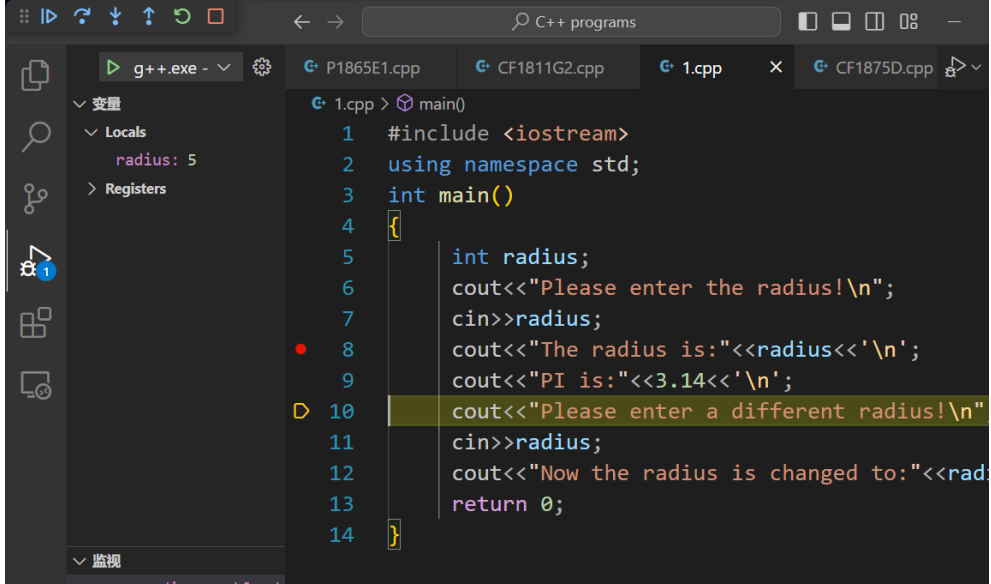
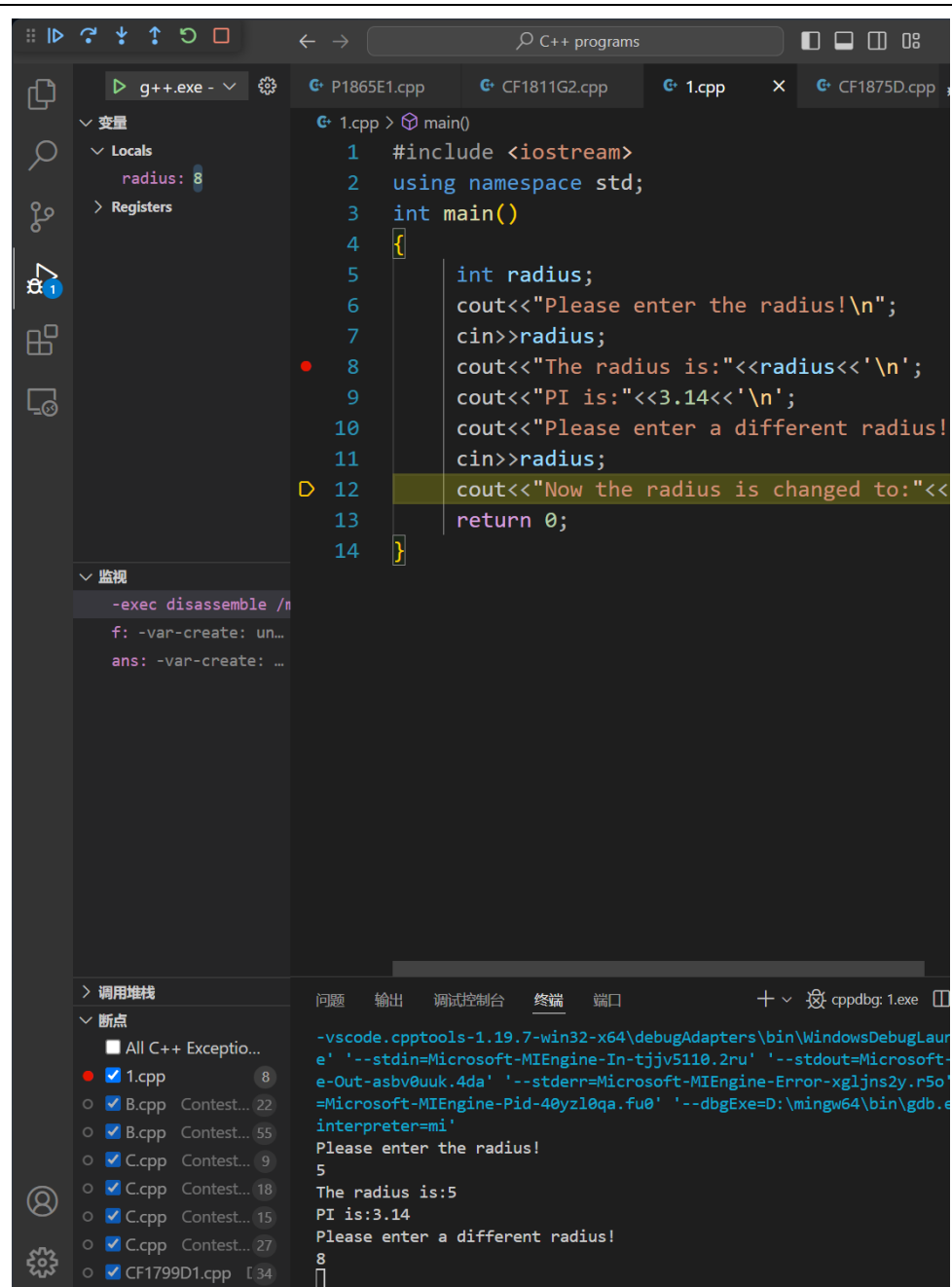


