# COMP2396B Tutorial 5

**Answer** 

```
class A {
       int n;
       public A() {
              this.n = 1;
       public void calculate() {
              this.n = 4 * this.n;
       public void print() {
              calculate();
              System.out.println("In A: " + this.n);
class B extends A {
       int n;
       public B() {
              this.n = 10;
       public void calculate() {
              this.n = 4 * super.n;
       public void print() {
              this.calculate();
              System.out.println("In B: " + this.n);
class C extends B {
       int n;
       public C() {
              this.n = 100;
       public void calculate() {
              this.n = 4 * this.n;
       public void print() {
              super.print();
              System.out.println("In C: " + this.n);
```

#### Question:

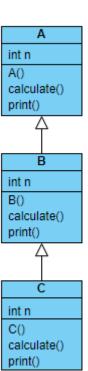
What is the output of the program? It has no compile-time or run-time error.

```
class A {
       int n;
       public A() {
              this.n = 1;
       public void calculate() {
              this.n = 4 * this.n;
       public void print() {
              calculate();
              System.out.println("In A: " + this.n);
class B extends A {
       int n;
       public B() {
              this.n = 10;
       public void calculate() {
              this.n = 4 * super.n;
       public void print() {
              this.calculate();
              System.out.println("In B: " + this.n);
class C extends B {
       int n;
       public C() {
              this.n = 100;
       public void calculate() {
              this.n = 4 * this.n;
       public void print() {
              super.print();
              System.out.println("In C: " + this.n);
```

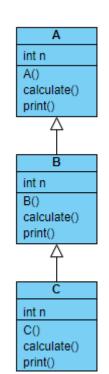
```
public class Main {
    public static void main(String[] args) {
        A x1 = new A();
        x1.print();

        B x2 = new B();
        x2.print();

        C x3 = new C();
        x3.print();
    }
}
```



```
class A {
       int n;
       public A() {
              this.n = 1;
       public void calculate() {
              this.n = 4 * this.n;
       public void print() {
              calculate();
              System.out.println("In A: " + this.n);
class B extends A {
       int n;
       public B() {
              this.n = 10;
       public void calculate() {
              this.n = 4 * super.n;
       public void print() {
              this.calculate();
              System.out.println("In B: " + this.n);
class C extends B {
       int n;
       public C() {
              this.n = 100;
       public void calculate() {
              this.n = 4 * this.n;
       public void print() {
              super.print();
              System.out.println("In C: " + this.n);
```



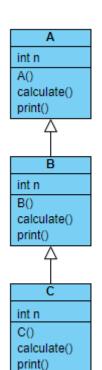
A n = 0

ints are initialized by 0

```
class A {
                                                                         public class Main {
       int n;
                                                                                 public static void main(String[] args) {
       public A() {
                                                                                        A \times 1 = \text{new A()}; \neg
               this.n = 1;
                                                                                         x1.print();
       public void calculate() {
                                                                                         B \times 2 = new B();
               this.n = 4 * this.n;
                                                                                         x2.print();
       public void print() {
                                                                                         C \times 3 = new C();
               calculate();
                                                                                         x3.print();
               System.out.println("In A: " + this.n);
class B extends A {
       int n;
       public B() {
               this.n = 10;
                                                                                         x1 – class A obj
                                                                int n
       public void calculate() {
                                                                                               n = 0
                                                                A()
               this.n = 4 * super.n;
                                                                calculate()
       public void print() {
                                                                print()
               this.calculate();
               System.out.println("In B: " + this.n);
                                                                int n
class C extends B {
                                                                B()
       int n;
                                                                calculate()
       public C() {
                                                                print()
               this.n = 100;
       public void calculate() {
               this.n = 4 * this.n;
                                                                int n
       public void print() {
                                                                C()
               super.print();
                                                                calculate()
               System.out.println("In C: " + this.n);
                                                                print()
```

```
class A {
                                                                        public class Main {
       int n;
                                                                                public static void main(String[] args) {
       public A() {
                                                                                       A \times 1 = new A(); \neg
           this.n = 1;
                                                                                        x1.print();
       public void calculate() {
                                                                                        B \times 2 = new B();
               this.n = 4 * this.n;
                                                                                        x2.print();
       public void print() {
                                                                                        C \times 3 = new C();
               calculate();
                                                                                        x3.print();
               System.out.println("In A: " + this.n);
class B extends A {
       int n;
       public B() {
               this.n = 10;
                                                                                        x1 – class A obj
                                                               int n
       public void calculate() {
                                                                                              n = 0 -> 1
                                                               A()
               this.n = 4 * super.n;
                                                               calculate()
       public void print() {
                                                               print()
               this.calculate();
               System.out.println("In B: " + this.n);
                                                               int n
class C extends B {
                                                               B()
       int n;
                                                               calculate()
       public C() {
                                                               print()
               this.n = 100;
       public void calculate() {
              this.n = 4 * this.n;
                                                               int n
       public void print() {
                                                               C()
               super.print();
                                                               calculate()
               System.out.println("In C: " + this.n);
                                                               print()
```

```
class A {
       int n;
       public A() {
              this.n = 1;
       public void calculate() {
              this.n = 4 * this.n;
       public void print() {
              calculate();
              System.out.println("In A: " + this.n);
class B extends A {
       int n;
       public B() {
              this.n = 10;
       public void calculate() {
              this.n = 4 * super.n;
       public void print() {
              this.calculate();
              System.out.println("In B: " + this.n);
class C extends B {
       int n;
       public C() {
              this.n = 100;
       public void calculate() {
              this.n = 4 * this.n;
       public void print() {
              super.print();
              System.out.println("In C: " + this.n);
```



