CLASSES, OBJECTS AND PACKAGES

15TH LECTURE

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Outline

- **Classes**
  - Creating New Data Types: class
  - Methods, Arguments and Return Values
- **Objects**
  - You Manipulate Objects Using References
  - Primitives
  - You Never Destroy Objects
- **Packages**
  - Using Other Components

Creating New Data Types: class

- Class keyword defines new data type

```
class ATypeName { /* class body goes here */ }
ATypeName a = new ATypeName();
```

- Fields

```
class DataOnly {
        int i;
        float f;
        boolean b;
}
```

- Each instance of **DataOnly** gets its own copy of the fields
- In a class, primitives get default values

Methods, Arguments and Return Values

- Methods: how you get things done in an object
- – Traditionally called “functions”
- – Can only be defined inside classes

```
ReturnType methodName(/* Argument list */) {
// Method body
}
```

- Example method call:

```
int x = a.f(); // For object a
```

You Manipulate Objects Using References

```
String s; // Reference only
// Normal object creation:
String s = new String("asdf");
// Special string initialization:
String s = "asdf";
```

Primitives

- Built-in types: *not* object references, but variables on the stack like C.
  - **boolean**, **char** (Unicode), **byte**, **short**, **int**, **long**, **float**, **double**
- Same operations as C/C++, same syntax
- Size of each data type is machine independent!
- Portability & performance implications
- To create objects, wrapper classes are provided:
  - **Boolean**, **Character**, **Byte**, **Short**, **Integer**, **Long**, **Float**, **Double**.

```
char ch = 'x';
Character c = new Character(ch);
Or
Character c = new Character('x');
```

Primitives Cont'd

Primitive type	Size	Minimum	Maximum	Wrapper type
boolean	—	—	—	Boolean
char	16-bit	Unicode 0	Unicode 2^{16}- 1	Character
byte	8-bit	-128	+127	Byte
short	16-bit	-2^{15}	$+2^{15}$—1	Short
int	32-bit	-2^{31}	$+2^{31}$—1	Integer
long	64-bit	-2^{63}	$+2^{63}$—1	Long
float	32-bit	IEEE754	IEEE754	Float
double	64-bit	IEEE754	IEEE754	Double
void	—	—	—	Void

You Never Destroy Objects

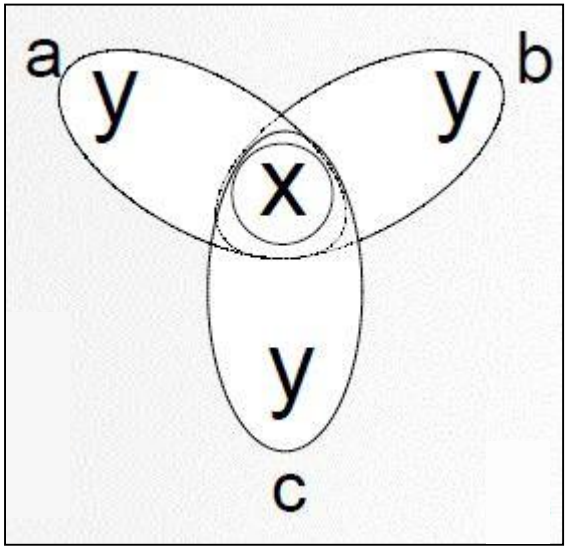
- Scope of objects

```
{ // <–- Beginning of scope
String s = new String("a string");
} // <-- End of scope
// Reference has gone "out of scope"
// but the object itself still exists
```

static Data (“class data”)

- Normally each object gets its own data
- What if you want only one piece of data shared between all objects of a class?

```
class WithStaticData {
static int x;
int y;
}
WithStaticData
a = new WithStaticData(),
b = new WithStaticData(),
c = new WithStaticData();
```



Using Other Components

- Bring in a library of components using **import** keyword
- To specify particular element in library:
  - **import com.bruceeckel.utility.MyClass;**
- To specify entire library:
  - **import java.util.*;**

Package: the Library Unit

- Managing “name spaces”
  - Class members are already hidden inside class
  - Class names could clash
  - Need completely unique name even over the Internet
- Compilation units (**.java** files)
  - Name of **.java** file == name of single **public** class
  - Other non-**public** classes : not visible
  - Each class in file gets its own **.class** file
  - Program is a bunch of **.class** files (no **.obj** or **.lib**)

Creating a Library of Classes

- **package mypackage;**
  - **public** class is under the umbrella **mypackage**
  - Client programmer must **import mypackage.*;**
- Creating unique package names
  - Location on disk encoded into package name
  - Convention: first part of package name is Internet
  - domain name of class creator (reversed)
  - Java interpreter uses CLASSPATH environment
  - variable as starting point for search