sử dụng hàm nặc danh để giúp An làm bài tập.

rg/moodle/mod/vpl/forms/submissionview.php?id=1876&userid=14482

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Description Submission Edit Submission view

Grade

Reviewed on Monday, 30 May 2022, 9:47 PM by Automatic grade
grade: 100.00 / 100.00

Assessment report[-]
[+]Kết quả chạy chương trình:
Submitted on Monday, 30 May 2022, 5:15 PM (Download)

bai12.cpp

```
1 #include <bits/stdc++.h>
2 using namespace std;
3
4 struct element {
5     int key;
6     int value;
7 };
8
9 vector<element> lst;
10 void input(){
11     int tmp1, tmp2;
12     while(cin >> tmp1 && cin >> tmp2){
13         element tmp;
14         tmp.key = tmp1;
15         tmp.value = tmp2;
16         lst.push_back(tmp);
17     }
18 }
19
20 void print(){
21     for(int i=0; i<lst.size(); i++){
22         cout << lst[i].key << " " << lst[i].value << endl;
23     }
24 }
```

odle/mod/vpl/forms/submissionview.php?id=1876&userid=14482

My courses Theme colours This course 2 Brak Lihou

```
9 vector<element> lst;
10 void input(){
11     int tmp1, tmp2;
12     while(cin >> tmp1 && cin >> tmp2){
13         element tmp;
14         tmp.key = tmp1;
15         tmp.value = tmp2;
16         lst.push_back(tmp);
17     }
18 }
19
20 void print(){
21     for(int i=0; i<lst.size(); i++){
22         cout << lst[i].key << " " << lst[i].value << endl;
23     }
24 }
25
26 int main(){
27     input();
28     sort(lst.begin(), lst.end(), [](element a, element b){
29         if(a.value > b.value) return true;
30         else if (a.value < b.value) return false;
31         else {
32             return a.key >= b.key;
33         }
34     });
35     print();
36 }
```

VPL

The screenshot shows a C++ IDE with two windows. The top window displays the source code for a program that reads pairs of integers, stores them in a vector, and prints them. The bottom window shows the execution output, which lists the input pairs and a confirmation message.

```

1 #include<bits/stdc++.h>
2 using namespace std;
3 struct element {
4     int key;
5     int value;
6 };
7
8 vector<element> lst;
9 void input(){
10     int tmp1, tmp2;
11     while(cin >> tmp1 && cin >> tmp2){
12         element tmp;
13         tmp.key = tmp1;
14         tmp.value = tmp2;
15
16         lst.push_back(tmp);
17     }
18 }
19
20 void print(){
21     for(int i=0; i<lst.size(); i++){
22         cout << lst[i].key << " " << lst[i].value << endl;
23     }
24 }
25
26 int main(){
27     input();
28     sort(lst.begin(),lst.end(),[] (element a, element b){
29         if(a.value > b.value) return true;
30         else if (a.value < b.value) return false;
31         else {
32             return a.key >= b.key;
33         }
34     });
35     print();
36 }

```

Execution Output:

```

2 3
4 8
9 1
1 8
.
4 8
1 8
2 3
9 1

...Program finished with exit code 0
Press ENTER to exit console.

```

Bài tập 13: Big Integer

Số nguyên lớn là các số nguyên có giá trị rất lớn và không thể biểu diễn bằng các kiểu dữ liệu nguyên cơ bản. Để biểu diễn số nguyên lớn, ta có thể dùng kiểu struct như sau:

```

struct bigNum{
    char sign;
    char num[101];
};

```

Nhiệm vụ các bạn là đa năng hóa các toán tử để thực hiện các phép toán số học với kiểu dữ liệu số nguyên lớn vừa định nghĩa ở trên.

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org/moodle/mod/vpl/forms/submissionview.php?id=1879&userid=14482

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Description Submission Edit Submission view

Grade

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grade: 100.00 / 100.00

Assessment report[-]

[+] **Kết quả chạy chương trình:**
Submitted on Monday, 30 May 2022, 5:15 PM (Download)

