

---

Methods (functions, procedures)

Appear in two contexts :

- method call
- method definition

General form for defn

```
type name (parameter list) {  
    // declarations  
    // executable stmts  
    return exp;  
}
```

General form for method call: 2

var = name(argument list);

or

name(argument list);

// if return type is void

Ex. (Doesn't work)

```
public static void main(String[] args){
```

```
    int a=6, b=7;
```

```
    swap(a,b);
```

```
    System.out.println(a + " " + b);
```

```
}
```

Continuing...

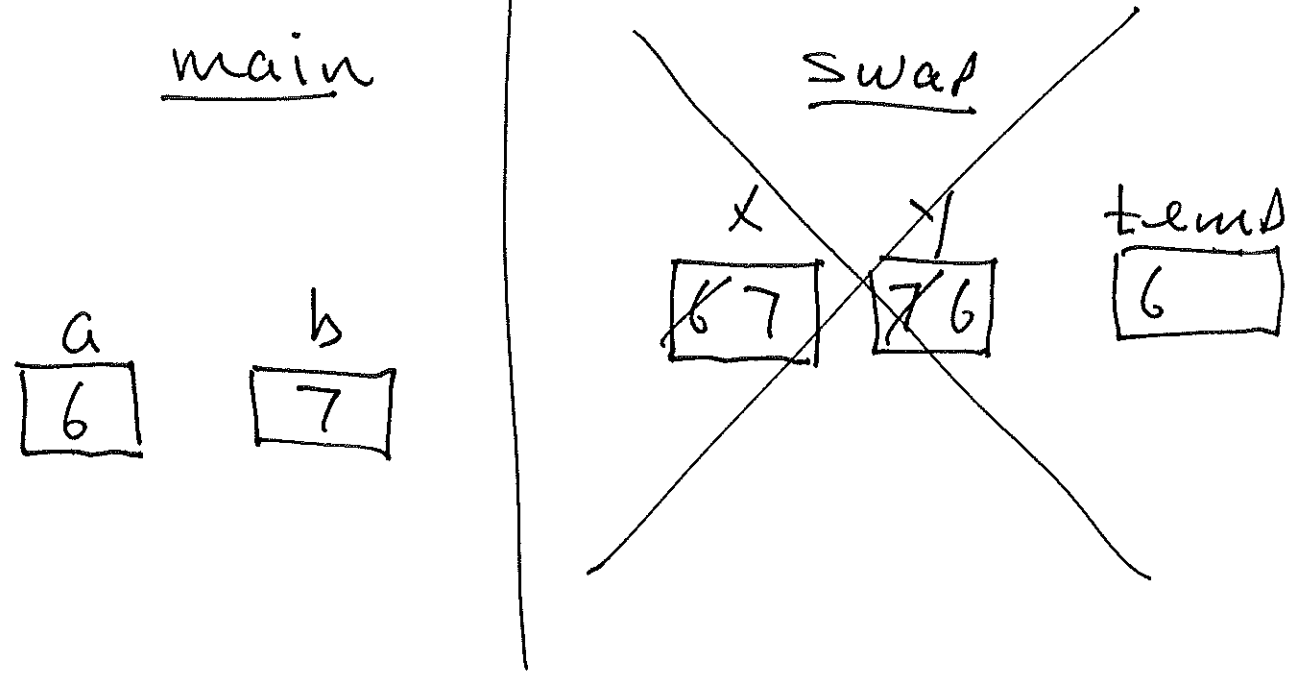
```

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

```

output: ~~7 6~~ or (6 7)

Trace:



Problem in swap() passes its arguments "by value".

Ex. FunExample.java on website  
main

<u>a</u>	<u>b</u>	<u>x</u>	<u>Y</u>
<del>5</del>	<del>10</del>	<del>7.5</del>	-
22	94	73.5	20.5

<u>fun3</u>	<u>u</u>	<u>v</u>	<u>w</u>
20.5	1.5	-	
		42	

returns (94)

## Factorial function:

Let  $n \geq 0$  be an integer. define

$$n! = \begin{cases} 1 & \text{if } n = 0 \\ n(n-1)(n-2)\dots 3 \cdot 2 \cdot 1 & \text{if } n \geq 1 \end{cases}$$

Ex.

```
int n = 10, Prod = 1, i;
```

```
i = 1;
```

```
while (i <= 10) {
```

```
    Prod *= i;
```

```
    i++;
```

```
}
```

```
System.out.println(Prod);
```

```
// output: 3628800
```

Trace:

<u>n</u>	<u>prod</u>	<u>i</u>
10	+	1
	+	2
	2	3
	6	4
	24	5
	<del>120</del>	6
	<del>720</del>	7
	<del>5040</del>	8
	<del>40320</del>	9
	<del>362880</del>	10
	3628800	11

Exercise:

re-write this as

• for loop

• do-while loop

Observe:

$$n! = \begin{cases} 1 & \text{if } n = 0 \\ n \cdot (n-1)! & \text{if } n \geq 1 \end{cases}$$

Trace factorialz(.):

Assume  $n = 5$  on line 8 of `Factorial.java`

`main()`  $\boxed{\begin{matrix} n \\ 5 \end{matrix}}$  `println(120)`

---

`factorialz()`  $\boxed{\begin{matrix} n \\ 5 \end{matrix}}$  `return 120`

---

`factorialz()`  $\boxed{\begin{matrix} n \\ 4 \end{matrix}}$  `return 24`

---

`factorialz()`  $\boxed{\begin{matrix} n \\ 3 \end{matrix}}$  `return 6`

factorial(2)  $\frac{n}{\boxed{2}}$  return 2

---

factorial(1)  $\frac{n}{\boxed{1}}$  return 1

---

factorial(0)  $\frac{n}{\boxed{0}}$  return 1

---