$$n = 0 -> 1$$

```
class A {
                                                                        public class Main {
       int n;
                                                                                public static void main(String[] args) {
       public A() {
                                                                                        A \times 1 = new A();
              this.n = 1;
                                                                                        x1.print();-
       public void calculate() {
                                                                                        B \times 2 = new B();
               this.n = 4 * this.n;
                                                                                        x2.print();
       public void print() {
                                                                                        C \times 3 = new C();
               calculate();
                                                                                        x3.print();
               System.out.println("In A: " + this.n);
class B extends A {
       int n;
       public B() {
               this.n = 10;
                                                                                        x1 – class A obj
                                                               int n
       public void calculate() {
                                                                                              n = 0 -> 1
                                                               A()
               this.n = 4 * super.n;
                                                               calculate()
       public void print() {
                                                               print()
               this.calculate();
               System.out.println("In B: " + this.n);
                                                               int n
class C extends B {
                                                               B()
       int n;
                                                               calculate()
       public C() {
                                                               print()
               this.n = 100;
       public void calculate() {
              this.n = 4 * this.n;
                                                               int n
       public void print() {
                                                               C()
               super.print();
                                                               calculate()
               System.out.println("In C: " + this.n);
                                                               print()
```

```
class A {
                                                                       public class Main {
       int n;
                                                                                public static void main(String[] args) {
       public A() {
                                                                                        A \times 1 = new A();
              this.n = 1;
                                                                                        x1.print();-
       public void calculate() {
                                                                                        B \times 2 = new B();
              this.n = 4 * this.n;
                                                                                        x2.print();
       public void print() {
                                                                                        C \times 3 = new C();
             calculate();
                                                                                        x3.print();
               System.out.println("In A: " + this.n);
class B extends A {
       int n;
       public B() {
               this.n = 10;
                                                                                        x1 – class A obj
                                                               int n
       public void calculate() {
                                                                                              n = 0 -> 1
                                                               A()
               this.n = 4 * super.n;
                                                               calculate()
       public void print() {
                                                               print()
               this.calculate();
               System.out.println("In B: " + this.n);
                                                               int n
class C extends B {
                                                               B()
       int n;
                                                               calculate()
       public C() {
                                                               print()
               this.n = 100;
       public void calculate() {
              this.n = 4 * this.n;
                                                               int n
       public void print() {
                                                               C()
               super.print();
                                                               calculate()
               System.out.println("In C: " + this.n);
                                                               print()
```

```
class A {
                                                                        public class Main {
       int n;
                                                                                public static void main(String[] args) {
       public A() {
                                                                                        A \times 1 = new A();
               this.n = 1;
                                                                                        x1.print();-
    → public void calculate() {
                                                                                        B \times 2 = new B();
               this.n = 4 * this.n;
                                                                                        x2.print();
       public void print() {
                                                                                        C \times 3 = new C();
             calculate();-
                                                                                        x3.print();
               System.out.println("In A: " + this.n);
class B extends A {
       int n;
       public B() {
               this.n = 10;
                                                                                        x1 – class A obj
                                                               int n
       public void calculate() {
                                                                                              n = 0 -> 1
                                                               A()
               this.n = 4 * super.n;
                                                               calculate()
       public void print() {
                                                               print()
               this.calculate();
               System.out.println("In B: " + this.n);
                                                               int n
class C extends B {
                                                               B()
       int n;
                                                               calculate()
       public C() {
                                                               print()
               this.n = 100;
       public void calculate() {
              this.n = 4 * this.n;
                                                               int n
       public void print() {
                                                               C()
               super.print();
                                                               calculate()
               System.out.println("In C: " + this.n);
                                                               print()
```

```
class A {
                                                                        public class Main {
       int n;
                                                                                 public static void main(String[] args) {
       public A() {
                                                                                         A \times 1 = new A();
               this.n = 1;
                                                                                         x1.print();-
       public void calculate() {
                                                                                         B \times 2 = new B();
           \rightarrow this.n = 4 * this.n;
                                                                                         x2.print();
       public void print() {
                                                                                         C \times 3 = new C();
             calculate();-
                                                                                         x3.print();
               System.out.println("In A: " + this.n);
class B extends A {
       int n;
       public B() {
               this.n = 10;
                                                                                         x1 – class A obj
                                                                int n
       public void calculate() {
                                                                                               n = 0 -> 1 -> 4
                                                                A()
               this.n = 4 * super.n;
                                                                calculate()
       public void print() {
                                                                print()
               this.calculate();
               System.out.println("In B: " + this.n);
                                                                int n
class C extends B {
                                                                B()
       int n;
                                                                calculate()
       public C() {
                                                                print()
               this.n = 100;
       public void calculate() {
               this.n = 4 * this.n;
                                                                int n
       public void print() {
                                                                C()
               super.print();
                                                                calculate()
               System.out.println("In C: " + this.n);
                                                                print()
```

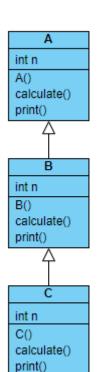
```
class A {
                                                                       public class Main {
       int n;
                                                                               public static void main(String[] args) {
       public A() {
                                                                                       A \times 1 = new A();
              this.n = 1;
                                                                                       x1.print();-
       public void calculate() {
                                                                                       B \times 2 = new B();
              this.n = 4 * this.n;
                                                                                       x2.print();
       public void print() {
                                                                                       C \times 3 = new C();
               calculate();
                                                                                       x3.print();
              System.out.println("In A: " + this.n);
class B extends A {
       int n;
       public B() {
              this.n = 10;
                                                                                       x1 – class A obj
                                                               int n
       public void calculate() {
                                                                                             n = 0 -> 1 -> 4
                                                              A()
              this.n = 4 * super.n;
                                                               calculate()
       public void print() {
                                                              print()
              this.calculate();
              System.out.println("In B: " + this.n);
                                                              int n
class C extends B {
                                                               B()
       int n;
                                                               calculate()
       public C() {
                                                               print()
              this.n = 100;
                                                                                       In A: 4
       public void calculate() {
                                                                                                               Program output
              this.n = 4 * this.n;
                                                               int n
       public void print() {
                                                               C()
              super.print();
                                                               calculate()
              System.out.println("In C: " + this.n);
                                                              print()
```

```
class A {
       int n;
       public A() {
              this.n = 1;
       public void calculate() {
              this.n = 4 * this.n;
       public void print() {
              calculate();
              System.out.println("In A: " + this.n);
class B extends A {
       int n;
       public B() {
              this.n = 10;
       public void calculate() {
              this.n = 4 * super.n;
       public void print() {
              this.calculate();
              System.out.println("In B: " + this.n);
class C extends B {
       int n;
       public C() {
              this.n = 100;
       public void calculate() {
              this.n = 4 * this.n;
       public void print() {
              super.print();
              System.out.println("In C: " + this.n);
```

```
public class Main {
    public static void main(String[] args) {
        A x1 = new A();
        x1.print();

        B x2 = new B();
        x2.print();

        C x3 = new C();
        x3.print();
}
```



