

```
1: // $Id: inherit.cpp,v 1.6 2016-04-08 19:51:13-07 - - $
2:
3: // Simple example using inheritance.
4:
5: #include <cmath>
6: #include <iostream>
7: #include <memory>
8: #include <sstream>
9: #include <vector>
10: using namespace std;
11:
12: //////////////////////////////////////
13: // class shape
14: //////////////////////////////////////
15:
16: class shape {
17:     private:
18:         static size_t next_id;
19:         size_t id {++next_id};
20:     public:
21:         virtual double area() const = 0;
22:         virtual double circum() const = 0;
23:         virtual ostream& show (ostream&) const;
24:         friend ostream& operator<< (ostream&, const shape&);
25: };
26:
27: size_t shape::next_id {0};
28:
29: ostream& shape::show (ostream& out) const {
30:     return out << "shape(" << id << ")";
31: }
32:
33: ostream& operator<< (ostream& out, const shape& sh) {
34:     return sh.show (out);
35: }
36:
37: //////////////////////////////////////
38: // class nothing
39: //////////////////////////////////////
40:
41: class nothing: public shape {
42:     public:
43:         virtual double area() const override { return 0; }
44:         virtual double circum() const override { return 0; }
45:         virtual ostream& show (ostream&) const override;
46: };
47:
48: ostream& nothing::show (ostream& out) const {
49:     return shape::show (out) << ": nothing ";
50: }
51:
```

```
52:
53: //////////////////////////////////////
54: // class circle
55: //////////////////////////////////////
56:
57: class circle: public shape {
58:     private:
59:         double radius {};
60:     public:
61:         circle (double r = 0): radius(r) {}
62:         virtual double area() const override {
63:             return M_PI * pow (radius, 2);
64:         }
65:         virtual double circum() const override {
66:             return 2 * M_PI * radius;
67:         }
68:         virtual ostream& show (ostream&) const override;
69: };
70:
71: ostream& circle::show (ostream& out) const {
72:     return shape::show (out) << ": circle radius " << radius;
73: }
74:
75: //////////////////////////////////////
76: // class square
77: //////////////////////////////////////
78:
79: class square: public shape {
80:     private:
81:         double side {};
82:     public:
83:         square (double s): side(s) {}
84:         virtual double area() const override { return pow (side, 2); }
85:         virtual double circum() const override { return 4 * side; }
86:         virtual ostream& show (ostream&) const override;
87: };
88:
89:
90: ostream& square::show (ostream& out) const {
91:     return shape::show (out) << ": square side " << side;
92: }
93:
```

```
94:
95:
96: ///////////////////////////////////////////////////////////////////
97: // main function
98: ///////////////////////////////////////////////////////////////////
99:
100: using shape_ptr = shared_ptr<shape>;
101: int main (int argc, char** argv) {
102:     vector<string> args (&argv[1], &argv[argc]);
103:     vector<shape_ptr> vsp;
104:     for (const auto& arg: args) {
105:         cout << arg << ":" << endl;
106:         istringstream argstream (arg);
107:         char type {}; double num {};
108:         argstream >> type >> num;
109:         shape_ptr obj = nullptr;
110:         switch (arg[0]) {
111:             case 'c': obj = make_shared<circle> (num); break;
112:             case 's': obj = make_shared<square> (num); break;
113:             default: obj = make_shared<nothing>(); break;
114:         }
115:         vsp.push_back (obj);
116:     }
117:     for (const auto& item: vsp) {
118:         cout << *item << ", area " << item->area() << ", circum "
119:             << item->circum() << endl;
120:     }
121:     return 0;
122: }
123:
124: //TEST// alias grind='valgrind --leak-check=full --show-reachable=yes'
125: //TEST// grind inherit c c10 s s15 x >inherit.out 2>&1
126: //TEST// mkpspdf inherit.ps inherit.cpp* inherit.out
127:
```

```
cpp -o inherit -lm
```

```
1: ==16635== Memcheck, a memory error detector
2: ==16635== Copyright (C) 2002-2015, and GNU GPL'd, by Julian Seward et al
.
3: ==16635== Using Valgrind-3.12.0 and LibVEX; rerun with -h for copyright
info
4: ==16635== Command: inherit c c10 s s15 x
5: ==16635==
6: c:
7: c10:
8: s:
9: s15:
10: x:
11: shape(1): circle radius 0, area 0, circum 0
12: shape(2): circle radius 10, area 314.159, circum 62.8319
13: shape(3): square side 0, area 0, circum 0
14: shape(4): square side 15, area 225, circum 60
15: shape(5): nothing , area 0, circum 0
16: ==16635==
17: ==16635== HEAP SUMMARY:
18: ==16635==      in use at exit: 0 bytes in 0 blocks
19: ==16635==    total heap usage: 22 allocs, 22 frees, 854 bytes allocated
20: ==16635==
21: ==16635== All heap blocks were freed -- no leaks are possible
22: ==16635==
23: ==16635== For counts of detected and suppressed errors, rerun with: -v
24: ==16635== ERROR SUMMARY: 0 errors from 0 contexts (suppressed: 0 from 0)
```