

Composition and initialization

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Composition *(folder 7)*

```
class Line {  
    Point p1, p2;  
};
```

C++	Java
Members are objects	Members are pointers

C++

Java

Stack:

line.p1.x

line.p1.y

line.p2.x

line.p2.y

Heap:

line

p1

p2

p1.x

p1.y

p2.x

p2.y

```
int main () { Line line; }
```

Construction

```
int main() {  
    B b;  
}
```

```
class A {  
public:  
    A() {  
        std::cout <<  
            "A - " <<  
            "parameterless" <<  
            " ctor\n";  
    }  
};
```

```
class B {  
    A _a1, _a2;  
public:  
    B() {  
        std::cout <<  
            "B - parameterless " <<  
            "ctor\n";  
    }  
};
```

Question: In what order
are the constructors
called?

Construction order

```
int main() {  
    B b;  
}
```

```
class A {  
public:  
    A() {  
        std::cout <<  
            "A - " <<  
            "parameterless" <<  
            " ctor\n";  
    }  
};
```

```
class B {  
    A _a1, _a2;  
public:  
    B() {  
        std::cout <<  
            "B - parameterless " <<  
            "ctor\n";  
    }  
};
```

```
// Answer: small to large  
A - parameterless ctor  
A - parameterless ctor  
B - parameterless ctor
```

Destruction

```
int main() {  
    B b;  
}
```

```
class A {  
public:  
    ~A() {  
        std::cout <<  
            "A - " <<  
            " dtor\n";  
    }  
};
```

```
class B {  
    A _a1, _a2;  
public:  
    ~B() {  
        std::cout <<  
            "B - dtor\n";  
    }  
};
```

Question: In what order
are the destructors
called?

Destruction order

```
int main() {  
    B b;  
}
```

```
class A {  
public:  
    ~A() {  
        std::cout <<  
            "A - " <<  
            " dtor\n";  
    }  
};
```

```
class B {  
    A _a1, _a2;  
public:  
    ~B() {  
        std::cout <<  
            "B - dtor\n";  
    }  
};
```

// Answer: large to small

```
B - dtor  
A - dtor  
A - dtor
```

The parameterless ctor (aka default ctor)

```
int main() {  
    B b;  
}
```

```
class A {  
public:  
    A(int a) {  
        std::cout <<  
            "A ctor with one  
            parameter\n";  
    }  
};
```

```
class B {  
    A _a1, _a2;  
public:  
    B() {  
        std::cout <<  
            "B - parameterless " <<  
            "ctor\n";  
    }  
};
```

```
// compilation error  
No parameterless ctor for _a1, _a2
```


The initialization list

```
int main() {  
    B b(2,3);  
}
```

```
class A {  
public:  
    A(int a) {  
        std::cout <<  
            "A (" << a << ") "  
        << std::endl;  
    }  
};
```

```
class B {  
    A _a1,_a2;  
public:  
    B(int i, int j)  
        :_a1 (i), _a2(j)  
    {  
        std::cout  
        << "B cons"  
        << std::endl;  
    }  
};
```

```
// output  
A (2)  
A (3)  
B cons
```

Initialization using pointers (1)

```
int main() {  
    B b(2);  
}
```

```
class A {  
public:  
    A(int a) {  
        std::cout <<  
            "A (" << a << ") "  
        << std::endl;  
    }  
};
```

```
class B {  
    A *_ap;  
public:  
    B(int i);  
};  
  
B::B(int i) {  
    _ap = new A (i);  
    cout << "B cons\n";  
}
```

```
// output  
A (2)  
B cons
```

Initialization using pointers (2)

```
int main() {  
    B b(2);  
}
```

```
class A {  
public:  
    A(int a) {  
        std::cout <<  
            "A (" << a << ") "  
        << std::endl;  
    }  
};
```

```
class B {  
    A *_ap;  
public:  
    B(int i);  
};  
  
B::B(int i)  
    : _ap (new A(i))  
{  
    cout << "B cons\n";  
}
```

```
output//  
A (2)  
B cons
```

The initialization list

```
int main() {  
    B b(2,3);  
}
```

```
class A {  
public:  
    A(int a) {  
        std::cout <<  
            "A (" << a << ") "  
        << std::endl;  
    }  
};
```

```
class B {  
    A _a1,_a2;  
public:  
    B(int i, int j)  
        :_a1 (i), _a2(j)  
    {  
        std::cout  
        << "B cons"  
        << std::endl;  
    }  
};
```

```
// output  
A (2)  
A (3)  
B cons
```

The initialization list

1. Initialization of object members.
2. Initialization of constants and reference variables.
3. Initialization of parent class.
4. It is faster and safer to use the initialization list than initialization in the constructor