#### x2 – class B obj

In A: 4

```
class A {
                                                                      public class Main {
       int n;
                                                                              public static void main(String[] args) {
       public A() {
                                                                                       A \times 1 = new A();
              this.n = 1;
                                                                                       x1.print();
       public void calculate() {
                                                                                      B \times 2 = new B(); \sim
              this.n = 4 * this.n;
                                                                                       x2.print();
       public void print() {
                                                                                      C \times 3 = new C();
              calculate();
              System.out.println("In A: " + this.n);
                                                                                       x3.print();
class B extends A {
       int n;
       public B() {
              this.n = 10;
                                                                                      x1 – class A obj
                                                              int n
       public void calculate() {
                                                                                            n = 0 -> 1 -> 4
                                                              A()
              this.n = 4 * super.n;
                                                              calculate()
       public void print() {
                                                              print()
              this.calculate();
                                                                                      x2 – class B obj
              System.out.println("In B: " + this.n);
                                                                                            n = 0
                                                              int n
class C extends B {
                                                              B()
                                                                                       В
                                                                                            n = 0
       int n;
                                                              calculate()
       public C() {
                                                              print()
              this.n = 100;
                                                                                      In A: 4
       public void calculate() {
                                                                                                              Program output
              this.n = 4 * this.n;
                                                              int n
       public void print() {
                                                              C()
              super.print();
                                                              calculate()
              System.out.println("In C: " + this.n);
                                                              print()
```

```
class A {
                                                                      public class Main {
       int n;
                                                                               public static void main(String[] args) {
       public A() {
                                                                                       A \times 1 = new A();
              this.n = 1;
                                                                                       x1.print();
       public void calculate() {
                                                                                      B \times 2 = new B(); \sim
              this.n = 4 * this.n;
                                                                                       x2.print();
       public void print() {
                                                                                      C \times 3 = new C();
              calculate();
                                                                                       x3.print();
              System.out.println("In A: " + this.n);
class B extends A {
       int n;
       public B() {~
              this.n = 10;
                                                                                      x1 – class A obj
                                                              int n
       public void calculate() {
                                                                                            n = 0 -> 1 -> 4
                                                              A()
              this.n = 4 * super.n;
                                                              calculate()
       public void print() {
                                                              print()
              this.calculate();
                                                                                      x2 – class B obj
              System.out.println("In B: " + this.n);
                                                                                            n = 0
                                                              int n
class C extends B {
                                                              B()
                                                                                       В
                                                                                            n = 0
       int n;
                                                              calculate()
       public C() {
                                                              print()
              this.n = 100;
                                                                                      In A: 4
       public void calculate() {
                                                                                                              Program output
              this.n = 4 * this.n;
                                                              int n
       public void print() {
                                                              C()
              super.print();
                                                              calculate()
              System.out.println("In C: " + this.n);
                                                              print()
```

```
class A {
                                                                      public class Main {
       int n;
                                                                              public static void main(String[] args) {
       public A() {
                                                                                      A \times 1 = new A();
        this.n = 1;
                                                                                      x1.print();
       public void calculate() {
                                                                                     B \times 2 = new B(); \sim
              this.n = 4 * this.n;
                                                                                      x2.print();
       public void print() {
                                                                                      C \times 3 = new C();
              calculate();
                                                                                      x3.print();
              System.out.println("In A: " + this.n);
class B extends A {
       int n;
       public B() {~
              this.n = 10;
                                                                                     x1 – class A obj
                                                              int n
       public void calculate() {
                                                                                            n = 0 -> 1 -> 4
                                                             A()
              this.n = 4 * super.n;
                                                              calculate()
       public void print() {
                                                             print()
              this.calculate();
                                                                                     x2 – class B obj
              System.out.println("In B: " + this.n);
                                                                                            n = 0 -> 1
                                                             int n
class C extends B {
                                                              B()
                                                                                      В
                                                                                            n = 0
       int n;
                                                              calculate()
       public C() {
                                                              print()
              this.n = 100;
                                                                                      In A: 4
       public void calculate() {
                                                                                                             Program output
              this.n = 4 * this.n;
                                                              int n
       public void print() {
                                                              C()
              super.print();
                                                              calculate()
              System.out.println("In C: " + this.n);
                                                             print()
```

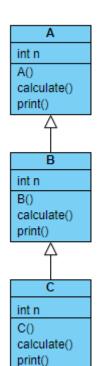
```
public class Main {
class A {
       int n;
                                                                              public static void main(String[] args) {
       public A() {
                                                                                      A \times 1 = new A();
              this.n = 1;
                                                                                      x1.print();
       public void calculate() {
                                                                                     B \times 2 = new B(); \sim
              this.n = 4 * this.n;
                                                                                      x2.print();
       public void print() {
                                                                                      C \times 3 = new C();
              calculate();
                                                                                      x3.print();
              System.out.println("In A: " + this.n);
class B extends A {
       int n;
     public B() {
             this.n = 10;
                                                                                      x1 – class A obj
                                                              int n
       public void calculate() {
                                                                                            n = 0 -> 1 -> 4
                                                              A()
              this.n = 4 * super.n;
                                                              calculate()
       public void print() {
                                                              print()
              this.calculate();
                                                                                      x2 – class B obj
              System.out.println("In B: " + this.n);
                                                                                            n = 0 -> 1
                                                              int n
class C extends B {
                                                              B()
                                                                                            n = 0 -> 10
                                                                                      В
       int n;
                                                              calculate()
       public C() {
                                                              print()
              this.n = 100;
                                                                                      In A: 4
       public void calculate() {
                                                                                                             Program output
              this.n = 4 * this.n;
                                                              int n
       public void print() {
                                                              C()
              super.print();
                                                              calculate()
              System.out.println("In C: " + this.n);
                                                              print()
```

```
class A {
       int n;
       public A() {
              this.n = 1;
       public void calculate() {
              this.n = 4 * this.n;
       public void print() {
              calculate();
              System.out.println("In A: " + this.n);
class B extends A {
       int n;
       public B() {
              this.n = 10;
       public void calculate() {
              this.n = 4 * super.n;
       public void print() {
              this.calculate();
              System.out.println("In B: " + this.n);
class C extends B {
       int n;
       public C() {
              this.n = 100;
       public void calculate() {
              this.n = 4 * this.n;
       public void print() {
              super.print();
              System.out.println("In C: " + this.n);
```

```
public class Main {
    public static void main(String[] args) {
        A x1 = new A();
        x1.print();

        B x2 = new B();
        x2.print();

        C x3 = new C();
        x3.print();
}
```



#### x2 – class B obj

B 
$$n = 0 -> 10$$

In A: 4

```
class A {
       int n;
       public A() {
              this.n = 1;
       public void calculate() {
              this.n = 4 * this.n;
       public void print() {
              calculate();
              System.out.println("In A: " + this.n);
class B extends A {
       int n;
       public B() {
              this.n = 10;
       public void calculate() {
              this.n = 4 * super.n;
       public void print() {
              this.calculate();
              System.out.println("In B: " + this.n);
class C extends B {
       int n;
       public C() {
              this.n = 100;
       public void calculate() {
              this.n = 4 * this.n;
       public void print() {
              super.print();
              System.out.println("In C: " + this.n);
```

```
public class Main {
    public static void main(String[] args) {
        A x1 = new A();
        x1.print();

        B x2 = new B();
        x2.print();

        C x3 = new C();
        x3.print();
    }
}
The most print() in prin
```

int n

A()

print()

int n

B()

print()

int n

C()

print()

calculate()

calculate()

calculate()

Which print() is called? Ans:

The most specific version.

The calling obj is of class B. The print() in B is overriding the print() in A. The most specific version is the one in B.

