

以 P. 324 - P. 325 例 10.10 为基础并进行适当扩展, 讨论转换构造函数及类型转换函数的使用, 完成下列文档

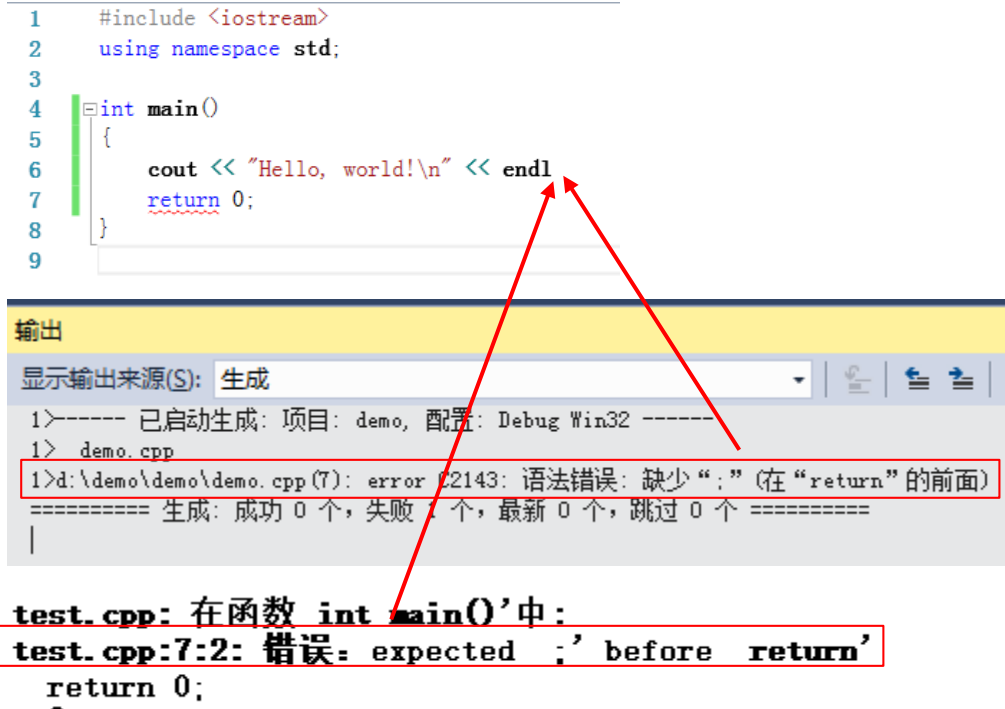
【填写方法:】

- 1、依次用 VS2017/Linux 编译指定的源程序文件

如果编译正确, 则对应位置填写运行结果并给出得到此结果的原因解释

如果编译错误, 则对应位置填写该行的编译错误提示及错误原因分析

- 2、如果编译器报多个错误, 填写源程序文件对应的错误提示即可, 示例如下, 将红色框截图即可:



- 3、如果 main 函数中某一句错误, 则将该句及下面的打印语句全部注释掉, 继续观察其余正确语句的运行结果 (示例如下)

<pre>c3 = c1 + Complex(2.5); //假设此句错误 c3.display();</pre>	⇒	<pre>// c3 = c1 + Complex(2.5); // c3.display();</pre>
---	---	--

- 4、用蓝色加粗字体填写

- 5、不需要填写的部分可以删除 (例如: 某句正确, 则错误部分不填, 可以删除)

【10-b1-1.cpp】无转换构造函数、无类型转换函数、友元方式实现复数+

◆ $c3 = c1 + \text{Complex}(2.5)$

编译错误，VS2017 下：

```
56 int main()
57 {
58     Complex c1(3,4), c3;
59
60     c3 = c1 + Complex(2.5);
61     c3.display();
62
63     c3 = c1 + 2.5;
64     c3.display();
65
66     c3 = 2.5 + c1;
67     c3.display();
68
69     return 0;
70 }
```