bai13.cpp

```
1 #include<bits/stdc++.h>
2 using namespace std;
3
4 struct bigNum {
5     char sign;
6     char num[101];
7 };
8
9 // input and preprocess data
10 void input(bigNum &num1, bigNum &num2){
11     string tmp;
12     cin >> tmp;
13     num1.sign = tmp[0];
14     int lens1 = tmp.length() - 1;
15     for(int i=0; i<lens1; i++){
16         num1.num[100-lens1+i+1] = tmp[i+1];
17     }
18     for(int i=0; i<100-lens1+1; i++) num1.num[i] = '0';
19
20     cin >> tmp;
21     num2.sign = tmp[0];
22     int lens2 = tmp.length() - 1;
23     for(int i=0; i<lens2; i++){
24         num2.num[100-lens2+i+1] = tmp[i+1];
25     }
26     for(int i=0; i<100-lens2+1; i++) num2.num[i] = '0';
27 }
28
29 // add 2 positive big number
30 void add(char res[], char *num1, char *num2){
31     int c = 0;
32
33     for(int i=100; i>=0; i--){
34         int tmp = (int)num1[i] - 48 + (int)num2[i] - 48 + c;
35         c = tmp / 10;
36         res[i] = tmp % 10 + 48;
37     }
38 }
39
40 // sub 2 positive big number, num1 > num2
41 void sub(char res[], char *num1, char *num2){
42     int c = 0;
43
44     for(int i=100; i>=0; i--){
45         int tmp1 = (int)num1[i] - 48;
46         int tmp2 = (int)num2[i] - 48;
47
48         if(tmp1 >= tmp2 + c){
49             res[i] = tmp1 - tmp2 - c + 48;
50             c = 0;
51         } else {
52             tmp1 = tmp1 + 10;
53             res[i] = tmp1 - tmp2 - c + 48;
54             c = 1;
55         }
56     }
57 }
58
59 // multi 2 positive big number
60 void multi(char res[], char *num1, char *num2){
61     // clear array res
62     for(int i=0; i<101; i++) res[i] = '0';
63
64     for(int i=100; i>=0; i--){
65         // init 1 array temp
66         char tmp[101];
67
68         // add 1 number 0 to last array
69         int k;
70         for(k=0; k<i; k++){
71             tmp[100-k] = '0';
72         }
73
74         int c = 0, sum = 0;
75         for(int j=100; j>=0; j--){
76             sum = ((int)num1[i] - 48) * ((int)num2[j] - 48) + c;
77             tmp[k] = (sum % 10) + 48;
78             c = sum / 10;
79             k--; if(k < 0) break;
80         }
81         add(res, tmp, res);
82     }
83 }
84
85 // check number1 >= number2
86 bool check(char *num1, char *num2){
87     int foo1, foo2;
88     for(foo1=0; foo1<101; foo1++){
89         if(num1[foo1] != '0') break;
90     }
91
92     for(foo2=0; foo2<101; foo2++){
93         if(num2[foo2] != '0') break;
94     }
95
96     if(foo1 > foo2) return false;
97     else if(foo1 < foo2) return true;
98     else { // foo1 == foo2
99         int foo = foo1;
100         while(foo < 101){
101             if(num1[foo] < num2[foo]) return false;
102             else if(num1[foo] > num2[foo]) return true;
```


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```
odle/mod/vpl/forms/submissionview.php?id=1879&userid=14482
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101     if(num1[foo] < num2[foo]) return false;
102     else if (num1[foo] > num2[foo]) return true;
103     else {
104         foo++;
105     }
106 }
107 }
108 return true;
109 }
110 }
111 // overloading operator "+"
112 bigNum operator + (bigNum num1, bigNum num2){
113     bigNum res;
114     if(num1.sign == '1' && num2.sign == '1'){
115         res.sign = '1';
116         add(res.num,num1.num,num2.num);
117         return res;
118     } else if(num1.sign == '1' && num2.sign == '0'){
119         if(check(num1.num,num2.num)){
120             res.sign = '1';
121             sub(res.num,num1.num,num2.num);
122             return res;
123         } else {
124             res.sign = '0';
125             sub(res.num,num2.num,num1.num);
126             return res;
127         }
128     } else if(num1.sign == '0' && num2.sign == '1'){
129         if(check(num1.num,num2.num)){
130             res.sign = '0';
131             sub(res.num,num1.num,num2.num);
132             return res;
133         } else {
134             res.sign = '1';
135             sub(res.num,num2.num,num1.num);
136             return res;
137         }
138     } else {
139         res.sign = '0';
140         add(res.num,num1.num,num2.num);
141         return res;
142     }
143 }
144 }
145 }
146 bigNum operator - (bigNum num1, bigNum num2){
147     bigNum res;
148     if(num1.sign == '1' && num2.sign == '0'){
149         num2.sign = '1';
150         res = num1 + num2;
151         return res;
152     } else if(num1.sign == '1' && num2.sign == '1'){
153         num2.sign = '0';
154         res = num1 + num2;
155         return res;
156     } else if(num1.sign == '0' && num2.sign == '1'){
157         num2.sign = '0';
158         res = num1 + num2;
159         return res;
160     } else {
161         num2.sign = '1';
162         res = num1 + num2;
163         return res;
164     }
165 }
166 }
167 }
168 bigNum operator * (bigNum num1, bigNum num2){
169     bigNum res;
170     if(num1.sign == '1' && num2.sign == '1'){
171         res.sign = '1';
172         multi(res.num,num1.num,num2.num);
173         return res;
174     } else if(num1.sign == '1' && num2.sign == '0'){
175         res.sign = '0';
176         multi(res.num,num1.num,num2.num);
177         return res;
178     }
179 }
180 }
181 } else if(num1.sign == '0' && num2.sign == '1'){
182     res.sign = '0';
183     multi(res.num,num1.num,num2.num);
184     return res;
185 } else {
186     res.sign = '1';
187     multi(res.num,num1.num,num2.num);
188     return res;
189 }
190 }
191 // print bignumber
192 void printBigNumber(bigNum number){
193     cout << number.sign;
194     int start;
195     for(start=0; start<101; start++){
196         if(number.num[start] != '0') break;
197     }
198     for(int i = start; i<101; i++){
199         cout << number.num[i];
200     }
201 }
202 int main(){
203     bigNum num1, num2;
204     Input(num1,num2);
205     bigNum so3, so4;
206     so3.sign = '1', so4.sign = '1';
207     for(int i=0; i<100; i++){
208         so3.num[i] = '0';
209         so4.num[i] = '0';
210     }
211     so3.num[100] = 3 + 48;
212     so4.num[100] = 4 + 48;
213     bigNum res = num1*num2 - so3 * num1 + so4 * num2;
214     printBigNumber(res);
215 }
216 }
217 }
218 }
```

The image shows a C++ IDE with three windows. The top window displays the first part of a C++ program. The middle window shows the continuation of the code, including functions for adding and subtracting big numbers. The bottom window shows the final part of the code, including a function for multiplying big numbers. A terminal window is also open, showing the output of the program.

