

## 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