6 Errors 0 Warnings 0 Messages Build + IntelliSense

Code	Description
E0289	no instance of constructor "Complex:Complex" matches the argument list
E0349	no operator "+" matches these operands
E0349	no operator "+" matches these operands
C2440	'<function-style-cast>': cannot convert from 'double' to 'Complex'
C2679	binary '+': no operator found which takes a right-hand operand of type 'double' (or there is no acceptable conversion)
C2678	binary '+': no operator found which takes a left-hand operand of type 'double' (or there is no acceptable conversion)

Linux 下：

10-b1-1.cpp: 在函数 'int main()' 中:
10-b1-1.cpp:60:23: 错误: 对 'Complex::Complex(double)' 的调用没有匹配的函数
 $c3 = c1 + \text{Complex}(2.5);$

错误原因分析：_____没有写转换构造函数_____

◆ $c3 = c1 + 2.5$

编译错误，VS2017 下：

```
56 int main()
57 {
58     Complex c1(3,4), c3;
59
60     c3 = c1 + Complex(2.5);
61     c3.display();
62
63     c3 = c1 + 2.5;
64     c3.display();
65
66     c3 = 2.5 + c1;
67     c3.display();
68
69     return 0;
70 }
```

6 Errors 0 Warnings 0 Messages Build + IntelliSense

Code	Description
E0289	no instance of constructor "Complex:Complex" matches the argument list
E0349	no operator "+" matches these operands
E0349	no operator "+" matches these operands
C2440	'<function-style-cast>': cannot convert from 'double' to 'Complex'
C2679	binary '+': no operator found which takes a right-hand operand of type 'double' (or there is no acceptable conversion)
C2678	binary '+': no operator found which takes a left-hand operand of type 'double' (or there is no acceptable conversion)

Linux 下：

10-b1-1.cpp:63:10: 错误: no match for 'operator+' (operand types are 'Complex' and 'double')
 $c3 = c1 + 2.5;$

错误原因分析：_____没有写转换构造函数_____

◆ $c3 = 2.5 + c1$

编译错误，VS2017 下：

```

56 int main()
57 {
58     Complex c1(3,4), c3;
59
60     c3 = c1 + Complex(2.5);
61     c3.display();
62
63     c3 = c1 + 2.5;
64     c3.display();
65
66     c3 = 2.5 + c1;
67     c3.display();
68
69     return 0;
70 }

```

Error List: 6 Errors, 0 Warnings, 0 Messages. Build + IntelliSense.

Code	Description
E0289	no instance of constructor "Complex:Complex" matches the argument list
E0349	no operator "+" matches these operands
E0349	no operator "+" matches these operands
C2440	'<function-style-cast>': cannot convert from 'double' to 'Complex'
C2679	binary '+': no operator found which takes a right-hand operand of type 'double' (or there is no acceptable conversion)
C2678	binary '+': no operator found which takes a left-hand operand of type 'double' (or there is no acceptable conversion)

Linux 下:

```

10-b1-1.cpp:66:11: 错误: no match for 'operator+' (operand types are 'double' and 'Complex')
    c3 = 2.5 + c1;
              ^

```

错误原因分析: 没有写转换构造函数

【10-b1-2.cpp】无转换构造函数、无类型转换函数、成员方式实现复数+

◆ c3 = c1 + Complex(2.5)

编译错误, VS2017 下:

```

56 int main()
57 {
58     Complex c1(3,4), c3;
59
60     c3 = c1 + Complex(2.5);
61     c3.display();
62
63     c3 = c1 + 2.5;
64     c3.display();
65
66     c3 = 2.5 + c1;
67     c3.display();
68
69     return 0;
70 }

```

Error List: 6 Errors, 0 Warnings, 0 Messages. Build + IntelliSense.

