COMP 110/L Lecture 5

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Slides adapted from Dr. Kyle Dewey

Outlines

- Methods
  - Defining methods
  - Calling methods

Methods

Motivation to Methods

- Real world programs often are large and complex
- Easier to manage in smaller pieces, in the case of Java, methods
  - Example of a "divide and conquer" strategy
  - Each method solves one small part of the entire problem
- Java standard library methods (built-in)
  - Have already been using these: println(), nextInt(), pow()

Reasons for Using Methods (Modularization)

- **Divide-and-Conquer:** Build Java programs from small, simple pieces.
- **Software Reusability:** Use existing methods as building blocks to create new Java programs.
- **Avoid repeating Code**
- **Easier to Debug:** Each method can be debugged separately.
- **Easier to Maintain:** Can make changes to a specific method rather than the whole Java program.

Basic Idea of a Method

- Consider mathematical functions:

  $y = f(x)$, where $f(x) = ?$

  - Need some definition for f(x)
    - defines the value of f(x) for any value of x
  - f(x) requires an argument, or parameter, x
  - f(x) produces a value that is assigned to y
    - Can use this method with any legal value substituted for x - e.g. $y = f(5)$
- Java methods work the same way
    - Of course, we must follow the Java syntax rule

Motivation

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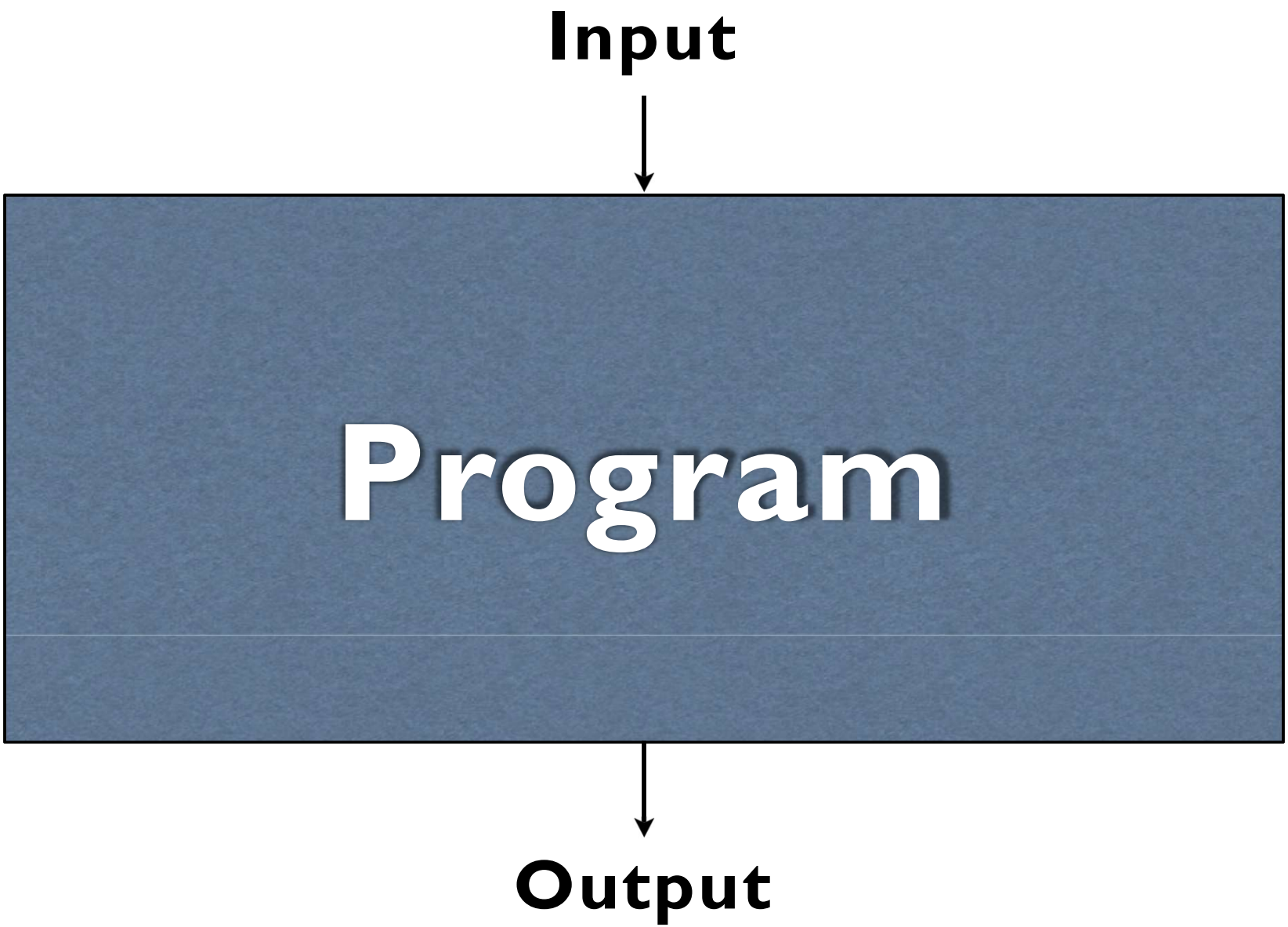

