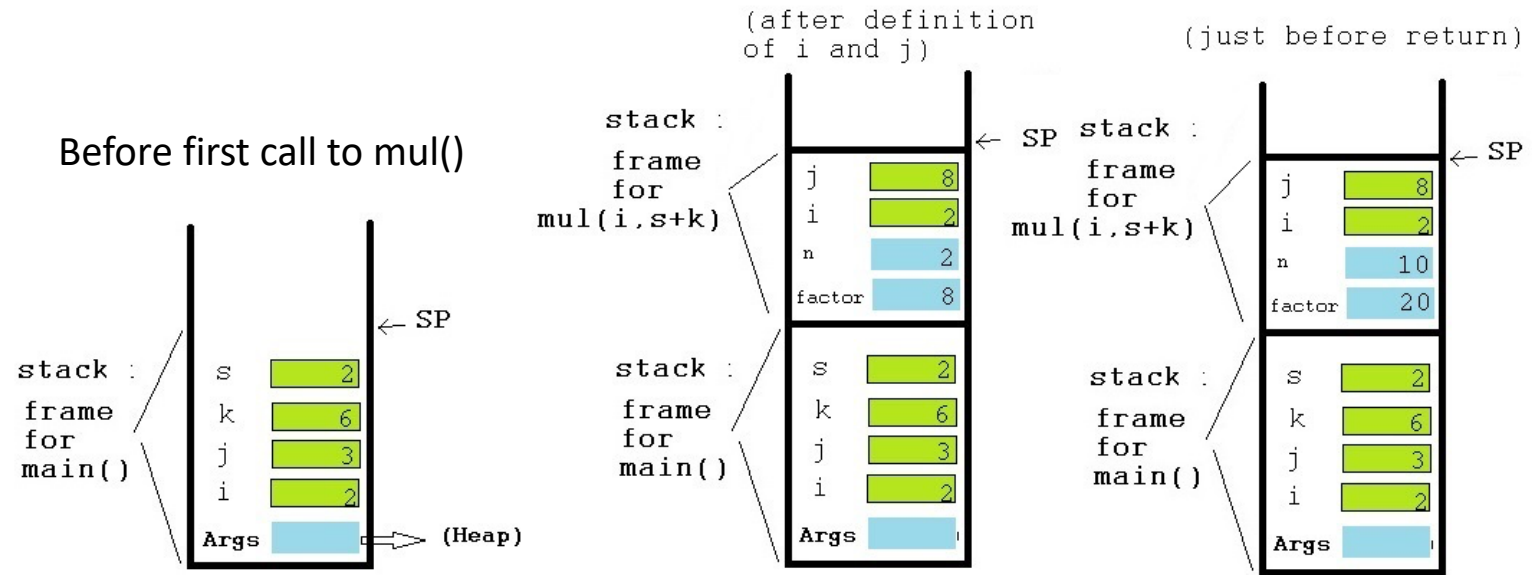


Lab 10

CSE114 – Intro to Object Oriented Programming

Declare (1)

```
public class Declare {  
...  
    public static void main (String[] args) {  
        int i;  
        i = 2;  
        int j = 3;  
  
        int k;  
        k = i * j;  
        System.out.println("sum is: " + i + j + k);  
        int s = 2;  
        i = mul(i, s + k);  
        j = mul(s, s);  
        System.out.println("sum is: " + i + j + s);  
    }  
}
```

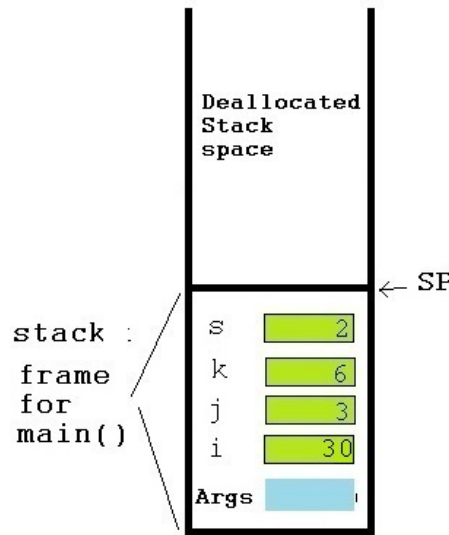


```
public static int mul(int n, int factor) {  
    int i = n;  
    int j = factor;  
    n = i + j;  
    factor = n + n;  
    return n + factor;  
}
```