#### x1 – class A obj

#### x2 – class B obj

A 
$$n = 0 -> 1$$
  
B  $n = 0 -> 10$ 

```
class A {
                                                                      public class Main {
       int n;
                                                                              public static void main(String[] args) {
       public A() {
                                                                                      A \times 1 = new A();
              this.n = 1;
                                                                                      x1.print();
       public void calculate() {
                                                                                      B \times 2 = new B();
              this.n = 4 * this.n;
                                                                                      x2.print(); -
       public void print() {
                                                                                      C \times 3 = new C();
              calculate();
              System.out.println("In A: " + this.n);
                                                                                      x3.print();
class B extends A {
       int n;
       public B() -
              this.n = 10;
                                                                                      x1 – class A obj
                                                              int n
       public void calculate() {
                                                                                            n = 0 -> 1 -> 4
                                                              A()
              this.n = 4 * super.n;
                                                              calculate()
       public void print() {
                                                              print()
              this.calculate();
                                                                                      x2 – class B obj
              System.out.println("In B: " + this.n);
                                                                                            n = 0 -> 1
                                                              int n
class C extends B {
                                                              B()
                                                                                            n = 0 -> 10
       int n;
                                                              calculate()
       public C() {
                                                              print()
              this.n = 100;
                                                                                      In A: 4
       public void calculate() {
                                                                                                              Program output
              this.n = 4 * this.n;
                                                              int n
       public void print() {
                                                              C()
              super.print();
                                                              calculate()
              System.out.println("In C: " + this.n);
                                                              print()
```

```
class A {
                                                                      public class Main {
       int n;
                                                                              public static void main(String[] args) {
       public A() {
                                                                                      A \times 1 = new A();
              this.n = 1;
                                                                                      x1.print();
       public void calculate() {
                                                                                      B \times 2 = new B();
              this.n = 4 * this.n;
                                                                                      x2.print(); -
       public void print() {
                                                                                      C \times 3 = new C();
              calculate();
              System.out.println("In A: " + this.n);
                                                                                      x3.print();
class B extends A {
       int n;
       public B() -
              this.n = 10;
                                                                                      x1 – class A obj
                                                              int n
       public void calculate() {
                                                                                            n = 0 -> 1 -> 4
                                                              A()
              this.n = 4 * super.n;
                                                              calculate()
       public void print() {
                                                              print()
             this.calculate();
                                                                                      x2 – class B obj
              System.out.println("In B: " + this.n);
                                                                                            n = 0 -> 1
                                                              int n
class C extends B {
                                                              B()
                                                                                            n = 0 -> 10
       int n;
                                                              calculate()
       public C() {
                                                              print()
              this.n = 100;
                                                                                      In A: 4
       public void calculate() {
                                                                                                              Program output
              this.n = 4 * this.n;
                                                              int n
       public void print() {
                                                              C()
              super.print();
                                                              calculate()
              System.out.println("In C: " + this.n);
                                                              print()
```

```
public class Main {
class A {
       int n;
                                                                            public static void main(String[] args) {
       public A() {
                                                                                    A \times 1 = new A();
              this.n = 1;
                                                                                    x1.print();
       public void calculate() {
                                                                                    B \times 2 = new B();
              this.n = 4 * this.n;
                                                                                    x2.print(); -
       public void print() {
                                                                                    C \times 3 = new C();
              calculate();
                                                                                    x3.print();
              System.out.println("In
                                      The calling obj is of class B. The
                                       most specific version of the
                                       calculate() is the one in B.
class B extends A {
       int n;
       public B()
              this.n = 10;
                                                                                    x1 – class A obj
                                                             int n
       public void calculate() {
                                                                                          n = 0 -> 1 -> 4
                                                            A()
              this.n = 4 * super.n;
                                                             calculate()
       public void print() {
                                                            print()
             this.calculate();
                                                                                    x2 – class B obj
              System.out.println("In B: " + this.n);
                                                                                          n = 0 -> 1
                                                            int n
class C extends B {
                                                            B()
                                                                                          n = 0 -> 10
       int n;
                                                             calculate()
       public C() {
                                                             print()
              this.n = 100;
                                                                                    In A: 4
       public void calculate() {
                                                                                                           Program output
              this.n = 4 * this.n;
                                                            int n
       public void print() {
                                                             C()
              super.print();
                                                             calculate()
              System.out.println("In C: " + this.n);
                                                            print()
```

```
public class Main {
class A {
       int n;
                                                                              public static void main(String[] args) {
       public A() {
                                                                                      A \times 1 = new A();
              this.n = 1;
                                                                                      x1.print();
       public void calculate() {
                                                                                      B \times 2 = new B();
              this.n = 4 * this.n;
                                                                                     x2.print(); -
       public void print() {
                                                                                      C \times 3 = new C();
              calculate();
              System.out.println("In A: " + this.n);
                                                                                      x3.print();
class B extends A {
       int n;
       public B() -
              this.n = 10;
                                                                                     x1 – class A obj
                                                              int n
     public void calculate() {
                                                                                            n = 0 -> 1 -> 4
                                                             A()
              this.n = 4 * super.n;
                                                              calculate()
       public void print() {
                                                             print()
             this.calculate();
                                                                                     x2 – class B obj
              System.out.println("In B: " + this.n);
                                                                                            n = 0 -> 1
                                                             int n
class C extends B {
                                                              B()
                                                                                            n = 0 -> 10
       int n;
                                                              calculate()
       public C() {
                                                              print()
              this.n = 100;
                                                                                      In A: 4
       public void calculate() {
                                                                                                             Program output
              this.n = 4 * this.n;
                                                              int n
       public void print() {
                                                              C()
              super.print();
                                                              calculate()
              System.out.println("In C: " + this.n);
                                                             print()
```

```
public class Main {
class A {
       int n;
                                                                            public static void main(String[] args) {
       public A() {
                                                                                    A \times 1 = new A();
              this.n = 1;
                                                                                    x1.print();
       public void calculate() {
                                                                                    B \times 2 = new B();
              this.n = 4 * this.n;
                                                                                   x2.print();-
      public void print() {
                                      This statement is in the scope of
                                                                                   C \times 3 = new C();
              calculate();
                                                                                    x3.print();
              System.out.println("In
                                      B, super refer to the parent class,
                                      i.e., A. Therefore, super.n refer to
                                                the n in A, i.e., 1
class B extends A {
       int n;
       public B()
              this.n = 10;
                                                                                   x1 – class A obj
                                                            int n
     public void calculate() -
                                                                                         n = 0 -> 1 -> 4
                                                            A()
             this.n = 4 * super.n;
                                                            calculate()
       public void print() {
                                                            print()
             this.calculate(); _
                                                                                   x2 – class B obj
              System.out.println("In B: " + this.n);
                                                                                          n = 0 -> 1
                                                            int n
class C extends B {
                                                            B()
                                                                                          n = 0 -> 10 -> 4
                                                                                    В
      int n;
                                                            calculate()
       public C() {
                                                            print()
              this.n = 100;
                                                                                   In A: 4
      public void calculate() {
                                                                                                          Program output
              this.n = 4 * this.n;
                                                            int n
       public void print() {
                                                            C()
              super.print();
                                                            calculate()
              System.out.println("In C: " + this.n);
                                                            print()
```

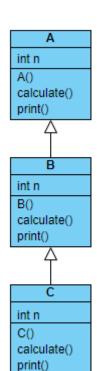
```
class A {
                                                                      public class Main {
       int n;
                                                                              public static void main(String[] args) {
       public A() {
                                                                                      A \times 1 = new A();
              this.n = 1;
                                                                                      x1.print();
       public void calculate() {
                                                                                      B \times 2 = new B();
              this.n = 4 * this.n;
                                                                                      x2.print(); -
       public void print() {
                                                                                      C \times 3 = new C();
              calculate();
              System.out.println("In A: " + this.n);
                                                                                      x3.print();
class B extends A {
       int n;
       public B() -
              this.n = 10;
                                                                                      x1 – class A obj
                                                              int n
       public void calculate() {
                                                                                            n = 0 -> 1 -> 4
                                                              A()
              this.n = 4 * super.n;
                                                              calculate()
       public void print() {
                                                              print()
              this.calculate();
                                                                                      x2 – class B obj
              System.out.println("In B: " + this.n);
                                                                                            n = 0 -> 1
                                                              int n
class C extends B {
                                                              B()
                                                                                            n = 0 -> 10 -> 4
                                                                                      В
       int n;
                                                              calculate()
       public C() {
                                                              print()
              this.n = 100;
                                                                                      In A: 4
       public void calculate() {
                                                                                                             Program output
              this.n = 4 * this.n;
                                                                                      In B: 4
                                                              int n
       public void print() {
                                                              C()
              super.print();
                                                              calculate()
              System.out.println("In C: " + this.n);
                                                              print()
```

```
class A {
       int n;
       public A() {
              this.n = 1;
       public void calculate() {
              this.n = 4 * this.n;
       public void print() {
              calculate();
              System.out.println("In A: " + this.n);
class B extends A {
       int n;
       public B() {
              this.n = 10;
       public void calculate() {
              this.n = 4 * super.n;
       public void print() {
              this.calculate();
              System.out.println("In B: " + this.n);
class C extends B {
       int n;
       public C() {
              this.n = 100;
       public void calculate() {
              this.n = 4 * this.n;
       public void print() {
              super.print();
              System.out.println("In C: " + this.n);
```

```
public class Main {
    public static void main(String[] args) {
        A x1 = new A();
        x1.print();

        B x2 = new B();
        x2.print();

        C x3 = new C();
        x3.print();
}
```



