Programming Basics

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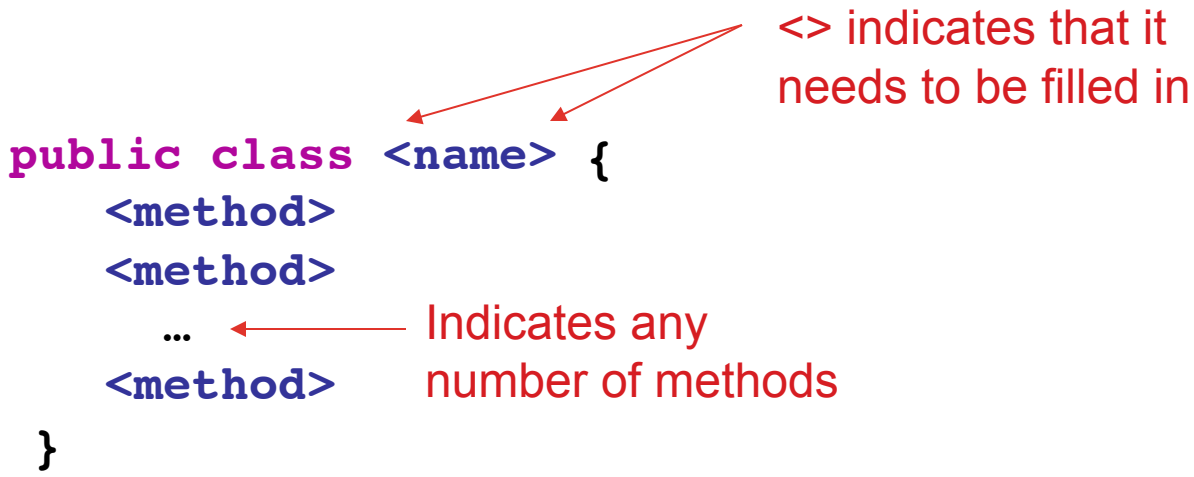
Java program structure

- Every Java program consists of one or more **classes**:
  - Each class contains **methods**:
    - Each method contains the **statements** (instructions) to be executed.

- The program starts its execution at the method called `main` and follows the instructions in the order specified.

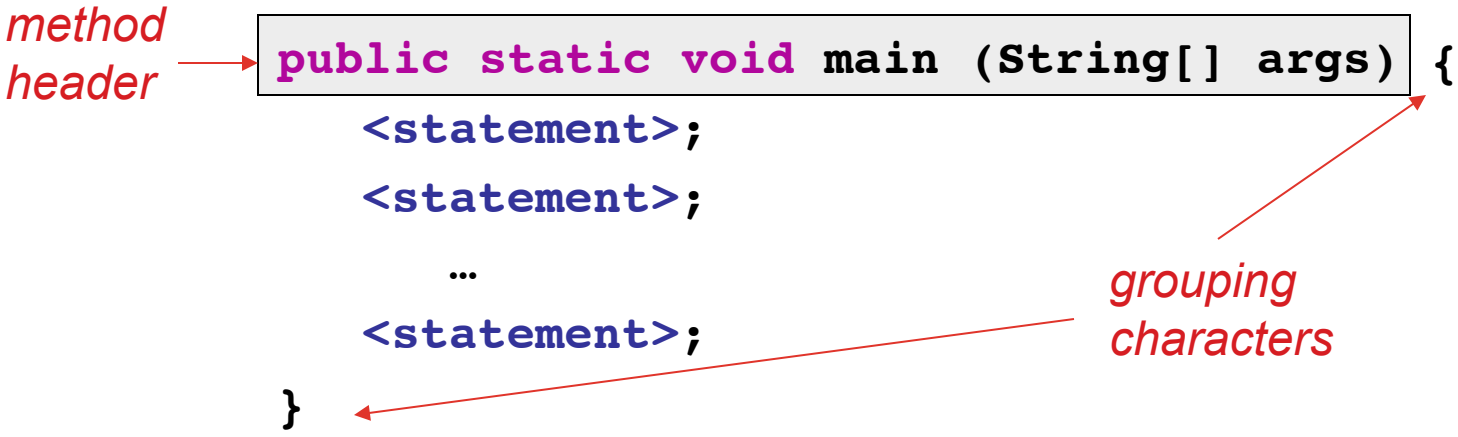
Java Classes

- Java programs contain one or more *classes*, which are the basic units of code.
- The basic form of a Java class is at follows:



Methods

- A ***method*** is named sequence of instructions that performs some task or computation.
- Every Java program must have a method named `main` of the form



- The program execution starts at the `main` method.

Statements

- A ***statement*** is a single instruction for the computer to execute.
- Statements terminate with a semicolon (;) character.
- The statements in a method are executed in the order they appear.
- A statement can *call* or *invoke* another method; it requests that the computer executes the instructions of that method before proceeding to the following statement.

A simple program

```
/*
 * Prints three lines to the console.
 */
public class DreamDisplayer {

   public static void main(String[] args) {
      System.out.println("When I grow up ... ");
      System.out.println();  // blank line
      System.out.print("I want to be ");
      System.out.println("an astronaut.");
   }
}
```

Comment: Text to explain the code but is ignored by the compiler.