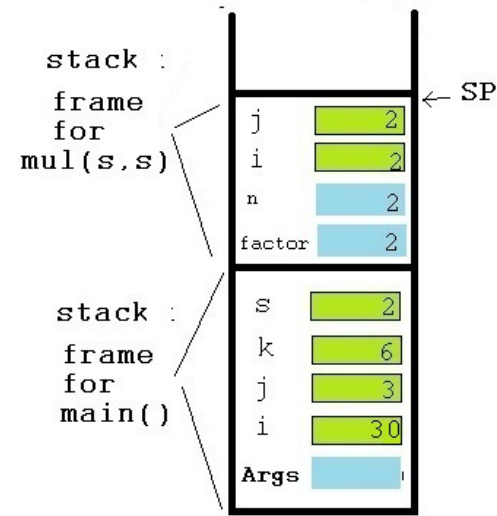
Declare (2)

```
public class Declare {  
...  
    public static void main (String[] args) {  
        int i;  
        i = 2;  
        int j = 3;  
  
        int k;  
        k = i * j;  
        System.out.println("sum is: " + i + j + k);  
        int s = 2;  
        i = mul(i, s + k);  
        j = mul(s, s);  
        System.out.println("sum is: " + i + j + s);  
    }  
}
```

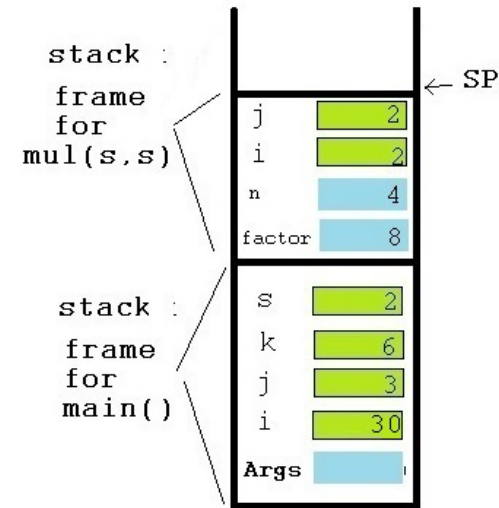
(before 2nd call to mul())



(after definition of i and j)



(just before return)

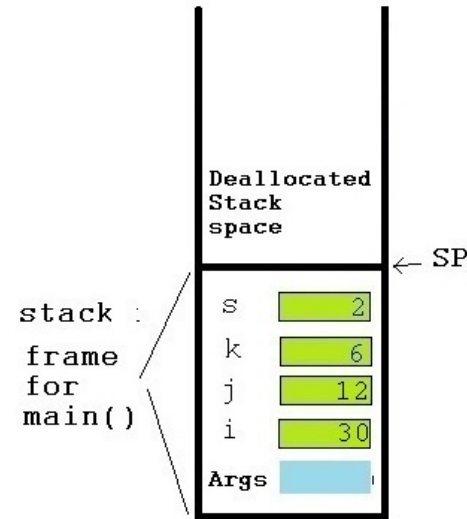


```
public static int mul(int n, int factor) {  
    int i = n;  
    int j = factor;  
    n = i + j;  
    factor = n + n;  
    return n + factor;  
}
```

Declare (3)

```
public class Declare {  
...  
    public static void main (String[] args) {  
        int i;  
        i = 2;  
        int j = 3;  
  
        int k;  
        k = i * j;  
        System.out.println("sum is: " + i + j + k);  
        int s = 2;  
        i = mul(i, s + k);  
        j = mul(s, s);  
        System.out.println("sum is: " + i + j + s);  
    }  
}
```

(just after return from mul() 2nd entry)

