



CS 149

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Chapter 4



JAVA Methods/Functions

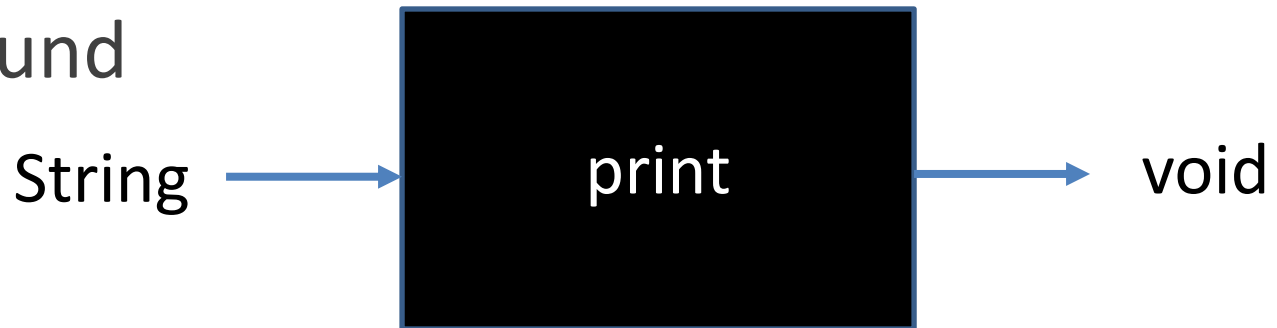
Fundamental idea in programming:

- Build small methods/functions
- Test them
- Use them to build more complex programs

Examples of methods we have already used?

Methods Already Explored

- print, println, and printf
- Math.round



```
System.out.print("Hello, my name is " + firstName);
```

print

```
public void print(String s)
```

Prints a string. If the argument is null the manner of the `write(int)` method.

Parameters:

`s` - The String to be printed

Returning values

double → **Math.round** → long

```
int piEstimate = (int) Math.round(Math.PI);
```

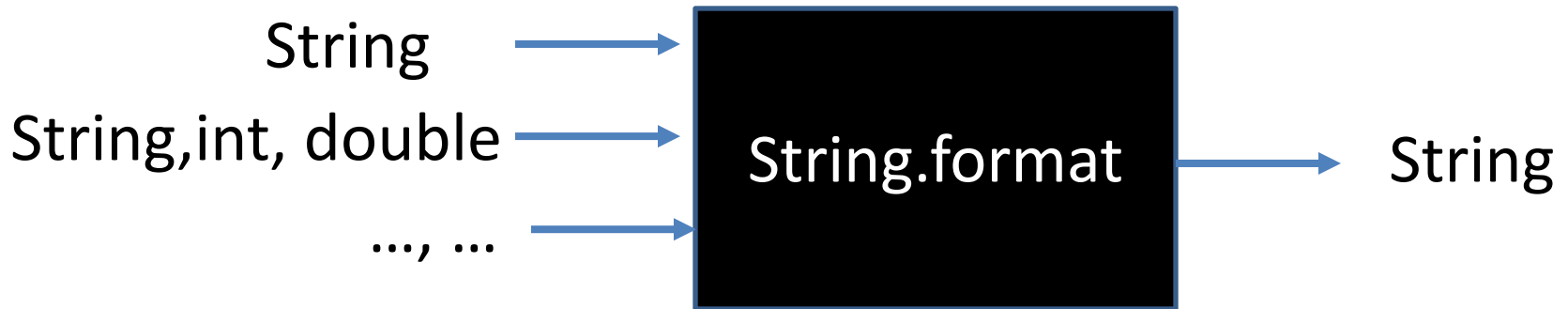
round

```
public static long round(double a)
```

Returns the closest long to the argument, v

Special cases:

Why return values?



```
String formattedPI = String.format("%.3f", Math.PI);
```

Allows us to capture the output in a variable (potentially to use later in our program).

format

```
public static String format(String format,  
                             Object... args)
```

Methods Model 1

```
public class Model1 {  
    public static void main(String[] args) {  
→ System.out.println("First line.");  
        threeLine();  
        System.out.println("Second line.");  
    }  
    public static void newLine() {  
        System.out.println();  
    }  
    public static void threeLine() {  
        newLine();  
        newLine();  
        newLine();  
    }  
}
```