A ***statement*** that calls the method **`print`**

- **`println`** is a method already written for you.
- **`System.out`** is where to find the method.

OUTPUT:

```
When I grow up ...

I want to be an astronaut.
```

Strings

- A ***string*** is a sequence of characters that we "string" together.
  - In Java you can specify a string by writing the literal text inside a pair of double quotation (") marks.
- Examples of ***string literals***:

```
"The following line is a one character string."
"I"
```

- A string cannot span more than one line:

```
"Not a valid
String literal"
```

WRONG!

Methods

```
public class MessageDisplayer{

   public static void main(String[]args){
      displayQuestion();
      System.out.println("DONUTS!");
      displayQuestion();
      System.out.println("BEER!");
   }

   public static void displayQuestion(){
      System.out.print("What does Homer like? ");
   }

}
```

method call

method definition

OUTPUT:

```
What does Homer like? DONUTS!
What does Homer like? BEER!
```

Method execution

Execute `main` method:

Execute `displayQuestion` method:

```
System.out.print("What does Homer like? ");
```

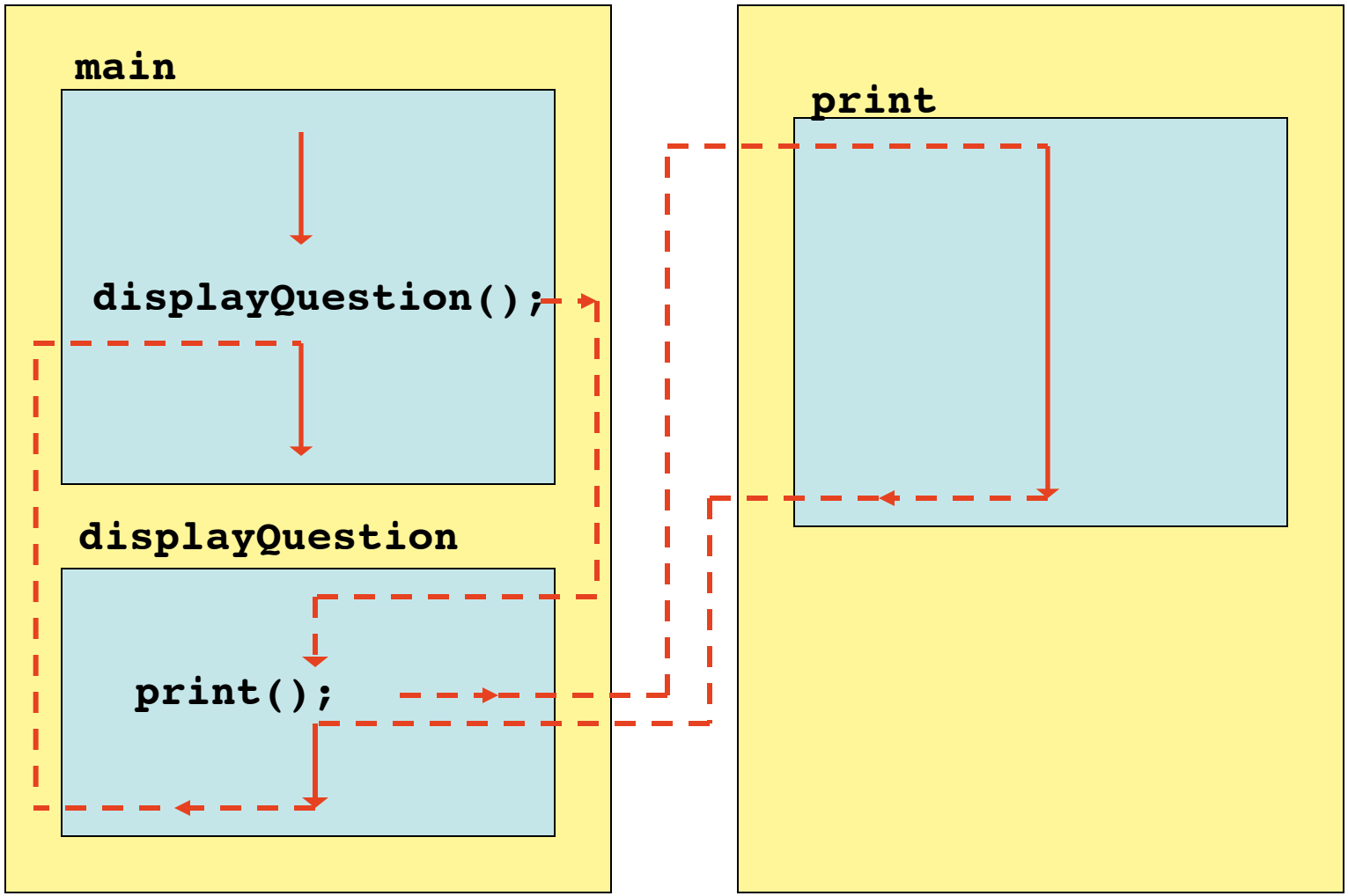
```
System.out.println("DONUTS!");
```

Execute `displayQuestion` method:

```
System.out.print("What does Homer like? ");
```

```
System.out.println("BEER!");
```

Method Flow of Control



Why Methods ?