```

1 #include<bits/stdc++.h>
2 using namespace std;
3
4 struct bigNum {
5     char sign;
6     char num[101];
7 };
8
9 // input and preprocess data
10 void input(bigNum &num1, bigNum &num2){
11     string tmp;
12     cin >> tmp;
13     num1.sign = tmp[0];
14     int lens1 = tmp.length() - 1;
15     for(int i=0; i<lens1; i++){
16         num1.num[100-lens1+i+1] = tmp[i+1];
17     }
18     for(int i=0; i<100-lens1+1; i++) num1.num[i] = '0';
19
20     cin >> tmp;
21     num2.sign = tmp[0];
22     int lens2 = tmp.length() - 1;
23     for(int i=0; i<lens2; i++){
24         num2.num[100-lens2+i+1] = tmp[i+1];
25     }
26 }
27
28 // add 2 positive big number
29 void add(char res[], char *num1, char *num2){
30     int c = 0;
31
32     for(int i=100; i>=0; i--){
33         int tmp = (int)num1[i] - 48 + (int)num2[i] - 48 + c;
34         c = tmp / 10;
35         res[i] = tmp % 10 + 48;
36     }
37 }
38
39 // sub 2 positive big number, num1 > num2
40 void sub(char res[], char *num1, char *num2){
41     int c = 0;
42
43     for(int i=100; i>=0; i--){
44         int tmp1 = (int)num1[i] - 48;
45         int tmp2 = (int)num2[i] - 48;
46         int tmp = tmp1 - tmp2 - c;
47         if(tmp >= 0){
48             res[i] = tmp + 48;
49             c = 0;
50         } else {
51             tmp1 = tmp1 + 10;
52             res[i] = tmp1 - tmp2 - c + 48;
53             c = 1;
54         }
55     }
56 }
57
58 // multi 2 positive big number
59 void multi(char res[], char *num1, char *num2){
60     // clear array res
61     for(int i=0; i<101; i++) res[i] = '0';
62
63     // init 1 array temp
64     char tmp[101];
65
66     // add i number 0 to last array
67     int k;
68     for(k = 0; k < i; k++)

```

The terminal window shows the output of the program:

```

0421867015
1347227347
042294724910108772
-----
Process exited after 81.29 seconds with return value
0
Press any key to continue . . .

```

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```
N:\thuc_hanh_so_2\bai13.cpp - [Executing] - Dev-C++ 5.11
Project Execute Tools AStyle Window Help
TDM-GCC 4.9.2 64-bit Debug




bai1.cpp bai2.cpp bai3.cpp bai4.cpp bai5.cpp bai6.cpp bai7.cpp bai8.cpp bai9.cpp bai11.cpp bai12.cpp bai13.cpp
70     for(k = 0; k < i; k++)
71         tmp[100-k] = '0';
72
73     int c = 0, sum = 0;
74     for(int j=100; j>=0; j--){
75         sum = ((int)num1[i] - 48) * ((int)num2[j] - 48) + c;
76         tmp[k] = (sum % 10) + 48;
77         c = sum / 10;
78         k--; if(k < 0) break;
79     }
80
81     add(res,tmp,res);
82 }
83 }
84
85 // check number1 >= number2
86 bool check(char *num1, char *num2){
87     int foo1, foo2;
88     for(foo1 = 0; foo1 < 101; foo1++){
89         if(num1[foo1] != '0') break;
90     }
91
92     for(foo2 = 0; foo2 < 101; foo2++){
93         if(num2[foo2] != '0') break;
94     }
95
96     if(foo1 > foo2) return false;
97     else if(foo1 < foo2) return true;
98     else { // foo1 == foo2
99         int foo = foo1;
100         while(foo < 101){
101             if(num1[foo] < num2[foo]) return false;
102             else if (num1[foo] > num2[foo]) return true;
103             else {
104                 foo++;
105             }
106         }
107     }
108
109     return true;
110 }
111
112 // overloading operator "+"
113 bigNum operator + (bigNum num1, bigNum num2){
114     bigNum res;
115
116     if(num1.sign == '1' && num2.sign == '1'){
117         res.sign = '1';
118         add(res.num,num1.num,num2.num);
119         return res;
120     } else if(num1.sign == '1' && num2.sign == '0'){
121         if(check(num1.num,num2.num)){
122             res.sign = '1';
123             sub(res.num,num1.num,num2.num);
124             return res;
125         } else {
126             res.sign = '0';
127             sub(res.num,num2.num,num1.num);
128             return res;
129         }
130     } else if(num1.sign == '0' && num2.sign == '1'){
131         if(check(num1.num,num2.num)){
132             res.sign = '0';
133             sub(res.num,num1.num,num2.num);
134             return res;
135         } else {
136             res.sign = '1';
137             sub(res.num,num2.num,num1.num);
138             return res;
139         }
140     }
141 }
```

Báo Cao Thực hành buổi 2-Brak Lihou (20200836)

```
Nhthuc_hanh_so_2\bai3.cpp - Dev-C++ 5.11
Project Execute Tools AStyle Window Help
TDM-GCC 4.9.2 64-bit Debug

bai1.cpp bai2.cpp bai3.cpp bai4.cpp bai5.cpp bai6.cpp bai7.cpp bai8.cpp bai9.cpp bai11.cpp bai12.cpp bai13.cpp
139 }
140 } else {
141     res.sign = '0';
142     add(res.num, num1.num, num2.num);
143     return res;
144 }
145 }
146
147 bigNum operator - (bigNum num1, bigNum num2){
148     bigNum res;
149
150     if(num1.sign == '1' && num2.sign == '0'){
151         num2.sign = '1';
152         res = num1 + num2;
153         return res;
154     } else if(num1.sign == '1' && num2.sign == '1'){
155         num2.sign = '0';
156         res = num1 + num2;
157         return res;
158     } else if(num1.sign == '0' && num2.sign == '1'){
159         num2.sign = '0';
160         res = num1 + num2;
161         return res;
162     } else {
163         num2.sign = '1';
164
165         num2.sign = '1';
166         res = num1 + num2;
167         return res;
168     }
169
170 bigNum operator * (bigNum num1, bigNum num2){
171     bigNum res;
172
173     if(num1.sign == '1' && num2.sign == '1'){
174         res.sign = '1';
175         multi(res.num, num1.num, num2.num);
176         return res;
177     } else if(num1.sign == '1' && num2.sign == '0'){
178         res.sign = '0';
179         multi(res.num, num1.num, num2.num);
180         return res;
181     } else if(num1.sign == '0' && num2.sign == '1'){
182         res.sign = '0';
183         multi(res.num, num1.num, num2.num);
184         return res;
185     } else {
186         res.sign = '1';
187         multi(res.num, num1.num, num2.num);
188         return res;
189     }
190
191 // print bignumber
192 void printBigNumber(bigNum number){
193     cout << number.sign;
194     int start;
195     for(start=0; start<101; start++){
196         if(number.num[start] != '0') break;
197     }
198     for(int i = start; i<101; i++){
199         cout << number.num[i];
200     }
201
202 int main(){
203     bigNum num1, num2;
204     input(num1, num2);
205
206     bigNum so3, so4;
207     so3.sign = '1', so4.sign = '1';
208     for(int i=0; i<100; i++){
209         so3 = so3 + so4;
210         so4 = so4 * so3;
211     }
212     printBigNumber(so3);
213     printBigNumber(so4);
214 }
```

```
205  
206     bigNum so3, so4;  
207     so3.sign = '1', so4.sign = '1';  
208     for(int i=0; i<100; i++){  
209         so3.num[i] = '0';  
210         so4.num[i] = '0';  
211     }  
212     so3.num[100] = 3 + 48;  
213     so4.num[100] = 4 + 48;  
214  
215     bigNum res = num1*num2 - so3 * num1 + so4 * num2;  
216  
217     printBigNumber(res);  
218 }
```

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