#### x2 – class B obj

In B: 4

# Program output

# x3 – class C obj

B 
$$n = 0$$

$$C n = 0$$

```
public class Main {
class A {
       int n;
                                                                             public static void main(String[] args) {
       public A() {
                                                                                     A \times 1 = new A();
              this.n = 1;
                                                                                     x1.print();
       public void calculate() {
                                                                                     B \times 2 = new B();
              this.n = 4 * this.n;
                                                                                     x2.print();
       public void print() {
                                                                                     C \times 3 = new C(); -
              calculate();
              System.out.println("In A: " + this.n);
                                                                                     x3.print();
class B extends A {
       int n;
       public B() {
                                                                                                                      x3 – class C obj
              this.n = 10;
                                                                                     x1 – class A obj
                                                             int n
       public void calculate() {
                                                                                                                            n = 0
                                                                                           n = 0 -> 1 -> 4
                                                             A()
              this.n = 4 * super.n;
                                                             calculate()
                                                                                                                            n = 0
       public void print() {
                                                             print()
              this.calculate();
                                                                                     x2 – class B obj
              System.out.println("In B: " + this.n);
                                                                                                                            n = 0
                                                                                           n = 0 -> 1
                                                             int n
class C extends B {
                                                             B()
                                                                                           n = 0 -> 10 -> 4
       int n;
                                                             calculate()
    → public C() {
                                                             print()
              this.n = 100;
```

int n

C()

print()

calculate()

public void calculate() {

super.print();

public void print() {

this.n = 4 \* this.n;

System.out.println("In C: " + this.n);

In A: 4 In B: 4

```
public class Main {
class A {
       int n;
                                                                             public static void main(String[] args) {
       public A() {
                                                                                     A \times 1 = new A();
              this.n = 1;
                                                                                     x1.print();
       public void calculate() {
                                                                                     B \times 2 = new B();
              this.n = 4 * this.n;
                                                                                     x2.print();
       public void print() {
                                                                                     C \times 3 = new C(); -
              calculate();
              System.out.println("In A: " + this.n);
                                                                                     x3.print();
class B extends A {
       int n;
      public B() {
                                                                                                                      x3 – class C obj
              this.n = 10;
                                                                                    x1 – class A obj
                                                             int n
       public void calculate() {
                                                                                                                            n = 0
                                                                                           n = 0 -> 1 -> 4
                                                             A()
              this.n = 4 * super.n;
                                                             calculate()
                                                                                                                            n = 0
       public void print() {
                                                             print()
              this.calculate();
                                                                                    x2 – class B obj
              System.out.println("In B: " + this.n);
                                                                                                                            n = 0
                                                                                           n = 0 -> 1
                                                             int n
class C extends B {
                                                             B()
                                                                                           n = 0 -> 10 -> 4
       int n;
                                                             calculate()
    → public C() { ~
                                                             print()
              this.n = 100;
       public void calculate() {
                                                                                     In A: 4
                                                                                                            Program output
              this.n = 4 * this.n;
                                                                                     In B: 4
                                                             int n
       public void print() {
                                                             C()
              super.print();
                                                             calculate()
              System.out.println("In C: " + this.n);
                                                             print()
```

```
class A {
                                                                     public class Main {
       int n;
                                                                             public static void main(String[] args) {
     ▶ public A() {
                                                                                     A \times 1 = new A();
              this.n = 1;
                                                                                     x1.print();
       public void calculate() {
                                                                                     B \times 2 = new B();
              this.n = 4 * this.n;
                                                                                     x2.print();
       public void print() {
                                                                                     C \times 3 = new C(); -
              calculate();
              System.out.println("In A: " + this.n);
                                                                                     x3.print();
class B extends A {
       int n;
       public B() { -
                                                                                                                      x3 – class C obj
              this.n = 10;
                                                                                     x1 – class A obj
                                                             int n
       public void calculate() {
                                                                                                                            n = 0
                                                                                           n = 0 -> 1 -> 4
                                                             A()
              this.n = 4 * super.n;
                                                             calculate()
                                                                                                                             n = 0
       public void print() {
                                                             print()
              this.calculate();
                                                                                     x2 – class B obj
              System.out.println("In B: " + this.n);
                                                                                                                             n = 0
                                                                                           n = 0 -> 1
                                                             int n
class C extends B {
                                                             B()
                                                                                           n = 0 -> 10 -> 4
       int n;
                                                             calculate()
    → public C() { ~
                                                             print()
              this.n = 100;
       public void calculate() {
                                                                                     In A: 4
                                                                                                            Program output
              this.n = 4 * this.n;
                                                                                     In B: 4
                                                             int n
       public void print() {
                                                             C()
              super.print();
                                                             calculate()
              System.out.println("In C: " + this.n);
                                                             print()
```

```
class A {
                                                                     public class Main {
       int n;
                                                                             public static void main(String[] args) {
     ▶ public A() {
                                                                                    A \times 1 = new A();
         this.n = 1;
                                                                                    x1.print();
       public void calculate() {
                                                                                    B \times 2 = new B();
              this.n = 4 * this.n;
                                                                                    x2.print();
       public void print() {
                                                                                    C \times 3 = new C(); -
              calculate();
                                                                                    x3.print();
              System.out.println("In A: " + this.n);
class B extends A {
       int n;
      public B() { -
                                                                                                                     x3 – class C obj
              this.n = 10;
                                                                                    x1 – class A obj
                                                             int n
       public void calculate() {
                                                                                                                           n = 0 -> 1
                                                                                          n = 0 -> 1 -> 4
                                                            A()
              this.n = 4 * super.n;
                                                             calculate()
                                                                                                                            n = 0
       public void print() {
                                                            print()
              this.calculate();
                                                                                    x2 – class B obj
              System.out.println("In B: " + this.n);
                                                                                                                            n = 0
                                                                                           n = 0 -> 1
                                                             int n
class C extends B {
                                                             B()
                                                                                           n = 0 -> 10 -> 4
       int n;
                                                             calculate()
    → public C() { ~
                                                             print()
              this.n = 100;
       public void calculate() {
                                                                                    In A: 4
                                                                                                           Program output
              this.n = 4 * this.n;
                                                                                    In B: 4
                                                             int n
       public void print() {
                                                             C()
              super.print();
                                                             calculate()
              System.out.println("In C: " + this.n);
                                                            print()
```

```
public class Main {
class A {
       int n;
                                                                             public static void main(String[] args) {
       public A() {
                                                                                     A \times 1 = new A();
              this.n = 1;
                                                                                     x1.print();
       public void calculate() {
                                                                                     B \times 2 = new B();
              this.n = 4 * this.n;
                                                                                     x2.print();
       public void print() {
                                                                                    C \times 3 = new C(); -
              calculate();
                                                                                     x3.print();
              System.out.println("In A: " + this.n);
class B extends A {
       int n;
      public B() {
                                                                                                                      x3 – class C obj
             this.n = 10;
                                                                                    x1 – class A obj
                                                             int n
       public void calculate() {
                                                                                                                           n = 0 -> 1
                                                                                          n = 0 -> 1 -> 4
                                                             A()
              this.n = 4 * super.n;
                                                             calculate()
                                                                                                                            n = 0 -> 10
       public void print() {
                                                             print()
              this.calculate();
                                                                                    x2 – class B obj
              System.out.println("In B: " + this.n);
                                                                                                                            n = 0
                                                                                           n = 0 -> 1
                                                             int n
class C extends B {
                                                             B()
                                                                                           n = 0 -> 10 -> 4
       int n;
                                                             calculate()
    → public C() { ~
                                                             print()
              this.n = 100;
       public void calculate() {
                                                                                    In A: 4
                                                                                                            Program output
              this.n = 4 * this.n;
                                                                                    In B: 4
                                                             int n
       public void print() {
                                                             C()
              super.print();
                                                             calculate()
              System.out.println("In C: " + this.n);
                                                             print()
```

```
public class Main {
class A {
       int n;
                                                                            public static void main(String[] args) {
       public A() {
                                                                                    A \times 1 = new A();
              this.n = 1;
                                                                                    x1.print();
       public void calculate() {
                                                                                    B \times 2 = new B();
              this.n = 4 * this.n;
                                                                                    x2.print();
       public void print() {
                                                                                    C \times 3 = new C(); -
              calculate();
                                                                                    x3.print();
              System.out.println("In A: " + this.n);
class B extends A {
       int n;
       public B() {
                                                                                                                     x3 – class C obj
              this.n = 10;
                                                                                    x1 – class A obj
                                                             int n
       public void calculate() {
                                                                                                                           n = 0 -> 1
                                                                                          n = 0 -> 1 -> 4
                                                            A()
              this.n = 4 * super.n;
                                                             calculate()
                                                                                                                            n = 0 -> 10
       public void print() {
                                                            print()
              this.calculate();
                                                                                    x2 – class B obj
                                                                                                                           n = 0 -> 100
              System.out.println("In B: " + this.n);
                                                                                           n = 0 -> 1
                                                            int n
class C extends B {
                                                             B()
                                                                                           n = 0 -> 10 -> 4
       int n;
                                                             calculate()
      public C() {
                                                             print()
```