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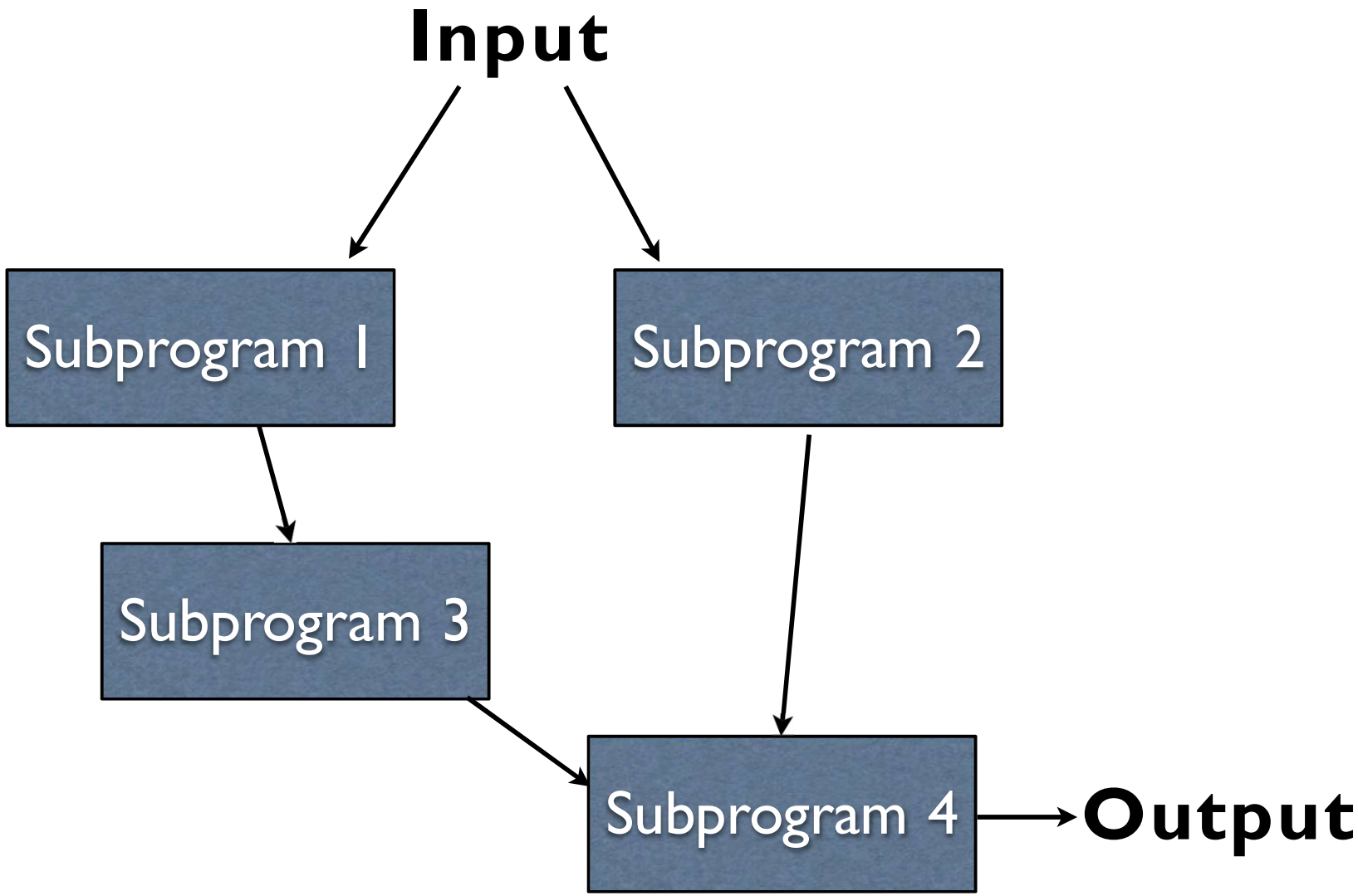
Input
Subprogram 1
Subprogram 2
Subprogram 3
Subprogram 4
Output