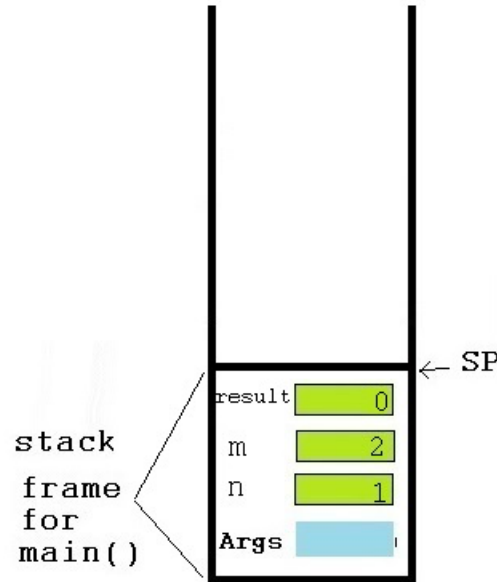


```
public static int mul(int n, int factor) {  
    int i = n;  
    int j = factor;  
    n = i + j;  
    factor = n + n;  
    return n + factor;  
}
```

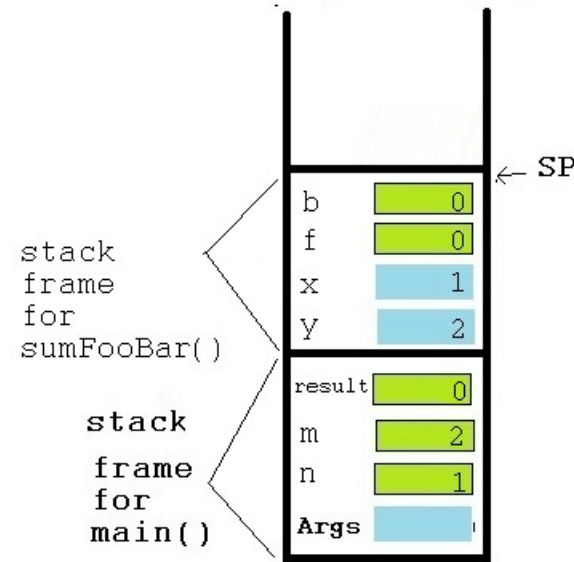
Stack (1)

```
public class Stack {
    public static int foo (int n) {
        int j = n;
        n = n + 2;
        j = j + 3;
        return j + n;
    }
    public static int bar (int n) {
        int i = n * n;
        i = i * n;
        n = i;
        return n + n;
    }
    ...
}
```

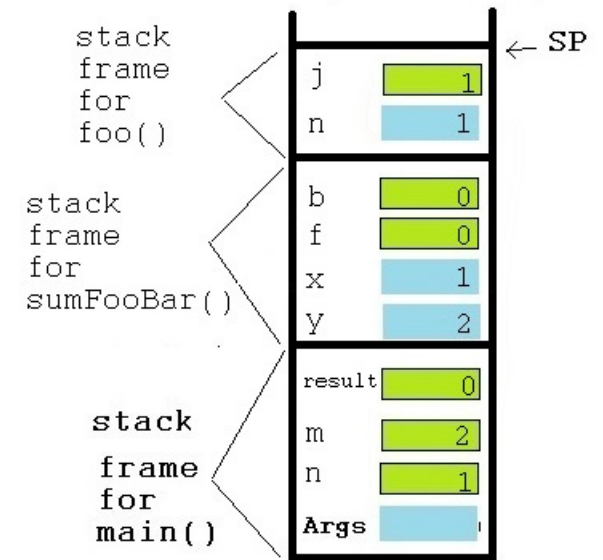
(before call to sumFooBar())



(before call to foo())



(just after definition of j)

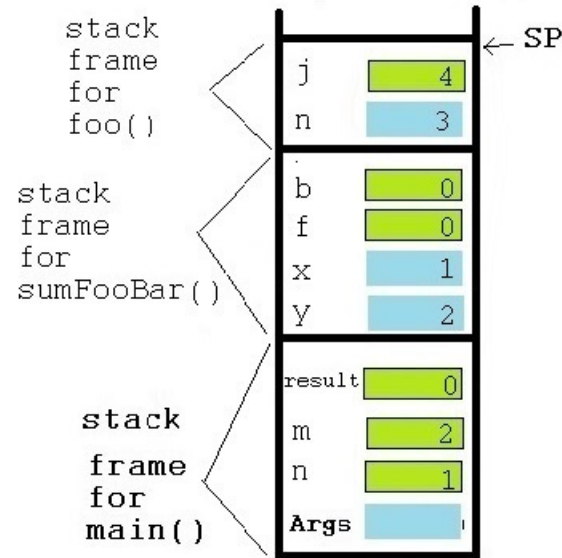


```
public static int sumFooBar (int x, int y) {
    int f = foo(x);
    int b = bar(y);
    return f + b;
}
public static void main (String[] args) {
    int n = 1;
    int m = 2;
    int result = sumFooBar(n, m);
    System.out.println(n + ", " + m + ", " + result);
}
```