Code	Description
E0289	no instance of constructor "Complex:Complex" matches the argument list
E0349	no operator "+" matches these operands
E0349	no operator "+" matches these operands
C2440	'<function-style-cast>': cannot convert from 'double' to 'Complex'
C2679	binary '+': no operator found which takes a right-hand operand of type 'double' (or there is no acceptable conversion)
C2678	binary '+': no operator found which takes a left-hand operand of type 'double' (or there is no acceptable conversion)

Linux 下:

```

10-b1-1.cpp: 在函数'int main()'中:
10-b1-1.cpp:60:23: 错误: 对'Complex::Complex(double)'的调用没有匹配的函数
    c3 = c1 + Complex(2.5);

```

错误原因分析: 没有写转换构造函数

◆ c3 = c1 + 2.5

编译错误, VS2017 下:

```

56 int main()
57 {
58     Complex c1(3,4), c3;
59
60     c3 = c1 + Complex(2.5);
61     c3.display();
62
63     c3 = c1 + 2.5;
64     c3.display();
65
66     c3 = 2.5 + c1;
67     c3.display();
68
69     return 0;
70 }

```

Error List
 6 Errors 0 Warnings 0 Messages Build + IntelliSense

Code	Description
E0289	no instance of constructor "Complex:Complex" matches the argument list
E0349	no operator "+" matches these operands
E0349	no operator "+" matches these operands
C2440	'<function-style-cast>': cannot convert from 'double' to 'Complex'
C2679	binary '+': no operator found which takes a right-hand operand of type 'double' (or there is no acceptable conversion)
C2678	binary '+': no operator found which takes a left-hand operand of type 'double' (or there is no acceptable conversion)

Linux 下:

```

10-b1-1.cpp:63:10: 错误: no match for 'operator+' (operand types are 'Complex' and 'double')
c3 = c1 + 2.5;

```

错误原因分析: 没有写转换构造函数

◆ c3 = 2.5 + c1

编译错误, VS2017 下:

```

56 int main()
57 {
58     Complex c1(3,4), c3;
59
60     c3 = c1 + Complex(2.5);
61     c3.display();
62
63     c3 = c1 + 2.5;
64     c3.display();
65
66     c3 = 2.5 + c1;
67     c3.display();
68
69     return 0;
70 }

```

Error List
 6 Errors 0 Warnings 0 Messages Build + IntelliSense

Code	Description
E0289	no instance of constructor "Complex:Complex" matches the argument list
E0349	no operator "+" matches these operands
E0349	no operator "+" matches these operands
C2440	'<function-style-cast>': cannot convert from 'double' to 'Complex'
C2679	binary '+': no operator found which takes a right-hand operand of type 'double' (or there is no acceptable conversion)
C2678	binary '+': no operator found which takes a left-hand operand of type 'double' (or there is no acceptable conversion)

Linux 下:

```

10-b1-1.cpp:66:11: 错误: no match for 'operator+' (operand types are 'double' and 'Complex')
c3 = 2.5 + c1;

```

错误原因分析: 没有写转换构造函数

【10-b1-3. cpp :】无转换构造函数、有类型转换函数、友元方式实现复数+

◆ c3 = c1 + Complex(2.5)

编译错误, VS2017 下:

```
56 int main()
57 {
58     Complex c1(3,4), c3;
59
60     c3 = c1 + Complex(2.5);
61     c3.display();
62
63     c3 = c1 + 2.5;
64     c3.display();
65
66     c3 = 2.5 + c1;
67     c3.display();
68
69     return 0;
70 }
```

6 Errors 0 Warnings 0 Messages Build + IntelliSense

Code	Description
E0289	no instance of constructor "Complex:Complex" matches the argument list
E0349	no operator "+" matches these operands
E0349	no operator "+" matches these operands
E0349	no operator "+" matches these operands
C2440	'<function-style-cast>': cannot convert from 'double' to 'Complex'
C2679	binary '+': no operator found which takes a right-hand operand of type 'double' (or there is no acceptable conversion)
C2678	binary '+': no operator found which takes a left-hand operand of type 'double' (or there is no acceptable conversion)

Linux 下:

```
10-b1-1.cpp: 在函数'int main()'中:
10-b1-1.cpp:60:23: 错误: 对'Complex::Complex(double)'的调用没有匹配的函数
c3 = c1 + Complex(2.5);
```

错误原因分析: 没有写转换构造函数

◆ $c3 = c1 + 2.5$

编译错误, VS2017 下:

```
56 int main()
57 {
58     Complex c1(3,4), c3;
59
60     c3 = c1 + Complex(2.5);
61     c3.display();
62
63     c3 = c1 + 2.5;
64     c3.display();
65
66     c3 = 2.5 + c1;
67     c3.display();
68
69     return 0;
70 }
```