Code Reuse

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```
System.out.println(...)
```

Code Reuse

```
System.out.println(...)
nextInt()
```

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```
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```
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You have used all of these multiple times.

Code Reuse

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You have used all of these multiple times.

These are all *methods*.

Methods

Distinct subprograms.

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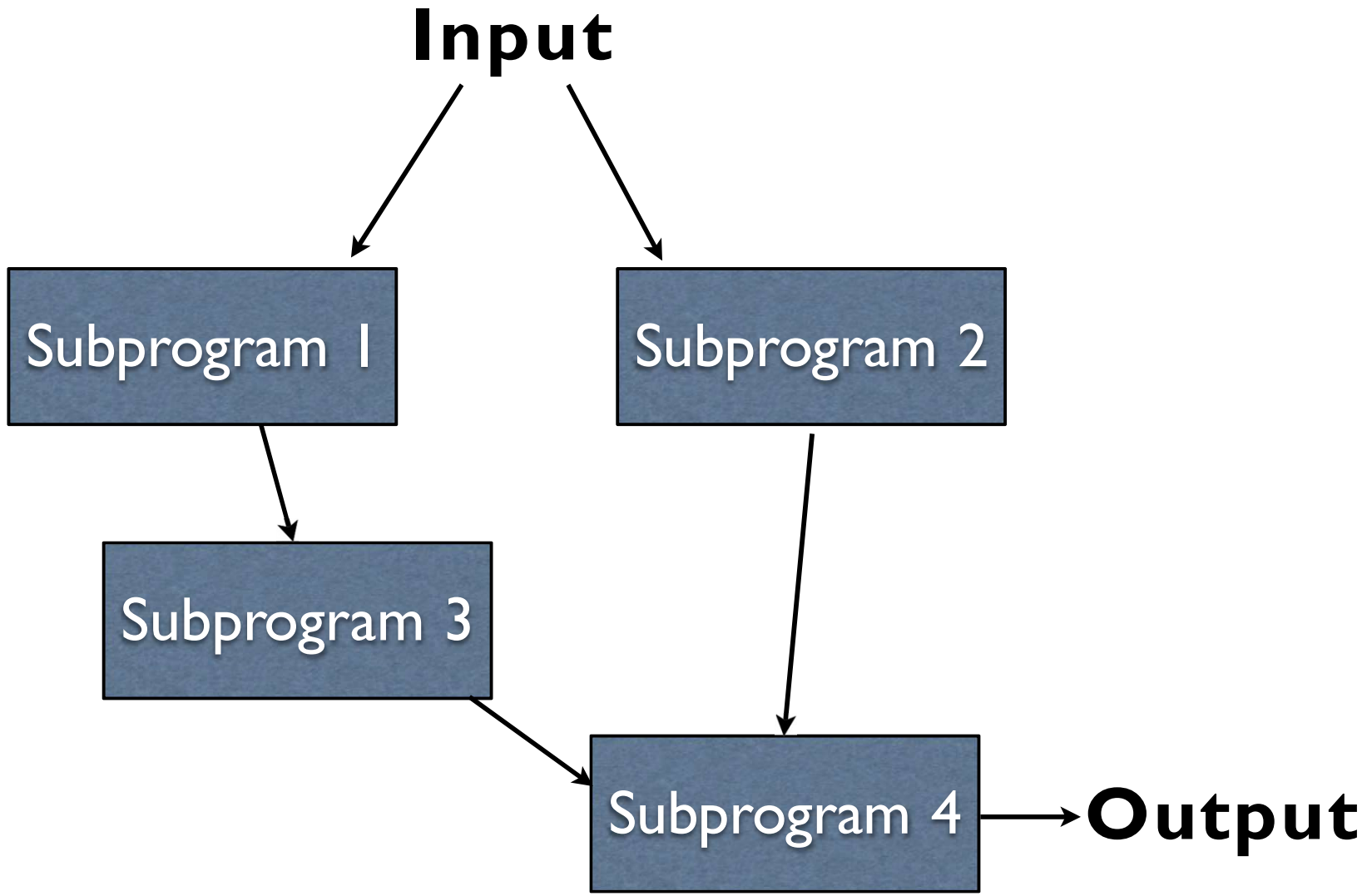

Methods

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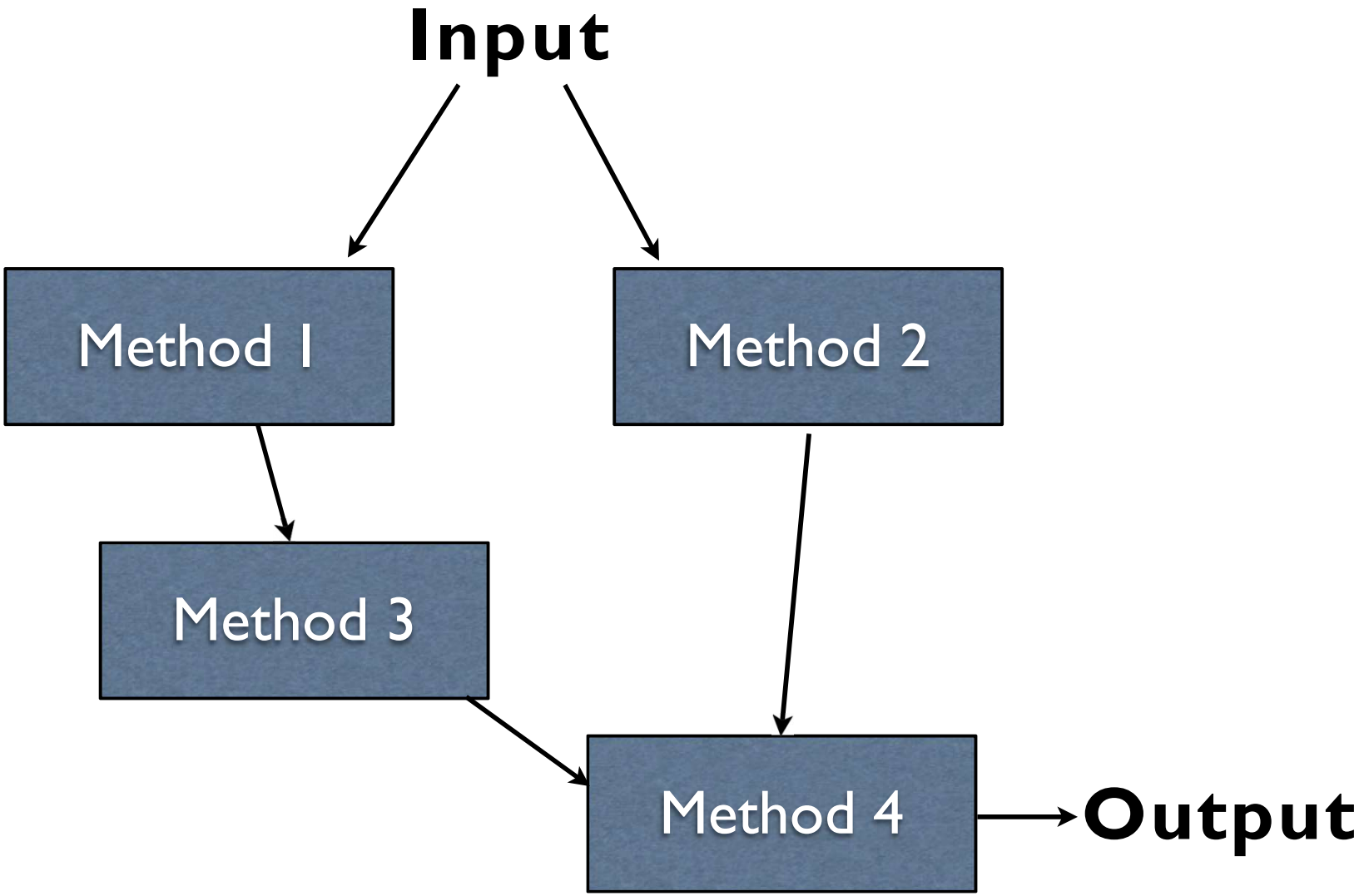

Method Terminology

- We can *define* a method
  - Make it available to the rest of the program
- We can *call* a method
  - Execute the subprogram

Elements of a Java Method

Method Definition:

1- Declares the "signature" of the method
Consists of return data type, method name, input parameters, Java operations

2- Reusable source code that can be called whenever needed.

Method Call:

1. Actually makes **use** of the method
2. **Real values** are specified for arguments

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Methods take some number of inputs (can be 0).

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One input, no outputs (cannot assign to a variable).