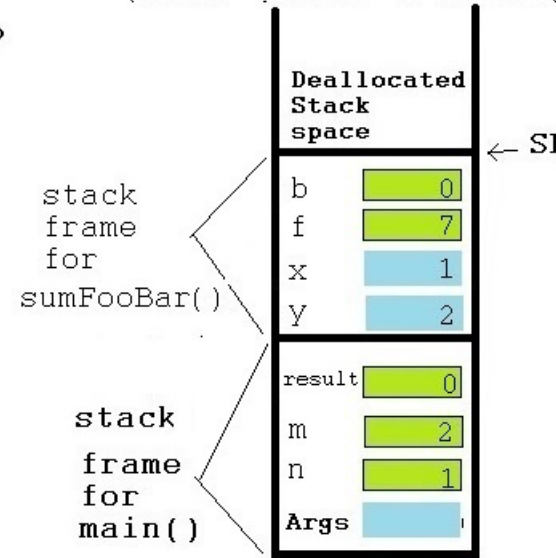
Stack (2)

```
public class Stack {
    public static int foo (int n) {
        int j = n;
        n = n + 2;
        j = j + 3;
        return j + n;
    }
    public static int bar (int n) {
        int i = n * n;
        i = i * n;
        n = i;
        return n + n;
    }
    ...
}
```

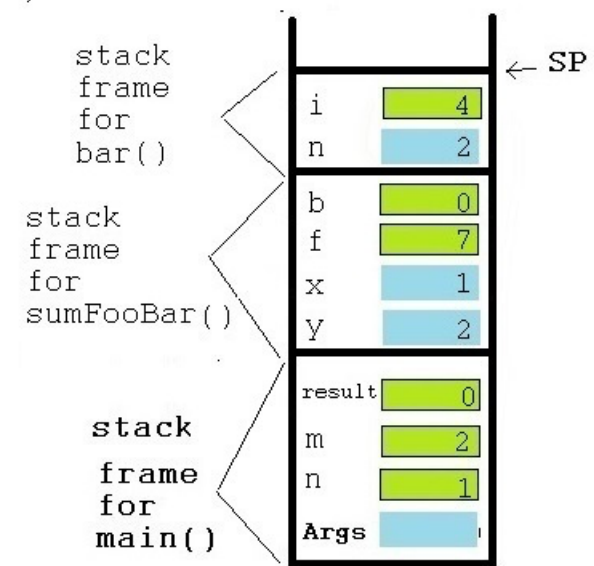
(just before return from foo())



(after return from foo())



(just after definition of i)

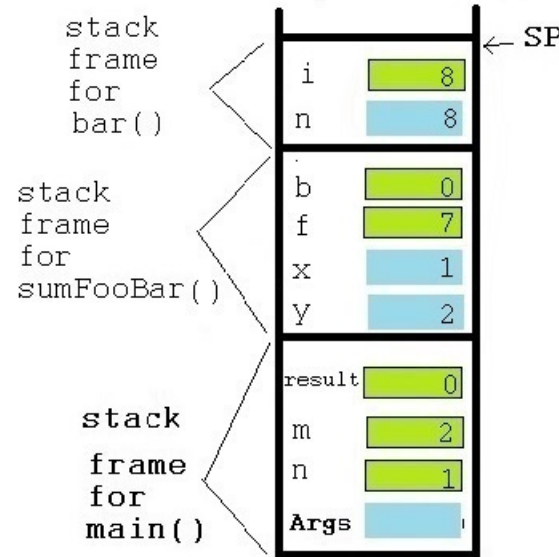


```
public static int sumFooBar (int x, int y) {
    int f = foo(x);
    int b = bar(y);
    return f + b;
}
public static void main (String[] args) {
    int n = 1;
    int m = 2;
    int result = sumFooBar(n, m);
    System.out.println(n + ", " + m + ", " + result);
}
```

