Introduction to Java

m(ethods)

A Modern Smartphone

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- Can be facilitated using methods

Method

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- It has
  - Name: for identification
  - Arguments: to pass information from outside world (rest of the program)
  - Body: processes the arguments do something useful
  - Return value: To communicate back to outside world
    - Sometimes not required

Why use Methods?

Example : Maximum of 3 numbers

```
… main(…){
   int a, b, c, m;

   /* code to read
    * a, b, c */

   if (a>b){
     if (a>c) m = a;
     else m = c;
   }
   else{
     if (b>c) m = b;
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   }

   /* print or use m */


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int max(int a, int b){
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This code can scale easily to handle large number of inputs (e.g.: max of 100 numbers!)

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- Solve each of the sub-problems separately as a method, and combine them together in another method.
- The main tool for modular programming.

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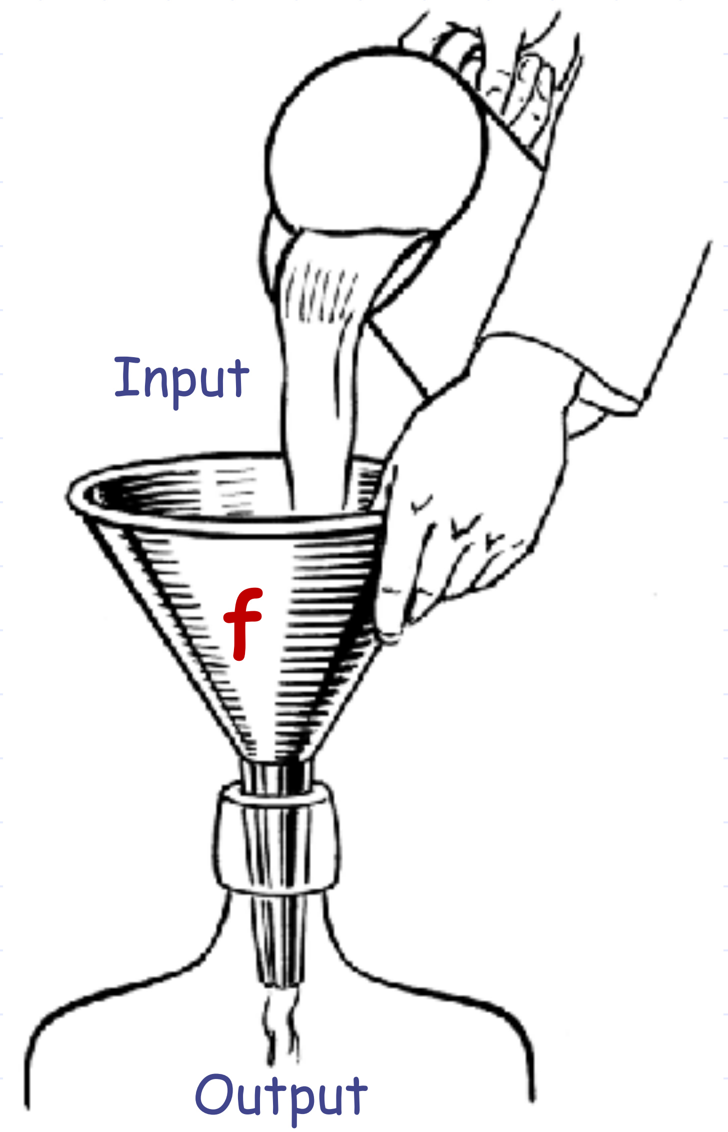
- main() is a special method. Execution of program starts from the beginning of main().
- println(…), read(…) are standard input-output library methods.

Parts of a method



```
int  max (int a, int b) {
   if (a > b)
       return a;
  else
       return b;
}
```

```
... main (...) {
     int x;
     x = max(6, 4);
     println("max "+x);