计算机学院 高级程序设计 课程实验报告

实验题目：C++简单程序设计		学号：202300130150
日期：2024-3-12	班级： 4	姓名： 王成意
实验目的： 运行第二章 ppt 中给出的下列程序，发现问题、提出问题，解决问题。		
实验步骤与内容： 2-1 		



```
1.cpp > ...
1  #include <iostream>
2  using namespace std;
3  int main()
4  {   const double PI(3.14159);
5      int radius;
6      cout<<"Please enter the radius!\n";
7      cin>>radius;
8      cout<<"The radius is:"<<radius<<'\n';
9      cout<<"PI is:"<<PI<<'\n';
10     cout<<"Please enter a different radius!\n";
11     cin>>radius;
12     cout<<"Now the radius is changed to:"<<radius<<'\n';
13     cout<<"PI is still:"<<PI<<'\n';
14     //cin>>pi;
15     return 0;
16 }
17
```

问题 输出 调试控制台 终端 端口 + v cppdbg: 1.exe [] [] ... ^

```
e-Out-blxqtwuy.k3o' '--stderr=Microsoft-MIEngine-Error-pnakoju2.geq' '--pid
=Microsoft-MIEngine-Pid-lydlrntd.hme' '--dbgExe=D:\mingw64\bin\gdb.exe' '--
interpreter=mi'
Please enter the radius!
4
The radius is:4
PI is:3.14159
Please enter a different radius!
4
Now the radius is changed to:4
PI is still:3.14159
PS D:\C++ programs>
```

//思考：能给常量输入新值吗？如定义PI时不初始化会怎样？
不能。
会报错：

```

1.cpp > main()
1  #include <iostream>
2  using namespace std;
3  int main()
4  {   const double PI;
5      int radius;
6      cout<<"Please enter the radius!\n";
7      cin>>radius;
8      cout<<"The radius is:"<<radius<<'\n';
9      cout<<"PI is:"<<PI<<'\n';
10     cout<<"Please enter a different radius!\n";
11     cin>>radius;
12     cout<<"Now the radius is changed to:"<<radius<<'\n';
13     cout<<"PI is still:"<<PI<<'\n';
14     //cin>>pi;
15     return 0;
16 }
17