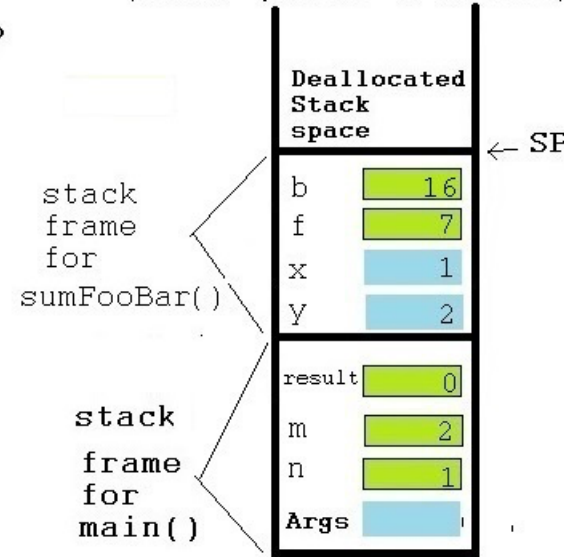
Stack (3)

```
public class Stack {
    public static int foo (int n) {
        int j = n;
        n = n + 2;
        j = j + 3;
        return j + n;
    }
    public static int bar (int n) {
        int i = n * n;
        i = i * n;
        n = i;
        return n + n;
    }
    ...
}
```

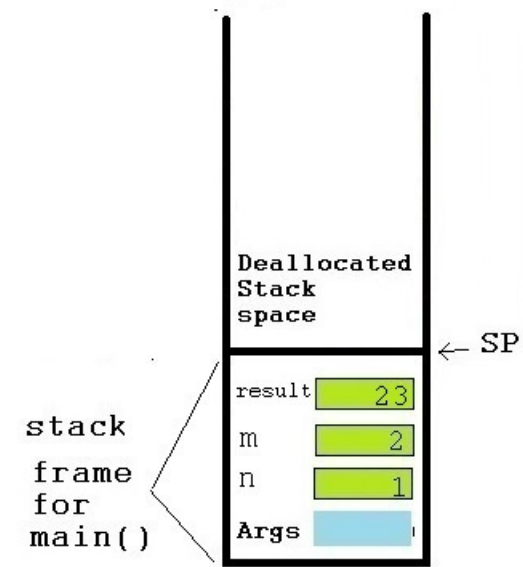
(just before return from bar())



(after return from bar())



(just after return from sumFooBar())



```
public static int sumFooBar (int x, int y) {
    int f = foo(x);
    int b = bar(y);
    return f + b;
}
public static void main (String[] args) {
    int n = 1;
    int m = 2;
    int result = sumFooBar(n, m);
    System.out.println(n + ", " + m + ", " + result);
}
```

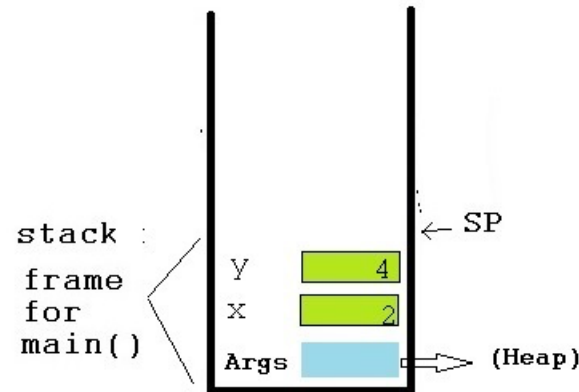
Parameter(1)

```
public class Parameter {
```

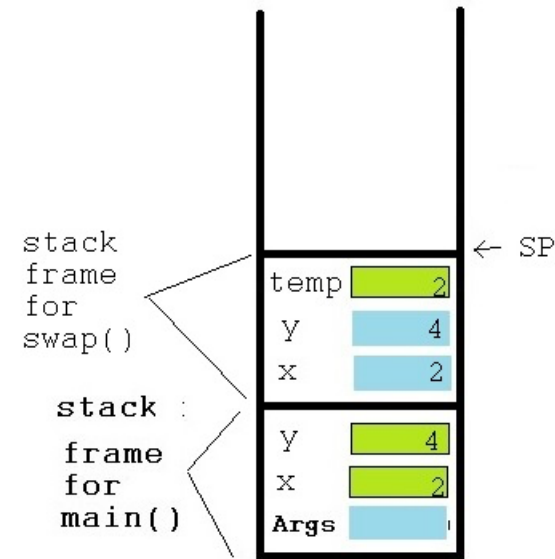
```
    public static void swap (int x, int y) {  
        int temp = x;  
        x = y;  
        y = temp;  
    }
```

```
    public static void main (String[] args) {  
        int x = 2;  
        int y = 4;  
  
        swap(x, y);  
        System.out.println(x + ", " + y);  
    }
```