6 Errors 0 Warnings 0 Messages Build + IntelliSense

Code	Description
E0289	no instance of constructor "Complex:Complex" matches the argument list
E0349	no operator "+" matches these operands
E0349	no operator "+" matches these operands
E0349	no operator "+" matches these operands
C2440	'<function-style-cast>': cannot convert from 'double' to 'Complex'
C2679	binary '+': no operator found which takes a right-hand operand of type 'double' (or there is no acceptable conversion)
C2678	binary '+': no operator found which takes a left-hand operand of type 'double' (or there is no acceptable conversion)

Linux 下:

```
10-b1-1.cpp:63:10: 错误: no match for 'operator+' (operand types are 'Complex' and 'double')
c3 = c1 + 2.5;
```

错误原因分析: 没有写转换构造函数

◆ $c3 = 2.5 + c1$

编译错误, VS2017 下:

```

56 int main()
57 {
58     Complex c1(3,4), c3;
59
60     c3 = c1 + Complex(2.5);
61     c3.display();
62
63     c3 = c1 + 2.5;
64     c3.display();
65
66     c3 = 2.5 + c1;
67     c3.display();
68
69     return 0;
70 }

```

Build + IntelliSense

Code	Description
E0289	no instance of constructor "Complex:Complex" matches the argument list
E0349	no operator "+" matches these operands
E0349	no operator "+" matches these operands
C2440	'<function-style-cast>': cannot convert from 'double' to 'Complex'
C2679	binary '+': no operator found which takes a right-hand operand of type 'double' (or there is no acceptable conversion)
C2678	binary '+': no operator found which takes a left-hand operand of type 'double' (or there is no acceptable conversion)

Linux 下:

```

10-b1-1.cpp:66:11: 错误: no match for 'operator+' (operand types are 'double' and 'Complex')
    c3 = 2.5 + c1;
              ^

```

错误原因分析: 没有写转换构造函数

【10-b1-4. cpp :】无转换构造函数、有类型转换函数、成员方式实现复数+

c3 = c1 + Complex(2.5)

编译错误, VS2017 下:

```

56 int main()
57 {
58     Complex c1(3,4), c3;
59
60     c3 = c1 + Complex(2.5);
61     c3.display();
62
63     c3 = c1 + 2.5;
64     c3.display();
65
66     c3 = 2.5 + c1;
67     c3.display();
68
69     return 0;
70 }

```

Build + IntelliSense

Code	Description
E0289	no instance of constructor "Complex:Complex" matches the argument list
E0349	no operator "+" matches these operands
E0349	no operator "+" matches these operands
C2440	'<function-style-cast>': cannot convert from 'double' to 'Complex'
C2679	binary '+': no operator found which takes a right-hand operand of type 'double' (or there is no acceptable conversion)
C2678	binary '+': no operator found which takes a left-hand operand of type 'double' (or there is no acceptable conversion)

Linux 下:

```

10-b1-1.cpp: 在函数'int main()'中:
10-b1-1.cpp:60:23: 错误: 对'Complex::Complex(double)'的调用没有匹配的函数
    c3 = c1 + Complex(2.5);

```

错误原因分析: 没有写转换构造函数

c3 = c1 + 2.5

编译错误, VS2017 下:

```

56 int main()
57 {
58     Complex c1(3,4), c3;
59
60     c3 = c1 + Complex(2.5);
61     c3.display();
62
63     c3 = c1 + 2.5;
64     c3.display();
65
66     c3 = 2.5 + c1;
67     c3.display();
68
69     return 0;
70 }

```

Error List: 6 Errors, 0 Warnings, 0 Messages. Build + IntelliSense.