```

问题 1 输出 终端 ... + v C/C++: g++.exe 生成活动文件 (x) [] [] ...

```

cmd /c chcp 65001>nul && D:\mingw64\bin\g++.exe -fdiagnostics-color=always
-g "D:\C++ programs\1.cpp" -o "D:\C++ programs\1.exe" -std=c++11
D:\C++ programs\1.cpp: In function 'int main()':
D:\C++ programs\1.cpp:4:18: error: uninitialized const 'PI' [-fpermissive]
{   const double PI;
                ^~

```

生成已完成，但出现错误。

* 终端进程已终止。退出代码: 1

变量

Locals

pi: 3.14158999999...

radius: 7

Registers

监视

-exec disassemble /n

f: -var-create: un...

ans: -var-create: ...

1.cpp > main()

1 #include <iostream>

2 using namespace std;

3 int main()

4 {

5 const double pi(3.14159);

6 int radius(0);

7 cout<<"The initial radius is:"<<radius<<"\n";

8 cout<<"PI is:"<<pi<<"\n";

9 cout<<"Please enter a different radius!\n";

10 cin>>radius;

11 cout<<"Now the radius is changed to:"<<radius<<"\n";

12 cout<<"PI is still:"<<pi<<"\n";

13 return 0;

14 }

调用堆栈

断点

■ All C++ Exceptio...

1.cpp 10

1.cpp 14

B.cpp Contest... 22

B.cpp Contest... 55

C.cpp Contest... 9

C.cpp Contest... 18

C.cpp Contest... 15

C.cpp Contest... 27

问题

输出

调试控制台

终端

端口

+ v

cppdbg: 1.exe

□

🗑

⋮

PS D:\C++ programs>

PS D:\C++ programs> & 'd:\VsCode-extentions\.vscode-insiders\extensions\ms-vscode.cpptools-1.19.7-win32-x64\debugAdapters\bin\WindowsDebugLauncher.exe' '--stdin=Microsoft-MIEngine-In-vvsxsnsr.xdp' '--stdout=Microsoft-MIEngine-Out-thuudcjk.cu0' '--stderr=Microsoft-MIEngine-Error-b1nqiz5m.jw3' '--pid=Microsoft-MIEngine-Pid-3dxrcfz3.clm' '--dbgExe=D:\mingw64\bin\gdb.exe' '--interpreter=mi'

The initial radius is:0

PI is:3.14159

Please enter a different radius!

7

```
1  #include <iostream>
2  using namespace std;
3  int main()
4  {
5      short int i;
6      unsigned short int j;
7      j = 50000;
8      i = j;
9      cout << "Short int is:"<<i<<endl;
10     cout << "Short unsigned int is: "<<j<<endl;
11     return 0;
12 }
13
```

问题 输出 调试控制台 终端 端口 + v cppdbg: 1.exe [] [] ...

```
7
PS D:\C++ programs> ^C
PS D:\C++ programs>
PS D:\C++ programs> & 'd:\VsCode-extensions\vscode-insiders\extensions\ms
-vscodelib\cpptools-1.19.7-win32-x64\debugAdapters\bin\WindowsDebugLauncher.ex
e' '--stdin=Microsoft-MIEngine-In-ox4gbihu.0zx' '--stdout=Microsoft-MIEngin
e-Out-hhwybaeu.jxh' '--stderr=Microsoft-MIEngine-Error-inpux52t.col' '--pid
=Microsoft-MIEngine-Pid-hszanyasp.bvm' '--dbgExe=D:\mingw64\bin\gdb.exe' '--
interpreter=mi'
Short int is:-15536
Short unsigned int is: 50000
PS D:\C++ programs> [ ]
```