int n

C()

print()

calculate()

this.n = 100;

public void print() {

public void calculate() {

super.print();

this.n = 4 \* this.n;

System.out.println("In C: " + this.n);

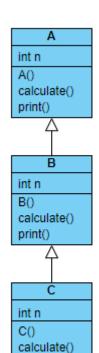
In A: 4 In B: 4

```
class A {
       int n;
       public A() {
              this.n = 1;
       public void calculate() {
              this.n = 4 * this.n;
       public void print() {
              calculate();
              System.out.println("In A: " + this.n);
class B extends A {
       int n;
       public B() {
              this.n = 10;
       public void calculate() {
              this.n = 4 * super.n;
       public void print() {
              this.calculate();
              System.out.println("In B: " + this.n);
class C extends B {
       int n;
       public C() {
              this.n = 100;
       public void calculate() {
              this.n = 4 * this.n;
       public void print() {
              super.print();
              System.out.println("In C: " + this.n);
```

```
public class Main {
    public static void main(String[] args) {
        A x1 = new A();
        x1.print();

        B x2 = new B();
        x2.print();

        C x3 = new C();
        x3.print();
}
```



print()

## x1 – class A obj

#### x2 – class B obj

B 
$$n = 0 \rightarrow 10 \rightarrow 4$$

#### x3 – class C obj

Α	n = 0 ->	1

B 
$$n = 0 -> 10$$

C 
$$n = 0 -> 100$$

In A: 4

In B: 4

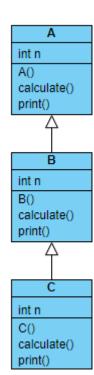
```
class A {
       int n;
       public A() {
              this.n = 1;
       public void calculate() {
              this.n = 4 * this.n;
       public void print() {
              calculate();
              System.out.println("In A: " + this.n);
class B extends A {
       int n;
       public B() {
              this.n = 10;
       public void calculate() {
              this.n = 4 * super.n;
       public void print() {
              this.calculate();
              System.out.println("In B: " + this.n);
class C extends B {
       int n;
       public C() {
              this.n = 100;
       public void calculate() {
              this.n = 4 * this.n;
       public void print() {
              super.print();
              System.out.println("In C: " + this.n);
```

```
public class Main {
    public static void main(String[] args) {
        A x1 = new A();
        x1.print();

        B x2 = new B();
        x2.print();

        C x3 = new C();
        x3.print();

        The most specific version of print() is in class C
```



#### x2 – class B obj

A 
$$n = 0 -> 1$$

B 
$$n = 0 \rightarrow 10 \rightarrow 4$$

#### x3 – class C obj

Α	n = 0 ->	1
, ,	•	_

B 
$$n = 0 -> 10$$

C 
$$n = 0 -> 100$$

In A: 4

In B: 4

```
public class Main {
class A {
       int n;
                                                                            public static void main(String[] args) {
       public A() {
                                                                                    A \times 1 = new A();
              this.n = 1;
                                                                                    x1.print();
       public void calculate() {
                                                                                    B \times 2 = new B();
              this.n = 4 * this.n;
                                                                                    x2.print();
       public void print() {
                                                                                    C \times 3 = new C();
              calculate();
                                                                                   x3.print();~
              System.out.println("In A: " + this.n);
class B extends A {
       int n;
       public B() {
                                                                                                                     x3 – class C obj
              this.n = 10;
                                                                                    x1 – class A obj
                                                             int n
       public void calculate() {
                                                                                                                           n = 0 -> 1
                                                                                          n = 0 -> 1 -> 4
                                                            A()
              this.n = 4 * super.n;
                                                             calculate()
                                                                                                                           n = 0 -> 10
       public void print() {
                                                            print()
              this.calculate();
                                                                                    x2 – class B obj
                                                                                                                           n = 0 -> 100
              System.out.println("In B: " + this.n);
                                                                                           n = 0 -> 1
                                                            int n
class C extends B {
                                                            B()
                                                                                           n = 0 -> 10 -> 4
       int n;
                                                             calculate()
       public C() {
                                                             print()
              this.n = 100;
       public void calculate() {
                                                                                    In A: 4
                                                                                                           Program output
              this.n = 4 * this.n;
                                                                                    In B: 4
                                                            int n
       public void print() {
                                                             C()
              super.print();
                                                             calculate()
              System.out.println("In C: " + this.n);
                                                            print()
```

```
public class Main {
class A {
       int n;
                                                                            public static void main(String[] args) {
       public A() {
                                                                                    A \times 1 = new A();
              this.n = 1;
                                                                                    x1.print();
       public void calculate() {
                                                                                    B \times 2 = new B();
              this.n = 4 * this.n;
                                                                                    x2.print();
       public void print() {
                                                                                    C \times 3 = new C();
              calculate();
                                                                                   x3.print();~
              System.out.println("In A: " + this.n);
class B extends A {
       int n;
       public B() {
                                                                                                                     x3 – class C obj
              this.n = 10;
                                                                                    x1 – class A obj
                                                             int n
       public void calculate() {
                                                                                                                           n = 0 -> 1
                                                                                          n = 0 -> 1 -> 4
                                                            A()
              this.n = 4 * super.n;
                                                             calculate()
                                                                                                                           n = 0 -> 10
       public void print() {
                                                            print()
              this.calculate();
                                                                                    x2 – class B obj
                                                                                                                           n = 0 -> 100
              System.out.println("In B: " + this.n);
                                                                                          n = 0 -> 1
                                                            int n
class C extends B {
                                                            B()
                                                                                          n = 0 -> 10 -> 4
       int n;
                                                             calculate()
       public C() {
                                                             print()
              this.n = 100;
       public void calculate() {
                                                                                    In A: 4
                                                                                                           Program output
              this.n = 4 * this.n;
                                                                                    In B: 4
                                                            int n
       public void print() {
                                                             C()
             super.print();
                                                             calculate()
              System.out.println("In C: " + this.n);
                                                            print()
```

```
public class Main {
class A {
       int n;
                                                                            public static void main(String[] args) {
       public A() {
              this.n = 1;
      public void calculate() {
              this.n = 4 * this.n;
       public void print() {
              calculate();
              System.out.println("In A: " + this.n);
class B extends A {
       int n;
       public B() {
              this.n = 10;
                                                            int n
      public void calculate() {
              this.n = 4 * super.n;
                                                            A()
                                                            calculate()
       public void print() {
                                                            print()
              this.calculate();
              System.out.println("In B: " + this.n);
                                  This statement is in the scope of
                                  C, super refer to the parent class,
class C extends B {
      int n;
                                    i.e., B. Therefore, super.print()
       public C() {
              this.n = 100;
                                        refer to the print() in B.
       public void calculate() {
              this.n = 4 * this.n;
                                                            int n
       public void print() {
                                                            C()
             super.print();
                                                            calculate()
              System.out.println("In C: " + this.n);
                                                            print()
```