CALL println

Methods Model 1

```
public class Model1 {  
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    public static void newLine() {  
        System.out.println();  
    }  
    public static void threeLine() {  
        newLine();  
        newLine();  
        newLine();  
    }  
}
```

CALL println
RET to main

Methods Model 1

```
public class Model1 {  
    public static void main(String[] args) {  
        System.out.println("First line.");  
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    }  
    public static void threeLine() {  
        newLine();  
        newLine();  
        newLine();  
    }  
}
```

CALL println
RET to main
CALL threeLine

Methods Model 1

```
public class Model1 {  
    public static void main(String[] args) {  
        System.out.println("First line.");  
        threeLine();  
        System.out.println("Second line.");  
    }  
    public static void newLine() {  
        System.out.println();  
    }  
    public static void threeLine() {  
→ newLine();  
    newLine();  
    newLine();  
    }  
}
```

```
CALL println  
RET to main  
CALL threeLine  
    CALL newLine
```

Methods Model 1

```
public class Model1 {
    public static void main(String[] args) {
        System.out.println("First line.");
        threeLine();
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    }
    public static void newLine() {
        → System.out.println();
    }
    public static void threeLine() {
        newLine();
        newLine();
        newLine();
    }
}
```

```
CALL println
RET to main
CALL threeLine
    CALL newLine
        CALL println
```

Methods Model 1

```
public class Model1 {  
    public static void main(String[] args) {  
        System.out.println("First line.");  
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        newLine();  
        newLine();  
        newLine();  
    }  
}
```

```
CALL println  
RET to main  
CALL threeLine  
    CALL newLine  
        CALL println  
            RET to newLine
```

Methods Model 1

```
public class Model1 {  
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        System.out.println("First line.");  
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        System.out.println();  
    }  
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→     newLine();  
        newLine();  
        newLine();  
    }  
}
```

```
CALL println  
RET to main  
CALL threeLine  
    CALL newLine  
        CALL println  
            RET to newLine  
        RET to threeLine
```

Methods Model 1

```
public class Model1 {  
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        newLine();  
    }  
}
```

```
CALL println  
RET to main  
CALL threeLine  
    CALL newLine  
        CALL println  
            RET to newLine  
        RET to threeLine  
    CALL newLine
```

Methods Model 1

```
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```

```
CALL println  
RET to main  
CALL threeLine  
    CALL newLine  
        CALL println  
        RET to newLine  
    RET to threeLine  
CALL newLine  
    CALL println
```

Methods Model 1

```
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        newLine();
        newLine();
        newLine();
    }
}
```

```
CALL println
RET to main
CALL threeLine
    CALL newLine
        CALL println
            RET to newLine
        RET to threeLine
    CALL newLine
        CALL println
            RET to newLine
```

Methods Model 1

```
public class Model1 {  
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        System.out.println("First line.");  
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    }  
    public static void threeLine() {  
        newLine();  
        → newLine();  
        newLine();  
    }  
}
```

```
CALL println  
RET to main  
CALL threeLine  
    CALL newLine  
        CALL println  
        RET to newLine  
    RET to threeLine  
CALL newLine  
    CALL println  
    RET to newLine  
RET to threeLine
```


Methods Model 1

```
public class Model1 {  
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        newLine();  
    }  
}
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```
CALL println  
RET to main  
CALL threeLine  
    CALL newLine  
        CALL println  
            RET to newLine  
        RET to threeLine  
    CALL newLine  
        CALL println  
            RET to newLine  
        RET to threeLine  
    CALL newLine
```

Methods Model 1

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        newLine();  
        newLine();  
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}
```

```
CALL println  
RET to main  
CALL threeLine  
    CALL newLine  
        CALL println  
        RET to newLine  
    RET to threeLine  
CALL newLine  
    CALL println  
    RET to newLine  
RET to threeLine  
CALL newLine  
    CALL println
```

Methods Model 1

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        newLine();
        newLine();
        newLine();
    }
}
```