//观察思考：将正数 50000 赋值给变量 i 以后，输出 i 的结果是什么？为什么？输出 j 的结果是什么？为什么？

输出结果如上图。

原因：i 因为 short 数据范围溢出所以输出-15536，j：50000<65535，没有溢出，输出结果为 50000。

```

1  #include <iostream>
2  #include <iostream>
3  #include <climits>
4  using namespace std;
5  int main()
6  { cout <<"Min of short is: "<<SHRT_MIN<<endl;
7    cout <<"Max of short is: "<<SHRT_MAX<<endl;
8    cout <<"Min of int is: "<<INT_MIN<<endl;
9    cout <<"Max of int is: "<<INT_MAX<<endl;
10   cout <<"Min of long is: "<<LONG_MIN<<endl;
11   cout <<"Max of long is: "<<LONG_MAX<<endl;
12   cout <<"Max of unsigned short is: "<<USHRT_MAX<<endl;
13   cout <<"Max of unsigned int is: "<<UINT_MAX<<endl;
14   cout <<"Max of unsigned long is: "<<ULONG_MAX<<endl;
15   return 0;
16 }
17

```

问题 输出 调试控制台 终端 端口 + v c++ cppdbg: 1.exe 窗口 ... ^

```

=Microsoft-MIEngine-Pid-gzitsjz2.wxk' '--dbgExe=D:\mingw64\bin\gdb.exe' '--
interpreter=mi'
Min of short is: -32768
Max of short is: 32767
Min of int is: -2147483648
Max of int is: 2147483647
Min of long is: -2147483648
Max of long is: 2147483647
Max of unsigned short is: 65535
Max of unsigned int is: 4294967295
Max of unsigned long is: 4294967295

```

```

1.cpp > main()
1  #include <iostream>
2  #include <limits>
3  using namespace std;
4  int main()
5  {
6      int isample, osample, hsample;
7      unsigned long ulsample;
8      cin>>isample>>oct>>osample>>hex>>hsample;
9      cout<<isample<<';'<<oct<<osample<<';'<<hex<<hsample<<endl;
10     isample=123;
11     osample=0173;
12     hsample=0x7B;
13     ulsample=4294967295UL;
14     cout<<dec<<isample<<';'<<oct<< isample
15         <<';'<<hex<< isample <<endl;
16     cout<<dec<< osample<<';' <<oct<<osample
17         <<';'<<hex<< osample <<endl;
18     cout<< dec<<hsample <<';'<<oct<< hsample<<';'
19         <<hex<<hsample<<endl;
20     cout<<dec<< ulsample <<';'<<oct<<ulsample<<';'
21         <<hex<<ulsample<<endl;
22     return 0;
23 }

```

问题 输出 调试控制台 终端 端口

+ v cpdbg: 1.exe □ ❏ ... ↗

```

-vcptools-1.19.7-win32-x64\debugAdapters\bin\WindowsDebugLauncher.exe' '--stdin=Microsoft-MIEngine-In-we3o1waj.kyl' '--stdout=Microsoft-MIEngine-Out-zkr2j0g3.rr4' '--stderr=Microsoft-MIEngine-Error-vb1ljvtv.vqu' '--pid=Microsoft-MIEngine-Pid-vuipv3tx.cpm' '--dbgExe=D:\mingw64\bin\gdb.exe' '--interpreter=mi'
666 666 666
666;666;666
123;173;7b
123;173;7b
123;173;7b
4294967295;3777777777;ffffffff
PS D:\C++ programs>

```



```

1  #include <limits>
2  #include <limits>
3  using namespace std;
4  const float PI_FLOAT = 3.1415926f;
5  const double PI_DOUBLE = 3.1415926;
6  const long double PI_LDOUBLE = 3.1415926;
7  int main()
8  {
9      float nRadiusFloat = 5.5f, nAreaFloat;
10     double nRadiusDouble = 5.5, nAreaDouble;
11     long double nRadiusLDouble = 5.5, nAreaLDouble;
12     nAreaFloat = PI_FLOAT* nRadiusFloat* nRadiusFloat;
13     nAreaDouble = PI_DOUBLE* nRadiusDouble*
14         nRadiusDouble;
15     nAreaLDouble = PI_DOUBLE* nRadiusDouble*
16         nRadiusDouble;
17     cout << "nAreaFloat = "<< nAreaFloat << ",sizeof(nAreaFloat) = "
18     << sizeof(nAreaFloat) << endl;
19     cout << "nAreaDouble = "<< nAreaDouble
20     << ", sizeof(nAreaDouble) = "
21     << sizeof(nAreaDouble)<<endl;
22     cout << "nAreaLDouble = "<< nAreaLDouble
23     << ", sizeof(nAreaLDouble) = "
24     << sizeof(nAreaLDouble)<<endl;
25     return 0;
26 }
27