 $A \times 1 = new A();$ 

 $B \times 2 = new B();$ 

 $C \times 3 = new C();$ 

x1.print();

x2.print();

x3.print();~

#### x2 – class B obj

In A: 4

In B: 4

## x3 – class C obj

Α	n = 0 -> 1

B 
$$n = 0 -> 10$$

C 
$$n = 0 -> 100$$

```
public class Main {
class A {
       int n;
                                                                            public static void main(String[] args) {
       public A() {
                                                                                    A \times 1 = new A();
              this.n = 1;
                                                                                    x1.print();
       public void calculate() {
                                                                                    B \times 2 = new B();
              this.n = 4 * this.n;
                                                                                    x2.print();
       public void print() {
                                                                                    C \times 3 = new C();
              calculate();
                                                                                   x3.print();~
              System.out.println("In A: " + this.n);
class B extends A {
       int n;
       public B() {
                                                                                                                     x3 – class C obj
              this.n = 10;
                                                                                    x1 – class A obj
                                                             int n
       public void calculate() {
                                                                                                                           n = 0 -> 1
                                                                                          n = 0 -> 1 -> 4
                                                            A()
              this.n = 4 * super.n;
                                                             calculate()
                                                                                                                           n = 0 -> 10
     public void print() {
                                                            print()
              this.calculate();
                                                                                    x2 – class B obj
                                                                                                                           n = 0 -> 100
              System.out.println("In B: " + this.n);
                                                                                          n = 0 -> 1
                                                            int n
class C extends B {
                                                            B()
                                                                                          n = 0 -> 10 -> 4
       int n;
                                                             calculate()
       public C() {
                                                             print()
              this.n = 100;
       public void calculate() {
                                                                                    In A: 4
                                                                                                           Program output
              this.n = 4 * this.n;
                                                                                    In B: 4
                                                            int n
       public void print() {
                                                             C()
             super.print(); _
                                                             calculate()
              System.out.println("In C: " + this.n);
                                                            print()
```

```
public class Main {
class A {
       int n;
                                                                            public static void main(String[] args) {
       public A() {
                                                                                    A \times 1 = new A();
              this.n = 1;
                                                                                    x1.print();
       public void calculate() {
                                                                                    B \times 2 = new B();
              this.n = 4 * this.n;
                                                                                    x2.print();
       public void print() {
                                                                                    C \times 3 = new C();
              calculate();
              System.out.println("In A: " + this.n);
                                                                                   x3.print();~
class B extends A {
       int n;
       public B() {
                                                                                                                     x3 – class C obj
              this.n = 10;
                                                                                    x1 – class A obj
                                                            int n
       public void calculate() {
                                                                                                                           n = 0 -> 1
                                                                                          n = 0 -> 1 -> 4
                                                            A()
              this.n = 4 * super.n;
                                                            calculate()
                                                                                                                           n = 0 -> 10
     public void print() {
                                                            print()
             this.calculate();
                                                                                    x2 – class B obj
                                                                                                                           n = 0 -> 100
              System.out.println("In B: " + this.n);
                                                                                          n = 0 -> 1
}
                                                            int n
class C extends B {
                                                            B()
                                                                                          n = 0 -> 10 -> 4
       int n;
                                                            calculate()
       public C() {
                                                            print()
              this.n = 100;
       public void calculate() {
                                                                                    In A: 4
                                                                                                           Program output
              this.n = 4 * this.n;
                                                                                    In B: 4
                                                            int n
       public void print() {
                                                            C()
             super.print(); _
                                                            calculate()
              System.out.println("In C: " + this.n);
                                                            print()
```

```
public class Main {
class A {
       int n;
                                                                           public static void main(String[] args) {
       public A() {
                                                                                   A \times 1 = new A();
              this.n = 1;
                                                                                   x1.print();
      public void calculate() {
                                                                                   B \times 2 = new B();
              this.n = 4 * this.n;
                                                                                   x2.print();
       public void print() {
                                                                                   C \times 3 = new C();
              calculate();
                                                                                  x3.print();~
              System.out.println("In A: " + this.n);
                                     Which calculate() to be called?
                                     Ans:
class B extends A {
       int n;
                                     The most specific version.
       public B() {
                                                                                                                   x3 – class C obj
              this.n = 10;
                                                                                  x1 – class A obj
                                                           int n
       public void calculate() {
                                                                                                                         n = 0 -> 1
                                                                                        n = 0 -> 1 -> 4
              this.n = 4 * super.n;
                                                           A()
                                                            calculate()
                                                                                                                         n = 0 -> 10
     public void print() {
                                                           print()
             this.calculate();
                                                                                  x2 – class B obj
                                                                                                                         n = 0 -> 100
              System.out.println("In B: " + this.n);
                                                                                         n = 0 -> 1
                                                           int n
class C extends B {
                                                           B()
                                                                                         n = 0 -> 10 -> 4
      int n;
                                                            calculate()
       public C() {
                                                            print()
              this.n = 100;
       public void calculate() {
                                                                                   In A: 4
                                                                                                         Program output
              this.n = 4 * this.n;
                                                                                   In B: 4
                                                           int n
       public void print() {
                                                            C()
             super.print(); _
                                                            calculate()
              System.out.println("In C: " + this.n);
                                                           print()
```

```
public class Main {
class A {
       int n;
                                                                            public static void main(String[] args) {
       public A() {
                                                                                    A \times 1 = new A();
              this.n = 1;
                                                                                    x1.print();
       public void calculate() {
                                                                                    B \times 2 = new B();
              this.n = 4 * this.n;
                                                                                    x2.print();
       public void print() {
                                                                                    C \times 3 = new C();
              calculate();
                                                                                   x3.print();~
              System.out.println("In A: " + this.n);
class B extends A {
       int n;
       public B() {
                                                                                                                     x3 – class C obj
              this.n = 10;
                                                                                    x1 – class A obj
                                                            int n
       public void calculate() {
                                                                                                                           n = 0 -> 1
                                                                                          n = 0 -> 1 -> 4
                                                            A()
              this.n = 4 * super.n;
                                                            calculate()
                                                                                                                           n = 0 -> 10
     public void print() {
                                                            print()
             this.calculate(); -
                                                                                    x2 – class B obj
                                                                                                                           n = 0 -> 100