}
```

Return Type

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int max (int a, int b) {
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2 arguments
a and b,
both of type int.
(formal args)

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Body of the method, enclosed inside { and } (mandatory) returns an int.

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Call to the method.
Actual args are 6 and 4.

Method Call

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  - directs a method to perform its task, and
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max(5, 3) is an expression of type integer that evaluates to 5

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println(""+max(5,3));
max(5,3) – min(5,3)
max(x, max(y, z)) == z

if (max(a, b)!=0)
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`if (max(a, b)!=0) println("Y");`	prints Y if max of a and b is not 0.

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void print_one_int(int n) {
    println(“”+ n);
}
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void print_positive(int n) {
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    println(""+n);
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Returning from a method: return statement

- When a return statement is encountered in a method definition
  - control is immediately transferred back to the statement making the method call in the parent method.
- A method in Java can return only ONE value or NONE.
  - Only one return type (including void)

Nested Method Calls

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… main(…) {
  println(""+min(6, 4));
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  - Input/Output Methods in System.in/ System.out
  - Consult the documentation

Avoiding Common Errors

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- Argument list of a method:
  - Provide the required number of arguments,
  - Check that each method argument has the correct type (or that conversion to the correct type will lose no information).

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Avoiding Common Errors

- Return statement
  - value must match the return type
  - return statement must be encountered during execution for a function having non void return type
- Also be careful in using functions that are undefined on some values.
  - $\sin^{-1}(x)$ is defined only for $-1 \le x \le 1$
  - In Java double asin(double x)
    - pronounced a-sine or arc-sine

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- Methods allow us to divide a program into smaller parts
  - each part does a well defined task
- There are other ways to *partition a program*
  - *Statement blocks, Files*
- Scope of a name is the part of the program in which the name can be used

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  - Java does not allow **shadowing**
  - A name cannot be redeclared in a nested scope.
- A variable can not be used outside its scope.
- Java program has
  - method/block scope
  - Class scope
  - Static scope

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int max(int a1, int b1) {
   int m1 = 0;
   if (a1 > b1) m1 = a1;
   else m1 = b1;
   return m1;
}

int min(int a2, int b2) {
   int m2 = 0;
   if (a2 < b2) m2 = a2;
   else m2 = b2;
   return m2;
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Quiz: Argument Passing

```
// swapping a and b
void swap(int a, int b){
   int temp;
   temp = a;
   a = b;
   b = temp;
   printf("a=%d b=%d\n", a, b);
}
public static void main(…){
   int  a=10, b=15;
   printf("a=%d b=%d\n", a, b);
   swap(a, b);
   printf("a=%d b=%d\n", a, b);

}
```

What is the output of the program?
(fill the blanks)

OUTPUT

a=____ b=____

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OUTPUT

a=____ b=____

a=____ b=____

a=____ b=____

Quiz: Argument Passing

```
// swapping a and b
void swap(int a, int b){
   int temp;
   temp = a;
   a = b;
   b = temp;
   printf("a=%d b=%d\n", a, b);
}
public static void main(…){
   int  a=10, b=15;
   printf("a=%d b=%d\n", a, b);
   swap(a, b);
   printf("a=%d b=%d\n", a, b);

}
```

What is the output of the program? (fill the blanks)

OUTPUT

a=_10_ b=_15_

a=____ b=____

a=____ b=____

Quiz: Argument Passing

```
// swapping a and b
void swap(int a, int b){
   int temp;
   temp = a;
   a = b;
   b = temp;
   printf("a=%d b=%d\n", a, b);
}
public static void main(…){
   int  a=10, b=15;
   printf("a=%d b=%d\n", a, b);
   swap(a, b);
   printf("a=%d b=%d\n", a, b);

}
```

What is the output of the program? (fill the blanks)

OUTPUT

a=_10_ b=_15_

a=____ b=____

a=____ b=____

Quiz: Argument Passing

```
// swapping a and b
void swap(int a, int b){
   int temp;
   temp = a;
   a = b;
   b = temp;
   printf("a=%d b=%d\n", a, b);
}
public static void main(…){
   int  a=10, b=15;
   printf("a=%d b=%d\n", a, b);
   swap(a, b);
   printf("a=%d b=%d\n", a, b);

}
```

What is the output of the program? (fill the blanks)

OUTPUT

a= 10 b= 15

a= 15 b= 10

a=____ b=____

Quiz: Argument Passing

```
// swapping a and b
void swap(int a, int b){
  int temp;
  temp = a;
  a = b;
  b = temp;
  printf("a=%d b=%d\n", a, b);
}
public static void main(…){
  int  a=10, b=15;
  printf("a=%d b=%d\n", a, b);
  swap(a, b);
  printf("a=%d b=%d\n", a, b);

}
```

What is the output of the program? (fill the blanks)

OUTPUT

a=<u>10</u> b=<u>15</u>

a=<u>15</u> b=<u>10</u>

a=____ b=____

Quiz: Argument Passing

```
// swapping a and b
void swap(int a, int b){
   int temp;
   temp = a;
   a = b;
   b = temp;
   printf("a=%d b=%d\n", a, b);
}
public static void main(…){
   int  a=10, b=15;
   printf("a=%d b=%d\n", a, b);
   swap(a, b);
   printf("a=%d b=%d\n", a, b);

}
```

What is the output of the program?
(fill the blanks)

OUTPUT

```
a= 10  b= 15

a= 15  b= 10

a= 10  b= 15
```

Quiz: Argument Passing

```
// swapping a and b
void swap(int a, int b){
   int temp;
   temp = a;
   a = b;
   b = temp;
   printf("a=%d b=%d\n", a, b);
}
public static void main(…){
   int  a=10, b=15;
   printf("a=%d b=%d\n", a, b);
   swap(a, b);
   printf("a=%d b=%d\n", a, b);

}
```

What is the output of the program? (fill the blanks)

OUTPUT

a=_10_ b=_15_

a=_15_ b=_10_

a=_10_ b=_15_