```

问题 输出 调试控制台 终端 端口

+ v cppdbg: 1.exe

```

PS D:\C++ programs> ^C
PS D:\C++ programs>
PS D:\C++ programs> & 'd:\VsCode-extentions\.vscode-insiders\extensions\
-vcode.cpptools-1.19.7-win32-x64\debugAdapters\bin\WindowsDebugLauncher.
e' '--stdin=Microsoft-MIEngine-In-lpyww00r.2e1' '--stdout=Microsoft-MIEng
e-Out-pnr2h33j.44y' '--stderr=Microsoft-MIEngine-Error-co5soogr.3ml' '--p
=Microsoft-MIEngine-Pid-wrbjnr fy.sob' '--dbgExe=D:\mingw64\bin\gdb.exe' '
interpreter=mi'
nAreaFloat = 95.0332, sizeof(nAreaFloat) = 4
nAreaDouble = 95.0332 , sizeof(nAreaDouble) = 8
nAreaLDouble = 95.0332 , sizeof(nAreaLDouble) = 16

```

```

1  #include <iostream>
2  using namespace std;
3  int main()
4  {
5      cout << 'A'<< ' ' << 'a'<<endl;    //输出普通字符
6      cout << "one\t\ttwo\t\tthree\n";    //使用水平制表符
7      cout << "123\b\b45\n";              //使用退格符
8      cout << "Alert\a\n";                //使用响铃
9      return 0;
10 }
11

```

问题 输出 调试控制台 终端 端口 + v cppdbg: 1.exe [] [] ... ^

```

PS D:\C++ programs>
PS D:\C++ programs> & 'd:\VsCode-extentions\.vscode-insiders\extensions\ms
-vscodelcpptools-1.19.7-win32-x64\debugAdapters\bin\WindowsDebugLauncher.ex
e' '--stdin=Microsoft-MIEngine-In-bjgzi44a.2dx' '--stdout=Microsoft-MIEngin
e-Out-tlmesjz4.b34' '--stderr=Microsoft-MIEngine-Error-oieoszrh.ckr' '--pid
=Microsoft-MIEngine-Pid-ge1oleam.wrc' '--dbgExe=D:\mingw64\bin\gdb.exe' '--
interpreter=mi'
A a
one    two    three
145
Alert
PS D:\C++ programs>

```

```

1.cpp > main()
1  #include <iostream>
2  using namespace std;
3  int main()
4  {
5      bool bV1= true, bV2= false;
6      cout <<" value bV1 = "<<bV1<<endl;
7      cout <<"bool value bV2 = "<<bV2<<endl;
8      int nV1=bV1, nV2 = 0;
9      bV1 = nV2;
10     cout <<"int value nV1 = "<< nV1<<endl;
11     cout <<"bool value bV1 = "<<bV1<<endl;
12     return 0;
13 }

```

问题 输出 调试控制台 终端 端口

+ v cppdbg: 1.exe [] []

```

PS D:\C++ programs>
PS D:\C++ programs> & 'd:\VsCode-extensions\.vscode-insiders\extensions\ms-vscode.cpptools-1.19.7-win32-x64\debugAdapters\bin\WindowsDebugLauncher.exe' '--stdin=Microsoft-MIEngine-In-vw1toedr.pbr' '--stdout=Microsoft-MIEngine-Out-ygplpws0.z0n' '--stderr=Microsoft-MIEngine-Error-k4aw00jp.4bf' '--pid=Microsoft-MIEngine-Pid-1i3s53w0.rwz' '--dbgExe=D:\mingw64\bin\gdb.exe' 'interpreter=mi'
value bV1 = 1
bool value bV2 = 0
int value nV1 = 1
bool value bV1 = 0