              System.out.println("In B: " + this.n);
                                                                                          n = 0 -> 1
                                                            int n
class C extends B {
                                                            B()
                                                                                          n = 0 -> 10 -> 4
       int n;
                                                            calculate()
       public C() {
                                                            print()
              this.n = 100;
     public void calculate() {
                                                                                    In A: 4
                                                                                                           Program output
              this.n = 4 * this.n;
                                                                                    In B: 4
                                                            int n
       public void print() {
                                                            C()
             super.print(); _
                                                            calculate()
              System.out.println("In C: " + this.n);
                                                            print()
```

```
public class Main {
class A {
       int n;
                                                                             public static void main(String[] args) {
       public A() {
                                                                                     A \times 1 = new A();
              this.n = 1;
                                                                                     x1.print();
       public void calculate() {
                                                                                     B \times 2 = new B();
              this.n = 4 * this.n;
                                                                                     x2.print();
       public void print() {
                                                                                     C \times 3 = new C();
              calculate();
                                                                                    x3.print();~
              System.out.println("In A: " + this.n);
class B extends A {
       int n;
       public B() {
                                                                                                                      x3 – class C obj
              this.n = 10;
                                                                                     x1 – class A obj
                                                             int n
       public void calculate() {
                                                                                                                            n = 0 -> 1
                                                                                           n = 0 -> 1 -> 4
                                                             A()
              this.n = 4 * super.n;
                                                             calculate()
                                                                                                                            n = 0 -> 10
      public void print() {
                                                             print()
             this.calculate(); -
                                                                                     x2 – class B obj
                                                                                                                            n = 0 \rightarrow 100 \rightarrow 400
              System.out.println("In B: " + this.n);
                                                                                           n = 0 -> 1
                                                             int n
class C extends B {
                                                             B()
                                                                                           n = 0 -> 10 -> 4
       int n;
                                                             calculate()
       public C() {
                                   100
                                                             print()
              this.n = 100;
     public void calculate()
                                                                                     In A: 4
                                                                                                            Program output
             this.n = 4 * this.n;
                                                                                     In B: 4
                                                             int n
       public void print() {
                                                             C()
             super.print(); _
                                                             calculate()
              System.out.println("In C: " + this.n);
                                                             print()
```

```
public class Main {
class A {
       int n;
                                                                            public static void main(String[] args) {
       public A() {
                                                                                    A \times 1 = new A();
              this.n = 1;
                                                                                    x1.print();
       public void calculate() {
                                                                                    B \times 2 = new B();
              this.n = 4 * this.n;
                                                                                    x2.print();
       public void print() {
                                                                                    C \times 3 = new C();
              calculate();
                                                                                   x3.print();~
              System.out.println("In A: " + this.n);
class B extends A {
      int n;
       public B() {
                                                                                                                    x3 – class C obj
              this.n = 10;
                                                                                   x1 – class A obj
                                                            int n
      public void calculate() {
                                                                                                                          n = 0 -> 1
                                                                                         n = 0 -> 1 -> 4
                                                10
                                                            A()
              this.n = 4 * super.n;
                                                            calculate()
                                                                                                                          n = 0 -> 10
     public void print() {
                                                            print()
              this.calculate();
                                                                                   x2 – class B obj
                                                                                                                          n = 0 -> 100 -> 400
             System.out.println("In B: " + this.n);
                                                                                          n = 0 -> 1
}
                                                            int n
class C extends B {
                                                            B()
                                                                                          n = 0 -> 10 -> 4
      int n;
                                                            calculate()
       public C() {
                                                            print()
              this.n = 100;
       public void calculate() {
                                                                                   In A: 4
                                                                                                          Program output
              this.n = 4 * this.n;
                                                                                   In B: 4
                                                            int n
       public void print() {
                                                            C()
                                                                                   In B: 10
             super.print(); _
                                                            calculate()
              System.out.println("In C: " + this.n);
                                                            print()
```

```
public class Main {
class A {
       int n;
                                                                           public static void main(String[] args) {
       public A() {
                                                                                   A \times 1 = new A();
              this.n = 1;
                                                                                   x1.print();
       public void calculate() {
                                                                                   B \times 2 = new B();
              this.n = 4 * this.n;
                                                                                   x2.print();
       public void print() {
                                                                                   C \times 3 = new C();
              calculate();
                                                                                  x3.print();~
              System.out.println("In A: " + this.n);
class B extends A {
      int n;
       public B() {
                                                                                                                   x3 – class C obj
              this.n = 10;
                                                                                   x1 – class A obj
                                                            int n
      public void calculate() {
                                                                                                                         n = 0 -> 1
                                                                                         n = 0 -> 1 -> 4
              this.n = 4 * super.n;
                                                           A()
                                                            calculate()
                                                                                                                         n = 0 -> 10
      public void print() {
                                                           print()
              this.calculate();
                                                                                   x2 – class B obj
                                                                                                                         n = 0 -> 100 -> 400
              System.out.println("In B: " + this.n);
                                                                                         n = 0 -> 1
                                                            int n
class C extends B {
                                                            B()
                                                                                         n = 0 -> 10 -> 4
      int n;
                                                            calculate()
       public C() {
                                                            print()
              this.n = 100;
       public void calculate() {
                                                                                   In A: 4
                                              400
                                                                                                          Program output
              this.n = 4 * this.n;
                                                                                   In B: 4
                                                            int n
      public void print() {
                                                            C()
                                                                                   In B: 10
              super.print();
```

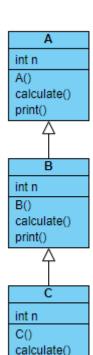
calculate()

In C: 400

print()

System.out.println("In C: " + this.n);

```
class A {
       int n;
       public A() {
              this.n = 1;
       public void calculate() {
              this.n = 4 * this.n;
       public void print() {
              calculate();
              System.out.println("In A: " + this.n);
class B extends A {
       int n;
       public B() {
              this.n = 10;
       public void calculate() {
              this.n = 4 * super.n;
       public void print() {
              this.calculate();
              System.out.println("In B: " + this.n);
class C extends B {
       int n;
       public C() {
              this.n = 100;
       public void calculate() {
              this.n = 4 * this.n;
       public void print() {
              super.print();
              System.out.println("In C: " + this.n);
```



print()

#### x1 – class A obj

#### x2 – class B obj

A 
$$n = 0 -> 1$$

B 
$$n = 0 \rightarrow 10 \rightarrow 4$$

## x3 – class C obj

A 
$$n = 0 -> 1$$

B 
$$n = 0 -> 10$$

C 
$$n = 0 \rightarrow 100 \rightarrow 400$$

In A: 4

In B: 4

In B: 10

In C: 400

Program output

Done!