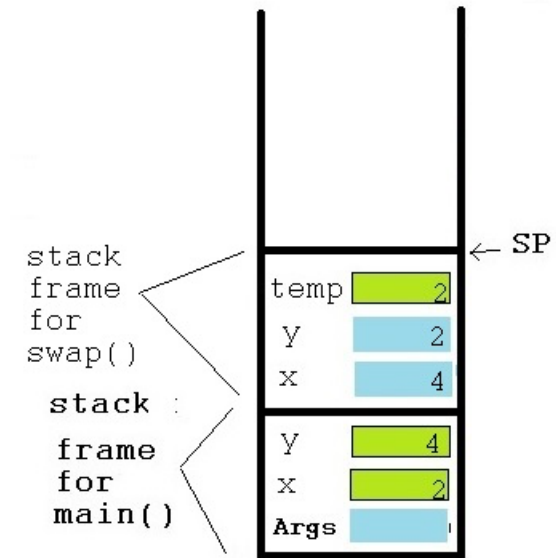
(before call to swap())



(after definition of temp)



(just before return)



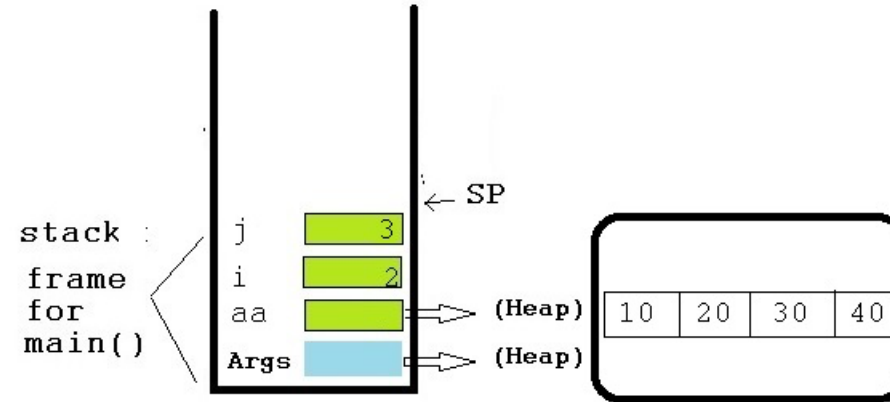
Memory(1)

```

public class Memory {
    public static void swap (int x, int y) {
        int temp = x;
        x = y;
        y = temp;
    }
    public static void swap2 (int[] arr, int i, int j) {
        int temp = arr[i];
        arr[i] = arr[j];
        arr[j] = temp;
    }
    public static void print (int[] aa) {
        ...
    }
    ...
}

```

(after definitions in main())

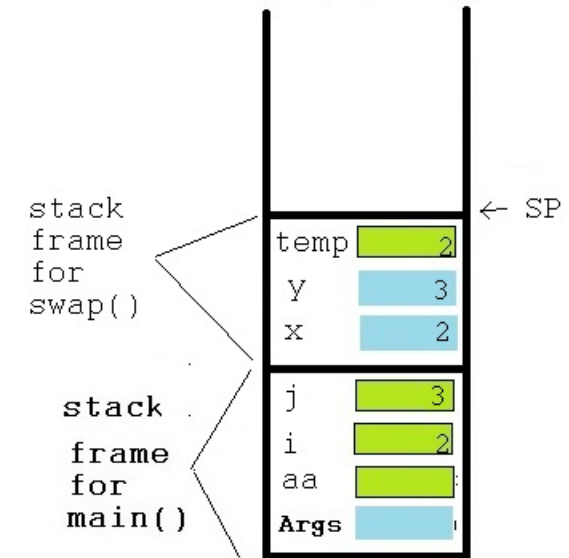


```

public static void main (String[] args) {
    int i = 2;
    int j = 3;
    int[] aa = {10, 20, 30, 40};
    System.out.println("i = " + i + " j = " + j);
    swap(i, j);
    System.out.println("i = " + i + " j = " + j);
    print(aa);
    swap(aa[2], aa[3]);
    print(aa);
    swap2(aa, 2, 3);
    print(aa);
}