- We use methods
  - to show the ***structure*** of a large program by decomposing it into smaller pieces and grouping related statements together in a method; and
  - to remove ***redundancy*** through reuse.

Methods can call methods

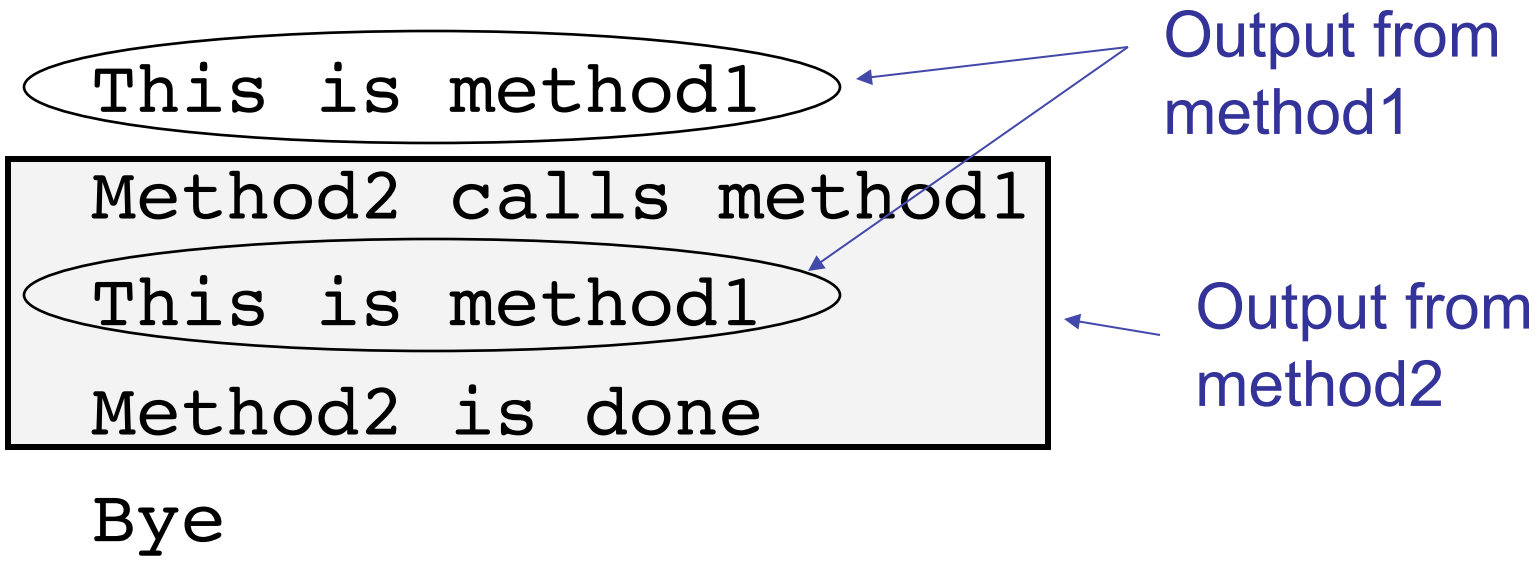
```
public class MethodCaller {

    public static void main(String[] args) {
        method1();
        method2();
        System.out.println("Bye");
    }

    public static void method1(){
        System.out.println("This is method1");
    }

    public static void method2(){
        System.out.println("Method2 calls method1");
        method1();
        System.out.println("Method2 is done");
    }
}
```

Output of MethodCaller



Exercise

- Write a program to print ***banana*** in block letters:

```
BBBB
B   B
BBBB
B   B
BBBB

 AAA
A   A
AAAAA
A   A
A   A

N   N
NN   N
N N N
N  NN
N   N
```

- Use static methods to reduce redundancy and to show the structure of the program.

Identifiers and Keywords

- ***Identifiers*** are names that specify different elements of a program such as class, method, or variable
  - can be any combination of letters, digits, _ or $
  - the first character must NOT be a digit
  - case-sensitive (**`total`** is different from **`Total`**)

  Examples: **`main method1 maxCount TUESDAY $amount Puzzle`**

- ***Keywords*** are a set of predefined identifiers that are reserved for special uses.

  Examples: **`public static void class`**

Naming Conventions

- Java naming conventions help readers readily distinguish various Java elements:
  - **Class:** Starts with a capital letter
    - A class name should be a noun that describe an object type.

    e.g., **`DreamDisplayer`**, **`Radio`**
  - **Method:** Starts with a lower case letter
    - A method name should start with a verb and describe what the method does.

    e.g., **`displayQuestion`**, **`getName`**, **`computeTax`**
  - **Variable:** Starts with a lower case letter
    - A variable name should be a noun that describes what data it holds.

    e.g., **`favoriteFood, name, taxRate`**