```

```
interpreter=mi'  
int/int, 24/5= 4  
int/int, 24%5= 4  
int/int, 24%(-5)= 4  
double/double, 24/5= 4.8  
double/int, 24/5= -4.8  
int/double, 24/5= 4.8  
val1 = 5  
5, 7, 7, 5  
val1 = 5  
5, 7, 7, 5
```

```
D:\C++ programs\1.exe  
int/int, 24/5= 4  
int/int, 24%5= 4  
int/int, 24%(-5)= 4  
double/double, 24/5= 4.8  
double/int, 24/5= -4.8  
1 int/double, 24/5= 4.8  
1 val1 = 5  
1 5, 7, 7, 5  
1 val1 = 5  
1 4, 5, 4, 5  
1
```

确实不同

2-13

```

1  #include <iostream>
2  #include <string>
3  using namespace std;
4  int main()
5  {
6      cout <<"sizeof(short)="<<sizeof(short)<<endl;
7      cout <<"sizeof(unsigned short)="<<sizeof(unsigned
8          short)<<endl;
9      cout <<"sizeof(int)= "<<sizeof(int)<<endl;
10     cout <<"sizeof(unsigned int)= "<<sizeof(unsigned
11         int)<<endl;
12     cout <<"sizeof(long)= "<<sizeof(long)<<endl;
13     cout <<"sizeof(unsigned long)="<<sizeof(unsigned
14         long)<<endl;
15     cout <<"sizeof(float)= "<<sizeof(float)<<endl;
16     cout <<"sizeof(double)= "<<sizeof(double)<<endl;
17     cout <<"sizeof(long double)= "<<sizeof(long dou
18         <<endl;
19     cout <<"sizeof(char)= "<<sizeof(char)<<endl;
20     return 0;
21 }

```

题 输出 调试控制台 终端 端口 + v 运行 cppdbg: 1.exe 窗口 删除 ...

```

interpreter=mi'
sizeof(short)=2
sizeof(unsigned short)=2
sizeof(int)= 4
sizeof(unsigned int)= 4
sizeof(long)= 4
sizeof(unsigned long)=4
sizeof(float)= 4
sizeof(double)= 8
sizeof(long double)= 16
sizeof(char)= 1

```

有。Long double 课本上长度是 8.

```
1.cpp > main()
1  #include <iostream>
2  #include <bitset>
3  using namespace std;
4  int main()
5  {
6      cout << "~15 = " << (~15) << endl;
7      cout << "15 & 21 = " << (15&21) << endl;
8      cout << "15 ^ 21 = " << (15^21) << endl;
9      cout << "15 | 21 = " << (15|21) << endl;
10     unsigned int nTest = 9;
11     cout << "nTest = " << nTest << endl;
12     nTest |= 1<<4; //将第4位置为1
13     cout << "After set the position 4 to 1, nTest = " << nTest << endl;
14     nTest &= ~(1<<4); //将第4位置0
15     cout << "After set the position 4 to 0, nTest = " << nTest << endl;
16     bool nFlag;
17     for (int i=0; i<16; i++){ //实现翻转
18         nFlag = nTest & (1<<i);
19         if (nFlag) {
20             nTest &= ~(1<<i);
21         }
22         else{
23             nTest |= 1<<i;
24         }
25     }
26     cout << "After flip, nTest = " << nTest << endl;
27 }
```

问题 输出 调试控制台 终端 端口 + v cpdbg: 1.exe [] [] ...

```
e-Out-bhlz5ptb.2do' '--stderr=Microsoft-MIEngine-Error-sczf44xk.0aj' '--pid=Microsoft-MIEngine-Pid-orugtfhq.ker' '--dbgExe=D:\mingw64\bin\gdb.exe' '--interpreter=mi'
~15 = -16
15 & 21 = 5
15 ^ 21 = 26
15 | 21 = 31
nTest = 9
After set the position 4 to 1, nTest = 25
After set the position 4 to 0, nTest = 9
After flip, nTest = 65526
```