```
CALL println
RET to main
CALL threeLine
    CALL newLine
        CALL println
        RET to newLine
    RET to threeLine
    CALL newLine
        CALL println
        RET to newLine
    RET to threeLine
    CALL newLine
        CALL println
        RET to newLine
```

Methods Model 1

```
public class Model1 {  
    public static void main(String[] args) {  
        System.out.println("First line.");  
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    public static void newLine() {  
        System.out.println();  
    }  
    public static void threeLine() {  
        newLine();  
        newLine();  
        → newLine();  
    }  
}
```

```
CALL println  
RET to main  
CALL threeLine  
    CALL newLine  
        CALL println  
        RET to newLine  
    RET to threeLine  
    CALL newLine  
        CALL println  
        RET to newLine  
    RET to threeLine  
    CALL newLine  
        CALL println  
        RET to newLine  
    RET to threeLine
```

Methods Model 1

```
public class Modell1 {  
    public static void main(String[] args) {  
        System.out.println("First line.");  
        → threeLine();  
        System.out.println("Second line.");  
    }  
    public static void newLine() {  
        System.out.println();  
    }  
    public static void threeLine() {  
        newLine();  
        newLine();  
        newLine();  
    }  
}
```

```
CALL println  
RET to main  
CALL threeLine  
    CALL newLine  
        CALL println  
        RET to newLine  
    RET to threeLine  
CALL newLine  
    CALL println  
    RET to newLine  
RET to threeLine  
CALL newLine  
    CALL println  
    RET to newLine  
RET to threeLine  
RET to main
```

Methods Model 1

```
public class Model1 {  
    public static void main(String[] args) {  
        System.out.println("First line.");  
        threeLine();  
        → System.out.println("Second line.");  
    }  
    public static void newLine() {  
        System.out.println();  
    }  
    public static void threeLine() {  
        newLine();  
        newLine();  
        newLine();  
    }  
}
```

```
CALL println  
RET to main  
CALL threeLine  
    CALL newLine  
        CALL println  
        RET to newLine  
    RET to threeLine  
    CALL newLine  
        CALL println  
        RET to newLine  
    RET to threeLine  
    CALL newLine  
        CALL println  
        RET to newLine  
    RET to threeLine  
RET to main  
CALL println
```

Methods Model 1

```
public class Model1 {  
    public static void main(String[] args) {  
        System.out.println("First line.");  
        threeLine();  
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    }  
    public static void newLine() {  
        System.out.println();  
    }  
    public static void threeLine() {  
        newLine();  
        newLine();  
        newLine();  
    }  
}
```

```
CALL println  
RET to main  
CALL threeLine  
    CALL newLine  
        CALL println  
        RET to newLine  
    RET to threeLine  
    CALL newLine  
        CALL println  
        RET to newLine  
    RET to threeLine  
RET to main  
CALL println  
RET to main
```



Methods Model 1

1. How many lines of code call the `System.out.println` method?
2. How many times is `println` actually called when the program runs?
3. For each `CALL` in the program trace on the right, draw an arrow to the corresponding method call on the left.
4. What is the output of the program? Please write `\n` to show each newline.
5. In your own words, describe what methods are for. Why not just write everything in `main`?
6. What is the difference between a method and a variable? What do they have in common?
7. When Java sees a name like `x`, `count`, or `newLine`, how can it tell whether it's a variable or a method? (Hint: syntax)



Methods Model 2

```
public class Model2 {  
    public static void baffle() {  
        System.out.print("wug");  
        ping();  
    }  
  
    public static void main(String[] args) {  
        System.out.println("No, I ");  
        zoop();  
        System.out.println("I ");  
        baffle();  
    }  
    public static void ping() {  
        System.out.println(".");  
    }  
    public static void zoop() {  
        baffle();  
        System.out.print("You wugga ");  
        baffle();  
    }  
}
```



Methods Model 2 Questions?

1. How many method call statements are in this program?
2. In what order are the methods declared in the class?
3. Based on Model 1, describe the order in which methods actually run. What does that order have to do with your answer to #2?
4. What is the output of the program? Be precise about where there are spaces and where there are newlines.

- **Acknowledgements**

Parts of this activity are based on materials developed by Chris Mayfield and Nathan Sprague.

</end>