Code	Description
E0289	no instance of constructor "Complex:Complex" matches the argument list
E0349	no operator "+" matches these operands
E0349	no operator "+" matches these operands
C2440	'<function-style-cast>': cannot convert from 'double' to 'Complex'
C2679	binary '+': no operator found which takes a right-hand operand of type 'double' (or there is no acceptable conversion)
C2678	binary '+': no operator found which takes a left-hand operand of type 'double' (or there is no acceptable conversion)

Linux 下:

```

10-b1-1.cpp:63:10: 错误: no match for 'operator+' (operand types are 'Complex' and 'double')
    c3 = c1 + 2.5;

```

错误原因分析: 没有写转换构造函数

◆ c3 = 2.5 + c1

编译错误, VS2017 下:

```

56 int main()
57 {
58     Complex c1(3,4), c3;
59
60     c3 = c1 + Complex(2.5);
61     c3.display();
62
63     c3 = c1 + 2.5;
64     c3.display();
65
66     c3 = 2.5 + c1;
67     c3.display();
68
69     return 0;
70 }

```

Error List: 6 Errors, 0 Warnings, 0 Messages. Build + IntelliSense.

Code	Description
E0289	no instance of constructor "Complex:Complex" matches the argument list
E0349	no operator "+" matches these operands
E0349	no operator "+" matches these operands
C2440	'<function-style-cast>': cannot convert from 'double' to 'Complex'
C2679	binary '+': no operator found which takes a right-hand operand of type 'double' (or there is no acceptable conversion)
C2678	binary '+': no operator found which takes a left-hand operand of type 'double' (or there is no acceptable conversion)

Linux 下:

```

10-b1-1.cpp:66:11: 错误: no match for 'operator+' (operand types are 'double' and 'Complex')
    c3 = 2.5 + c1;

```

错误原因分析: 没有写转换构造函数

【10-b1-5. cpp :】有转换构造函数、无类型转换函数、友元方式实现复数+
编译正确, 运行结果:

```

C:\Windows\system32\cmd.exe
5.5+4i
5.5+4i
5.5+4i
Press any key to continue . . .

```

能得到此结果的原因: 2.5 强制转换为 Complex, Complex+Complex 得到 Complex,复制给左值

【10-b1-6. cpp :】有转换构造函数、无类型转换函数、成员方式实现复数+

◆ c3 = c1 + Complex(2.5)

编译正确, 运行结果:

```
C:\Windows\system32\cmd.exe
5.5+4i
5.5+4i
5.5+4i
Press any key to continue . . .
```

能得到此结果的原因：___2.5 强制转换为 Complex，Complex+Complex 得到 Complex,复制给左值___

◆ $c3 = c1 + 2.5$

编译正确，运行结果：

```
C:\Windows\system32\cmd.exe
5.5+4i
5.5+4i
5.5+4i
Press any key to continue . . .
```

能得到此结果的原因：___2.5 强制转换为 Complex，Complex+Complex 得到 Complex,复制给左值___

◆ $c3 = 2.5 + c1$

编译错误，VS2017 下：

```
c3 = 2.5 + c1;
c3.display()
return 0;
```

no operator "+" matches these operands
operand types are: double + Complex

Linux 下：

```
10-b1-6.cpp:66:11: 错误: no match for 'operator+' (operand types are 'double' and 'Complex')
c3 = 2.5 + c1;
```

错误原因分析：___+是 Complex 类的成员函数，而 2.5 不是 Complex 类，不能调用这个函数___

【10-b1-7.cpp】有转换构造函数、有类型转换函数、友元方式实现复数+

◆ $c3 = c1 + \text{Complex}(2.5)$

编译正确，运行结果：

```
C:\Windows\system32\cmd.exe
5.5+4i
Press any key to continue . . .
```

，能得到此结果的原因：___2.5 强制转换为 Complex，Complex+Complex 得到 Complex,复制给左值___

◆ $c3 = c1 + 2.5$

编译错误，VS2017 下：

```
c3 = 2.5 + c1;
c3.display()
return 0;
```

no operator "+" matches these operands
operand types are: double + Complex

Linux 下：

```
10-b1-6.cpp:66:11: 错误: no match for 'operator+' (operand types are 'double' and 'Complex')
c3 = 2.5 + c1;
```

