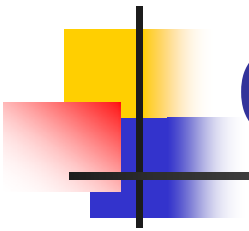
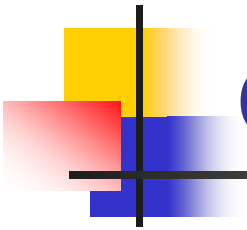


CS 11 java track: lecture 2

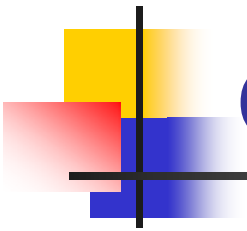
- This week:
  - more on object-oriented programming (OOP)
    - objects vs. primitive types
    - creating new objects with **`new`**
    - calling methods on an object
    - importing classes
  - input/output



objects and primitive types (1)

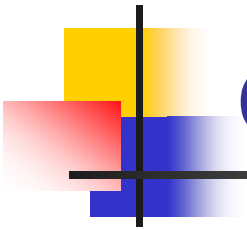
- everything in java is either
  - an object
  - a primitive type

- differences?
  - objects take up more memory
  - objects allocated in main computer memory (heap)
  - objects have methods
  - manipulating primitive types is faster



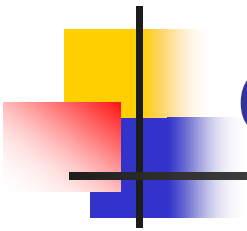
objects and primitive types (2)

- primitive types:
  - boolean, byte, char, int, long, float, double
  - char is actually 16-bits (Unicode)
- object types:
  - String, arrays, user-defined classes



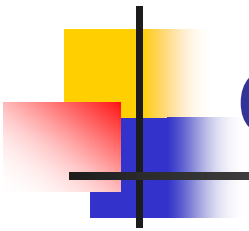
classes

- classes
  - are a template for creating objects
  - define the types of the data (fields)
  - define the code that acts on the data (methods)
  - can define methods that don't act on data
    - static methods
    - like global functions in most languages
    - main() was an example of this



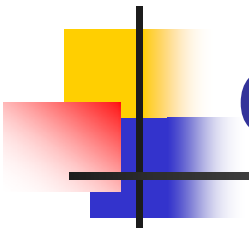
example class (1)

```
public class Point2d {
    private double xcoord;
    private double ycoord;
    // Constructor:
    public Point2d(double x, double y) {
        this.xcoord = x;
        this.ycoord = y;
    }
    // continued on next slide...
```



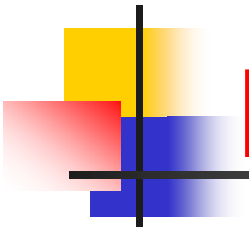
example class (2)

```
// no-argument constructor:
public Point2d() {
    this.xcoord = 0.0;
    this.ycoord = 0.0;
}
// accessors:
public double getX() { return xcoord; }
public double getY() { return ycoord; }
// not done yet...
```



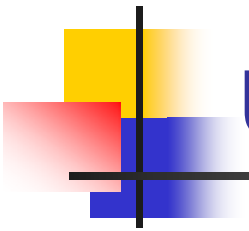
example class (3)

```
    public void setX(double value) {
        xcoord = value;
    }
    public void setY(double value) {
        ycoord = value;
    }
} // end of class Point2d
```



public and private

- what do public and private mean, anyway?
- private: can only be used by methods of this class
- public: can be used anywhere
- usually fields are private and methods are public (some exceptions)
- also protected (for a later lecture)



using the class

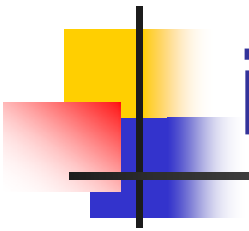
- Creating new objects of the class:

```
Point2d a = new Point2d(2.0, 3.0);
Point2d b = new Point2d(2.0, 3.0);
System.out.println(a == b);  // false!
```

- Calling methods:

```
a.setY(10.0);
```

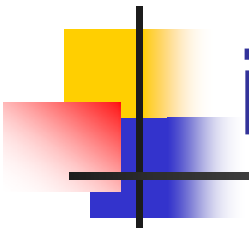
- n.b. methods have direct access to all of an object's fields



input/output (I/O) (1)

- input/output is very powerful and flexible in java
- downside: simple tasks are much more complicated than you'd expect
- first need to import the java i/o classes:

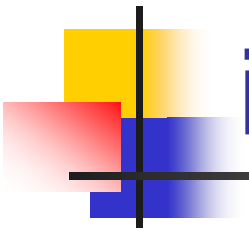
```
// import all i/o classes
import java.io.*;
// can now say "Foo" instead of "java.io.Foo"
```



input/output (I/O) (2)

- printing:
  - **`System.out.println()`**
    - prints a data value + a newline
  - **`System.out.print()`**
    - prints a data value without a newline
  - **`+`** is used for string concatenation (overloading)

```
// this prints "foo10":
System.out.println("foo" + 10);
```



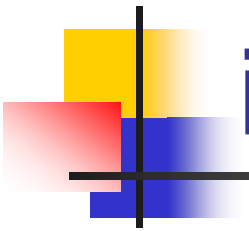
input/output (I/O) (3)

- input is more complicated...
- need to know the following classes:

`InputStreamReader`: converts bytes to characters

`StreamTokenizer`: converts characters to "tokens"

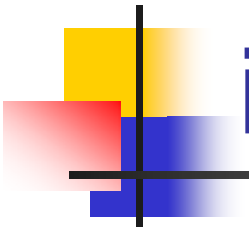
- a token is a string of characters separated by space
- **`nextToken()`** method – gets next token
- **`nval`** field (double) – contains the numeric value of the next token (if it has one)



input/output (I/O) (4)

- sample input code:

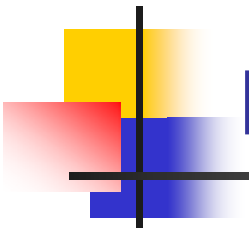
```
// System.in is the terminal input
InputStreamReader isr = new
  InputStreamReader(System.in);
StreamTokenizer tokens = new
  StreamTokenizer(isr);
// Repeat for every token you need:
tokens.nextToken();
// token value is in tokens.sval (and also in
// tokens.nval if it's a number)
```



input/output (I/O) (5)

- `nextToken()` can throw an `IOException` if something goes wrong
- this is our first encounter with "exception handling" in java
- we'll deal with this in later lectures
- for now, have to change `main()` to be

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



next week

- exception handling in depth
- more on OOP
- documentation (javadoc)