```

(after definition of temp)



Memory(2)

```

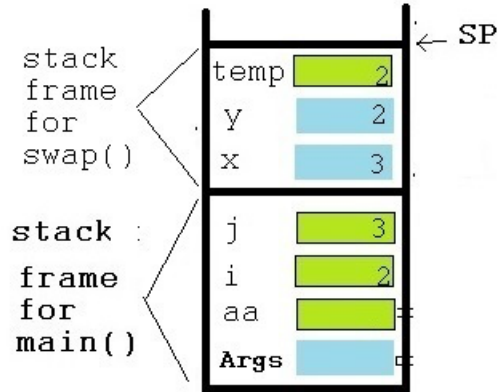
public class Memory {
    public static void swap (int x, int y) {
        int temp = x;
        x = y;
        y = temp;
    }

    public static void swap2 (int[] arr, int i, int j) {
        int temp = arr[i];
        arr[i] = arr[j];
        arr[j] = temp;
    }

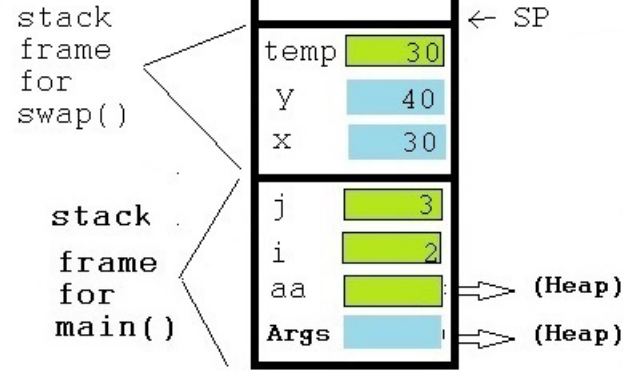
    public static void print (int[] aa) {
        ...
    }
    ...
}

```

(before return from swap1())



(after definition of temp in swap() 2nd entry)



```

public static void main (String[] args) {
    int i = 2;
    int j = 3;
    int[] aa = {10, 20, 30, 40};
    System.out.println("i = " + i + " j = " + j);
    swap(i, j);
    System.out.println("i = " + i + " j = " + j);
    print(aa);
    swap2(aa, 2, 3);
    print(aa);
}

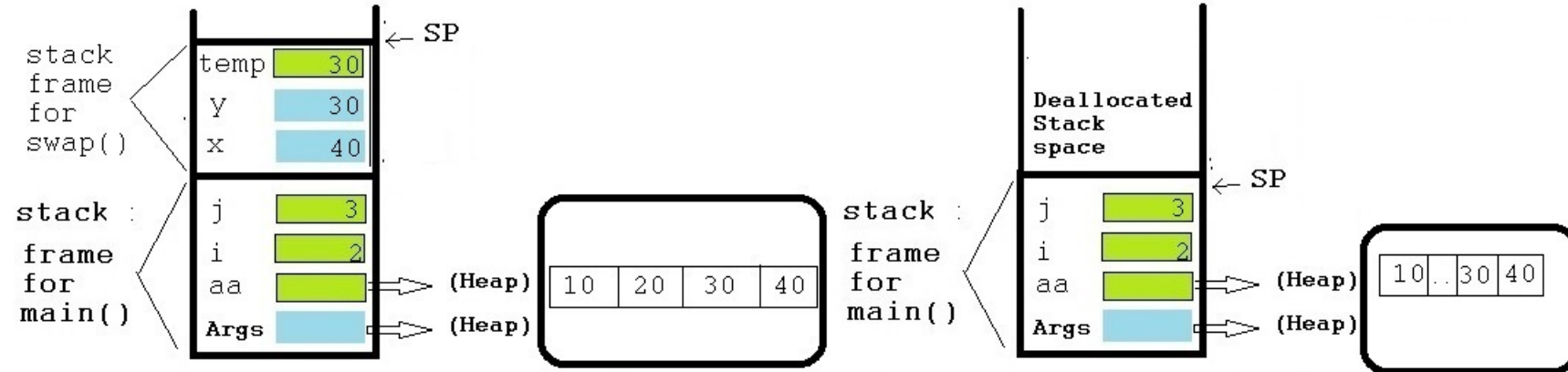
```