错误原因分析：___+是 Complex 类的成员函数，而 2.5 不是 Complex 类，不能调用这个函数___

◆ $c3 = 2.5 + c1$

编译错误，VS2017 下：

```
c3 = 2.5 + c1;
c3.display()
return 0;
```

no operator "+" matches these operands
operand types are: double + Complex

Linux 下：

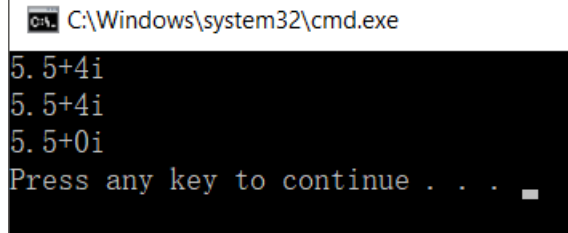
```
10-b1-6.cpp:66:11: 错误: no match for 'operator+' (operand types are 'double' and 'Complex')
c3 = 2.5 + c1;
```


错误原因分析: ++是 Complex 类的成员函数, 而 2.5 不是 Complex 类, 不能调用这个函数

【10-b1-8.cpp :】有转换构造函数、有类型转换函数、成员方式实现复数+

◆ `c3 = c1 + Complex(2.5)`

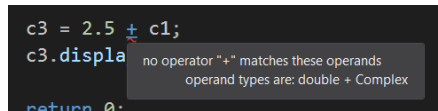
编译正确, 运行结果:



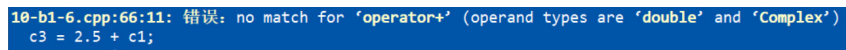
能得到此结果的原因: 2.5 强制转换为 Complex, Complex+Complex 得到 Complex, 复制给左值

◆ `c3 = c1 + 2.5`

编译错误, VS2017 下:



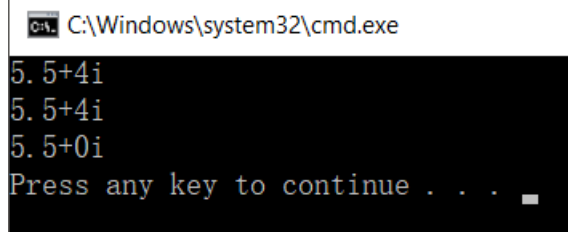
Linux 下:



错误原因分析: ++是 Complex 类的成员函数, 而 2.5 不是 Complex 类, 不能调用这个函数

◆ `c3 = 2.5 + c1`

编译正确, 运行结果:



能得到此结果的原因: 2.5 强制转换为 Complex, Complex+Complex 得到 Complex, 复制给左值

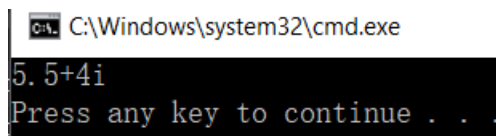
【10-b1-9.cpp :】有转换构造函数、有类型转换函数、成员方式实现复数+、另有 `double+Complex`

◆ 仅讨论语句 `c3 = 2.5 + c1`, 回答下列问题

1、为什么编译不错?

没有二义性, 在第一次寻找严格匹配的时候就找到对应 `double+Complex` 的函数, 不再继续向下匹配。

2、运行结果是多少?



3、为什么和 10-b1-8 结果不同?

10-b1-8 是通过内部转换匹配的, 匹配到了 `double+double`, Complex 先强制转换为 `double`

【10-b1-10.cpp :】单独讨论有类型转换的情况下, `cout` 重载的输出结果与期望值不同

◆ 目前 `main` 函数中第 4 个输出语句与期望值不同, 原因是: 常对象不能调用普通成员函数

◆ 仅允许改动两行, 使程序输出与期望值相同:

改动第 32 行, 原内容: `friend ostream & operator<<(ostream & stream, Complex &c);`

新内容: `_ friend ostream & operator<<(ostream & stream, const Complex &c);`
改动第 35 行, 原内容: `_ostream &operator<<(ostream &out, Complex &c) _`
新内容: `_ ostream &operator<<(ostream &out, const Complex &c)_`