// 程序 15:

// 执行如下程序，解释每一行打印结果

```
1.cpp > main()
1  #include <iostream>
2  using namespace std;
3
4  int main(){
5      auto a = 0;
6      auto b = 0.0;
7      auto c = 0.0f;
8      auto d = b+c;
9      decltype(c) e = a+b;
10     cout<<sizeof(a)<<endl;
11     cout<<sizeof(b)<<endl;
12     cout<<sizeof(c)<<endl;
13     cout<<sizeof(d)<<endl;
14     cout<<sizeof(e)<<endl;
15     cout<<sizeof(sizeof(e))<<endl;
16 }
17
```

问题 输出 调试控制台 终端 端口 + v cpdbg: 1.exe

```
-vscode.cpptools-1.19.7-win32-x64\debugAdapters\bin\WindowsDebugLaun
e' '--stdin=Microsoft-MIEngine-In-3scwesoz.jpj' '--stdout=Microsoft-
e-Out-siavipb3.vbj' '--stderr=Microsoft-MIEngine-Error-eax0p0xc.stv'
=Microsoft-MIEngine-Pid-glwwuxif.sli' '--dbgExe=D:\mingw64\bin\gdb.e
interpreter=mi'
4
8
4
8
4
8
PS D:\C++ programs>
```

a 是 int 型 4 字节, b 是 double 型 8 字节, c 是 float 型 4 字节, d 是 double 型 8 字节, e 是 float 型 4 字节, sizeof (e) 是 unsigned long long 型 8 字节。

// 程序 16:

// 执行如下程序, 解释为什么最后 a 的值是这个。

```
1.cpp > ...
1  #include <iostream>
2  using namespace std;
3
4  int main(){
5      int a = 2;
6      a=(a=(a*2+1)+2)*3+a;
7      cout<<a<<endl;
8  }
9
```

问题 输出 调试控制台 终端 端口 + v cppdbg: 1.exe

```
4
8
9 PS D:\C++ programs> ^C
2 PS D:\C++ programs>
5 PS D:\C++ programs> & 'd:\VsCode-extensions\.vscode-insiders\extensions
9 -vscode.cpptools-1.19.7-win32-x64\debugAdapters\bin\WindowsDebugLaun
e' '--stdin=Microsoft-MIEngine-In-oljmhlyjy.x45' '--stdout=Microsoft-
9 e-Out-zqzy1j0t.ehn' '--stderr=Microsoft-MIEngine-Error-eg5ybd51.ptr'
8 =Microsoft-MIEngine-Pid-k1m1c2px.jrz' '--dbgExe=D:\mingw64\bin\gdb.e
5 interpreter=mi'
7 28
4
```

解释:

a 先是 $2 \times 2 + 1 = 5$, 再 $+2 = 7$, 再 $3 \times 7 + 7 = 28$


```
6          a=(a=(a=2*a+1)+2)*3+a;
=> 0x0000000000401564 <+20>:    mov     -0x4(%rbp),%eax
    0x0000000000401567 <+23>:    add     %eax,%eax
    0x0000000000401569 <+25>:    add     $0x1,%eax
    0x000000000040156c <+28>:    mov     %eax,-0x4(%rbp)
    0x000000000040156f <+31>:    addl    $0x2,-0x4(%rbp)
    0x0000000000401573 <+35>:    mov     -0x4(%rbp),%edx
    0x0000000000401576 <+38>:    mov     %edx,%eax
    0x0000000000401578 <+40>:    add     %eax,%eax
    0x000000000040157a <+42>:    add     %edx,%eax
    0x000000000040157c <+44>:    add     %eax,-0x4(%rbp)
```

结论分析与体会：

这一次的实验十分有价值，让我对于 c++ 这门语言有了全新的认知。比如说不同的编译器编译顺序也可能不一样（2-10）。除此之外，我在 c 语言的基础上对于 c++ 的理解也有了提高，认识到了 c 语言和 c++ 的许多极为相似的性质和一些不同的属性。这让我在接下来的 c++ 学习中充满了动力。