COMP2012 Object-Oriented Programming and Data Structures

Supplementary Notes on Constructors and Destructor

Page 52: Cons / Destruction Order: Postoffice Has a Clock

```
// postoffice1.h
#include <iostream>
using namespace std;

class Clock {
  public:
    Clock() {
      cout << "Clock Constructor\n";  // Step 4
    }
    ~Clock() {
      cout << "Clock Destructor\n";  // Step 8
    }
};
class Postoffice {
    Clock clock;  // Step 3
  public:
    Postoffice() {
       cout << "Postoffice Constructor\n";  // Step 5
    }
    ~Postoffice() {
       cout << "Postoffice Destructor\n";   // Step 7
    }
};

// postoffice1.cpp
#include <iostream>
#include "postoffice1.h"
using namespace std;

int main() {
  cout << "Beginning of main\n";       // Step 1
  Postoffice x;                        // Step 2
  cout << "End of main\n";             // Step 6
  return 0;
}
```

Output:

```
Beginning of main                      Step 1
Clock Constructor                      Step 4
Postoffice Constructor                 Step 5
End of main                            Step 6
Postoffice Destructor                  Step 7
Clock Destructor                       Step 8
```

Page 54: Cons / Destruction Order: Postoffice “Owns” a Clock

```
// postoffice2.h
#include <iostream>
using namespace std;

class Clock {
  public:
    Clock() {
      cout << "Clock Constructor\n";  // Step 5
    }
    ~Clock() {
      cout << "Clock Destructor\n";
    }
};
class Postoffice {
    Clock* clock;  // Step 3
  public:
    Postoffice() {
      clock = new Clock;  // Step 4
      cout << "Postoffice Constructor\n";  // Step 6
    }
    ~Postoffice() {
       cout << "Postoffice Destructor\n";  // Step 8
    }
};

// postoffice2.cpp
#include <iostream>
#include "postoffice2.h"
using namespace std;

int main() {
  cout << "Beginning of main\n";       // Step 1
  Postoffice x;                         // Step 2
  cout << "End of main\n";             // Step 7
  return 0;
}
```

Output:

```
Beginning of main                      Step 1
Clock Constructor                      Step 5
Postoffice Constructor                 Step 6
End of main                            Step 7
Postoffice Destructor                  Step 8
```

Page 56: Cons / Destruction Order: Postoffice “Owns” a Clock

```
// postoffice3.h
#include <iostream>
using namespace std;

class Clock {
  public:
    Clock() {
      cout << "Clock Constructor\n";  // Step 5
    }
    ~Clock() {
      cout << "Clock Destructor\n";  // Step 10
    }
};
class Postoffice {
    Clock* clock;  // Step 3
  public:
    Postoffice() {
      clock = new Clock;  // Step 4
      cout << "Postoffice Constructor\n";  // Step 6
    }
    ~Postoffice() {
       cout << "Postoffice Destructor\n";  // Step 8
       delete clock;  // Step 9
    }
};

// postoffice3.cpp
#include <iostream>
#include "postoffice3.h"
using namespace std;

int main() {
  cout << "Beginning of main\n";      // Step 1
  Postoffice x;                       // Step 2
  cout << "End of main\n";            // Step 7
  return 0;
}
```

Output:

```
Beginning of main                     Step 1
Clock Constructor                     Step 5
Postoffice Constructor                Step 6
End of main                           Step 7
Postoffice Destructor                 Step 8
Clock Destructor                      Step 10
```

Page 57: Cons / Destruction Order: Postoffice Has Clock + Room

```
// postoffice4.h
#include <iostream>
using namespace std;

class Clock {
  private:
    int HHMM;
  public:
    Clock() : HHMM(0) // Step 6 {
      cout << "Clock Constructor\n";  // Step 7
    }
    ~Clock() { cout << "Clock Destructor\n"; }  // Step 11
};

class Room {
  public:
    Room() { cout << "Room Constructor\n"; }  // Step 4
    ~Room() { cout << "Room Destructor\n"; }  // Step 12
};

class Postoffice {
  private:
    Room room;  // Step 3
    Clock clock;  // Step 5
  public:
    Postoffice() { cout << "Postoffice Constructor\n"; }  // Step 8
    ~Postoffice() { cout << "Postoffice Destructor\n"; }  // Step 10
};

// postoffice4.cpp
#include <iostream>
#include "postoffice4.h"
using namespace std;

int main() {
  cout << "Beginning of main\n";        // Step 1
  Postoffice x;                         // Step 2
  cout << "End of main\n";              // Step 9
  return 0;
}
```

Output:

```
Beginning of main                     Step 1
Room Constructor                      Step 4
Clock Constructor                     Step 7
Postoffice Constructor                Step 8
End of main                           Step 9
Postoffice Destructor                 Step 10
Clock Destructor                      Step 11
Room Destructor                       Step 12
```

Page 58: Cons / Destruction Order: Post office Moves Clock to Room

```
// postoffice5.h
#include <iostream>
using namespace std;

class Clock {
  public:
    Clock() {
      cout << "Clock Constructor\n";  // Step 5
    }
    ~Clock() { cout << "Clock Destructor\n"; }  // Step 11
};

class Room {
  private:
    Clock clock;  // Step 4
  public:
    Room() { cout << "Room Constructor\n"; }  // Step 6
    ~Room() { cout << "Room Destructor\n"; }  // Step 10
};

class Postoffice {
  private:
    Room room;  // Step 3
  public:
    Postoffice() { cout << "Postoffice Constructor\n"; }  // Step 7
    ~Postoffice() { cout << "Postoffice Destructor\n"; }  // Step 9
};

// postoffice5.cpp
#include <iostream>
#include "postoffice5.h"
using namespace std;

int main() {
  cout << "Beginning of main\n";      // Step 1
  Postoffice x;                       // Step 2
  cout << "End of main\n";            // Step 8
  return 0;
}
```

Output:

```
Beginning of main                     Step 1
Clock Constructor                     Step 5
Room Constructor                      Step 6
Postoffice Constructor                Step 7
End of main                           Step 8
Postoffice Destructor                 Step 9
Room Destructor                       Step 10
Clock Destructor                      Step 11
```

Page 59: Cons / Destruction Order: Postoffice w/ a Temporary Clock

```
// postoffice6.h
#include <iostream>
using namespace std;

class Clock {
  private:
    int HHMM;
  public:
    Clock() : HHMM(0) // Step 4 {
      cout << "Clock Constructor\n";  // Step 5
    }
    Clock(int hhmm) : HHMM(hhmm) // Step 8 {
      cout << "Clock Constructor at " << HHMM << endl;  // Step 9
    }
    ~Clock() {
      cout << "Clock Destructor at " << HHMM << endl;   // Step 10, 13
    }
};

class Postoffice {
  private:
    Clock clock;  // Step 3
  public:
    Postoffice() {
      cout << "Postoffice Constructor\n";  // Step 6
      clock = Clock(800);  // Step 7
    }
    ~Postoffice() { cout << "Postoffice Destructor\n"; }  // Step 12
};

// postoffice6.cpp
#include <iostream>
#include "postoffice6.h"
using namespace std;

int main() {
  cout << "Beginning of main\n";       // Step 1
  Postoffice x;                        // Step 2
  cout << "End of main\n";             // Step 11
  return 0;
}
```

Output:

```
Beginning of main                      Step 1
Clock Constructor                      Step 5
Postoffice Constructor                 Step 6
Clock Constructor at 800               Step 9
Clock Destructor at 800                Step 10
End of main                            Step 11
Postoffice Destructor                  Step 12
Clock Destructor at 800                Step 13
```