COMP 110/L Lecture 6

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Outline

- Methods
    - Variable scope
    - Call-by-value
- Testing with JUnit

Variable Scope

Question

Does this compile?

```
public class Test {
    public static void
    main(String[] args) {
        int x = 7;
        int x = 8;
    }
}
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Same name

Question

Does this compile?

```
public class Test {
    public static void
    main(String[] args) {
        int x = 7;
        int x = 8;
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}
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Same name

Does not compile!

```
error: variable x is already defined in
method main
```

Methods and Variables

- Method parameters introduce new variables
- Method bodies may introduce new variables

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public static int foo(int x) {
   int y = x + 1;
   return y;
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public static int foo(int x) {
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public static void
main(String[] args) {
   int y = 8;
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- Method bodies may introduce new variables

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}
```

Same name - does this compile?

```
public static void
main(String[] args) {
   int y = 8;
   System.out.println(y);
}
```

Yup!

Why?

- Declared variables have a *scope*
- Declaring two variables with the same name in the **same** scope: **error**
- Declaring two variables with the same name in **different** scopes: **ok**
- Scopes are introduced with { }

```
public class Test {
    public static void
    main(String[] args) {
        int x = 7;
        int x = 8;
    }
}
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public class Test {
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Scope of `main`

```
public class Test {
    public static void
main(String[] args) {
    int x = 7;
    int x = 8;
}
}
```

Same variable name in same scope: error

Scope of `main`

```
public static int foo(int x) {
   int y = x + 1;
   return y;
}
```

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public static void
main(String[] args) {
   int y = 8;
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   int y = x + 1;
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public static void
main(String[] args) {
   int y = 8;
   System.out.println(y);
}
```

```
public static int foo(int x) {
   int y = x + 1;
   return y;
}
```

Scope of `foo`

```
public static void
main(String[] args) {
   int y = 8;
   System.out.println(y);
}
```

Scope of `main`

```
public static int foo(int x) {
   int y = x + 1;
   return y;
}
```

Scope of `foo`

Same variable name in different scopes: ok

```
public static void
main(String[] args) {
   int y = 8;
   System.out.println(y);
}
```

Scope of `main`

-Motivation for scoping: if all variables were in the same scope (i.e., you could never reuse a variable name), you'd have to read through all methods just to figure out which variable names you could use
-This quickly gets ridiculous (programs which have hundreds of thousands of lines are not uncommon)

Call-by-Value

Question

What does this code print?

```
public static void something(int x) {
   x = 1;
}
```

```
public static void
main(String[] args) {
   int x = 8
   something(x);
   System.out.println(x);
}
```

Question

What does this code print?

Answer: 8

```
public static void something(int x) {
   x = 1;
}
```

```
public static void
main(String[] args) {
   int x = 8
   something(x);
   System.out.println(x);
}
```

Why?

- Java uses *call-by-value*
- Semantics: when a call is made, the method called works with a **copy** of passed data

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public static void
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Why?

- Java uses *call-by-value*
- Semantics: when a call is made, the method called works with a **copy** of passed data

```
public static void something(int x) {
   x = 1;
}
```

`something` **gets a copy of** `x`

```
public static void
main(String[] args) {
   int x = 8
   something(x);
   System.out.println(x);
}
```

any changes `something` **makes will only change the copy**

-This is in contrast to call-by-reference semantics, wherein the original x would change
-C++ has optional call-by-reference (default is call-by-value)

Testing with JUnit

Testing Motivation

- Builds confidence that code works as intended
- Ensures that code doesn't break if downstream changes are made

JUnit Motivation

- **Wildly** popular for writing tests for Java
- Can do a *lot*

Example:

`TrianglePerimeter.java`

Key Point 1: Filename

Tests must be held in `MyClassTest.java`,
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`TriangularPerimeterTest.java`

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`TriangularPerimeterTest.java`

`MultiplySeven.java`

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`TriangularPerimeter.java`

`TriangularPerimeterTest.java`

`MultiplySeven.java`

`MultiplySevenTest.java`

Key Point 2: `imports`

File containing tests must begin with:

```
import static org.junit.Assert.assertEquals;
import org.junit.Test;
```

Key Point 3: Method Setup

Each test is a method of the form:

```
@Test public void testName() {
   ...
}
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```
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Note: no `static`

Key Point 4: `assertEquals`

- Test method bodies must contain `assertEquals`, which **fails** the test if the two passed values are **not** equal
- Tests without `assertEquals` test nothing!

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- Tests without `assertEquals` test nothing!

```
@Test public void myTest() {
  assertEquals(1, 2);
}
```

Key Point 5: ClassName.methodName

To call a method `foo` **defined in** `Foo.java` **from** `FooTest.java`**, you must say** `Foo.foo()`

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```
@Test public void myOtherTest() {
  assertEquals(2, Foo.foo(7));
}
```