Memory(3)

(before return from swap() 2nd entry)

(after return from swap() 2nd entry)

```
public class Memory {
    public static void swap (int x, int y) {
        int temp = x;
        x = y;
        y = temp;
    }
    public static void swap2 (int[] arr, int i, int j) {
        int temp = arr[i];
        arr[i] = arr[j];
        arr[j] = temp;
    }
    public static void print (int[] aa) {
        ...
    }
    ...
}
```



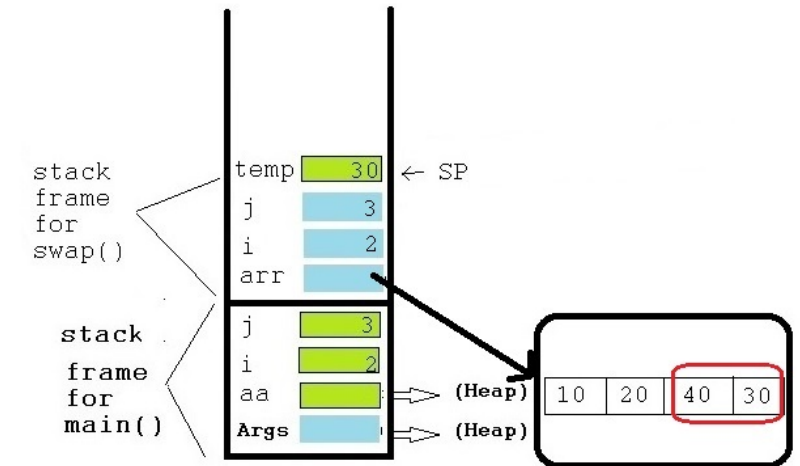
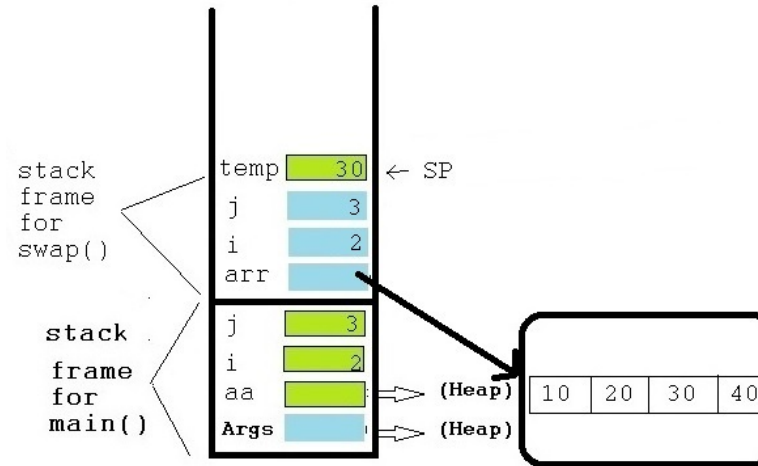
```
public static void main (String[] args) {
    int i = 2;
    int j = 3;
    int[] aa = {10, 20, 30, 40};
    System.out.println("i = " + i + " j = " + j);
    swap(i, j);
    System.out.println("i = " + i + " j = " + j);
    print(aa);
    swap2(aa[2], aa[3]);
    print(aa);
    swap2(aa, 2, 3);
    print(aa);
}
```

Memory(4)

(after definition of temp in swap2())

(before return from swap2())

```
public class Memory {
    public static void swap (int x, int y) {
        int temp = x;
        x = y;
        y = temp;
    }
    public static void swap2 (int[] arr, int i, int j) {
        int temp = arr[i];
        arr[i] = arr[j];
        arr[j] = temp;
    }
    public static void print (int[] aa) {
        ...
    }
    ...
}
```



```
public static void main (String[] args) {
    int i = 2;
    int j = 3;
    int[] aa = {10, 20, 30, 40};
    System.out.println("i = " + i + " j = " + j);
    swap(i, j);
    System.out.println("i = " + i + " j = " + j);
    print(aa);
    swap(aa[2], aa[3]);
    print(aa);
    swap2(aa, 2, 3);
    print(aa);
}
```

Questions?