```
Math.pow(2,3);
```

Two inputs, one output.

```
inputScanner.nextInt();
```

```
inputScanner.nextInt();
```

No inputs, one output.

```
inputScanner.nextInt();
```

No inputs, one output.

```
System.out.print("Goodbye");
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No inputs, one output.

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One input, no outputs (cannot assign to a variable)

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inputScanner.nextLong();
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```
inputScanner.nextInt();
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No inputs, one output.

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One input, no outputs (cannot assign to a variable)

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inputScanner.nextLong();
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- The method is executed
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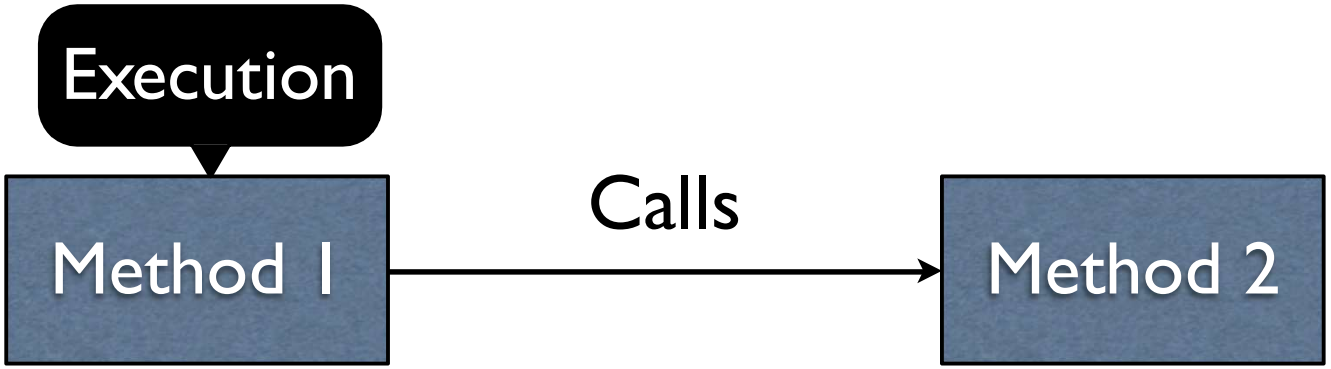

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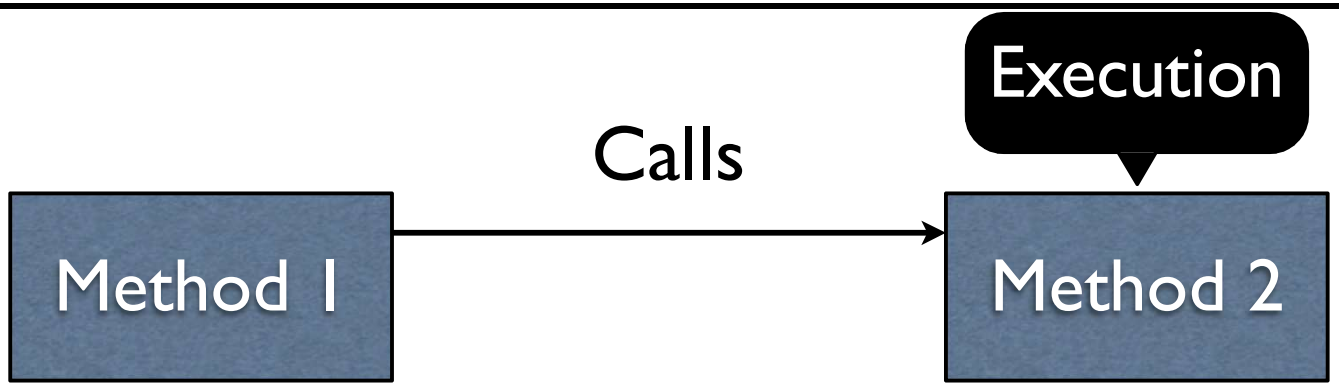

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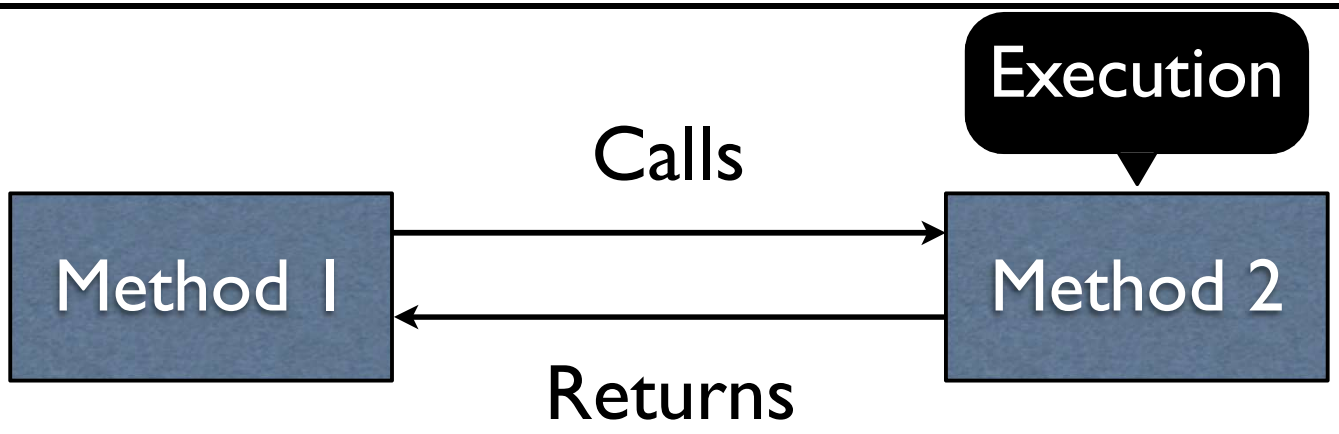

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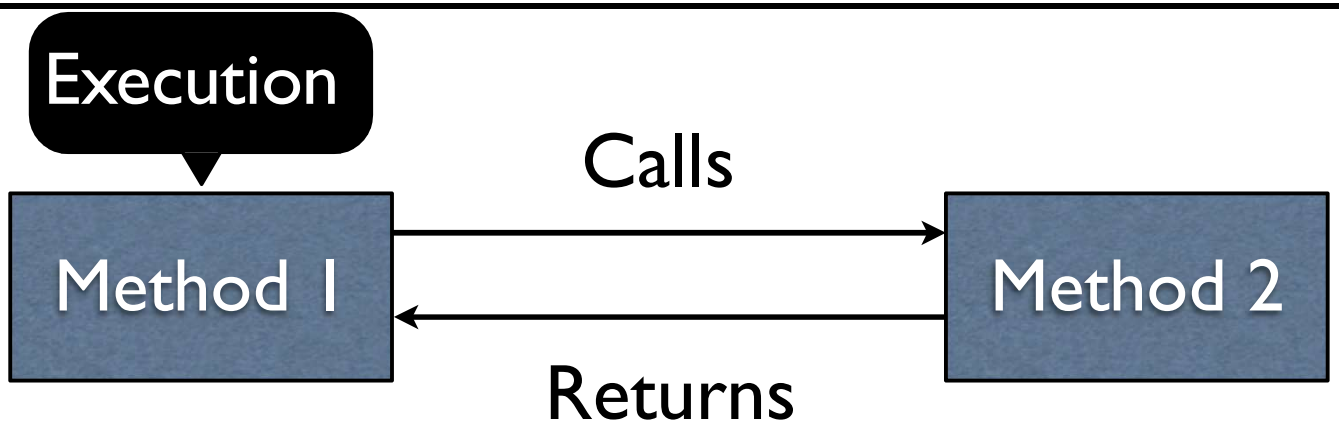

```
class Main {
    public static void main(String[] args) {
    ... .. ...
    myFunction();
    ... .. ...
    }

    private static void myFunction() {
        // function body
        ... .. ...
        ... .. ...
    }
}
```

1

2

3

Defining a Method

Easiest to see with real code.

Example:
`Return42.java`

Method Parameters

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}
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```
int a = foo( );
```

7 8

Example:

`ReturnParameter.java`

Example:

`MultParameters1.java`

Example:

`MultParameters2.java`

Example:

`MultParameters3.java`

Method Definition General Form

```
public static
returnType
methodName(parameter_list) {
   ...
   return expression;
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Method ends here, evaluates `expression`, and produces its result

Methods which Produce no Values

Methods which produce no values have a `void` return type

Example: `ReturnNothing.java`

Aside: Expressions vs. Statements

- Expressions return values (e.g., `1 + 2`)
- Statements do not return values (e.g., `System.out.println("Hello")`)
- Statements are separated with semicolon (`;`)

```
System.out.println("Hello");
System.out.println("Goodbye");
```

`main` Method

`main` is just another method.

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