Introduction to Programming

Lecture 3

Programming Is About Naming

- Representation == naming
  - Pointers
- Everything is named
  - Files
  - Instructions (programs; functions)
  - Data (variables)
- Typed languages
  - Data Types: char, String, int, float, double, Boolean
- Memory: volatile vs. non-volatile

- Variables:
  - integers
  - floating point number
  - a character or a string
  - a Boolean
  - others
- Strongly-typed vs Weakly-typed

```
var myVariable; //JavaScript
myVariable = 200;
myVariable = 12.1;
myVariable = "Hello World!";
myVariable = true;
```

Variables

- "A hole in computer memory" …with a name
- Objects, lists, other variables
- Changeable ("variable")

Variables

- upper or lower case letters, numbers
- no spaces
- first character must not be a number
- must not be a *keyword*

examples:

```
x = 123 #integer
x = 3.14 #float
x = "hello" #string
x = [0,1,2] #list
```

Note:

```
firstName != firstname
```

The Assignment Operator

- Programming concept: = (assignment operator) does not mean equals
- If you need "equals" use ==
- Variables, typically used with the *assignment operator*

```
firstName = "Bubs"
```

- Whatever on the right → whatever on the left
- This is okay…

```
x = 1
x = x + 1
```

…result: `x` stores the number 2

Operators

- assignment: `=`
- equals: `==`
- concatenation: `+`
- arithmetic: `+ - * /`
- order of operations:
  - `( )` evaluated first
  - `*` and `/` left to right
  - `+` and `-` left to right
- shorthand:

  `+=` `++`
  `-=` `--`
  `*=`
  `/=`

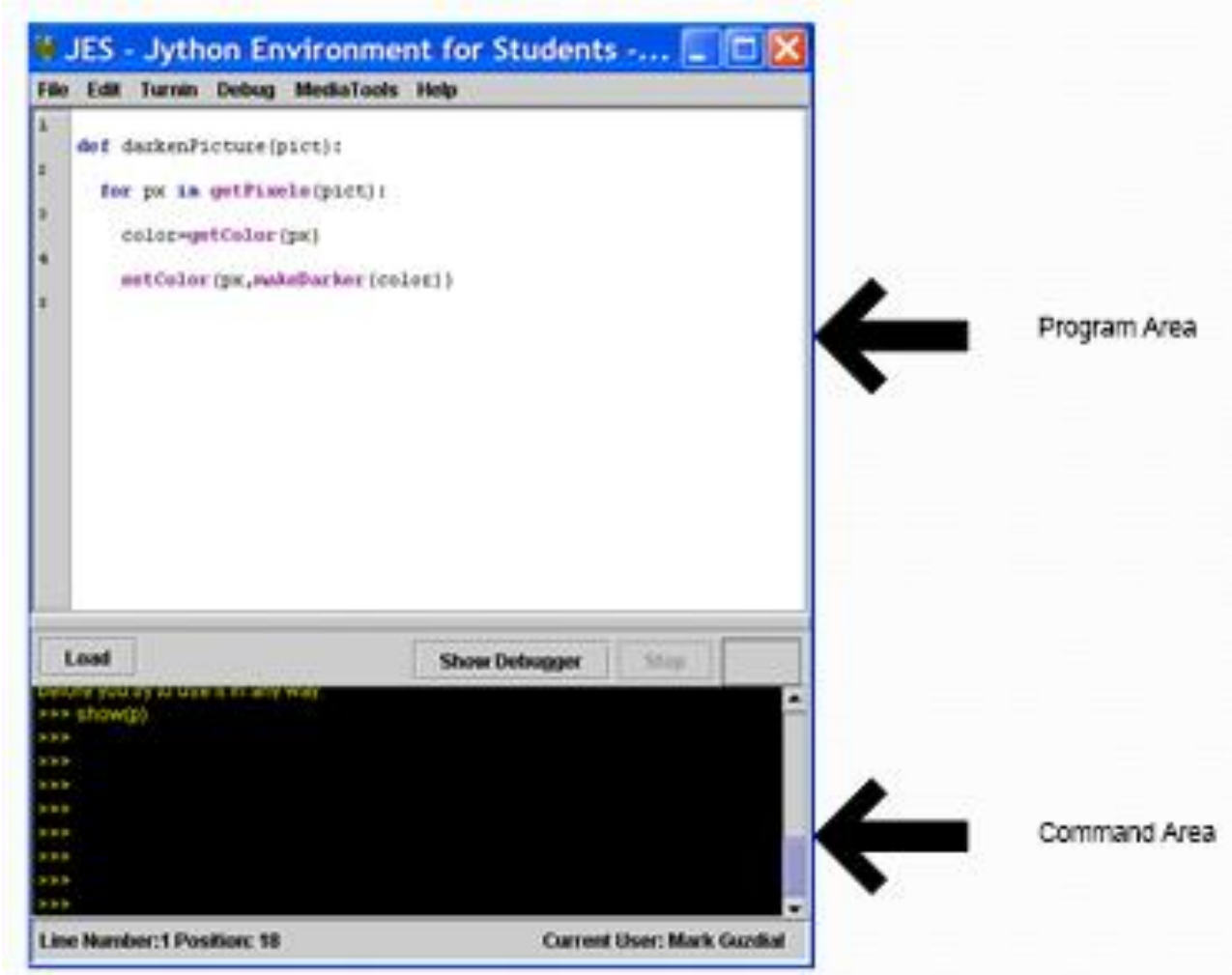
```
a = 100;
b = 50;
result = a + b;
```

```
score = score + 1;
score += 1;
score++;
```

Programming in Python

- Python and Jython
- Java Runtime Environment (JRE) and Java Development Kit (JDK)
- Install JES (Java Environment for Students)
  - Requires a Java JRE
- If not already…
  - Lab Assignment 1a: Install JES

JES 5



JES: Jython Environment for Students

- IDE (Integrated Development Environment)
- No byte code; no executables
- Learn: how to program
- Learn: the *true* nature of digital media
- Install JES
  - On your own laptop
    Installation files: https://github.com/gatech-csl/jes/releases
  - Or use the lab computers
- JES Help
  - https://b.gatech.edu/2zVME3h
  - Also available in JES | HELP menu

Python syntax

(compared to other programming languages)

- White space sensitive!
  - statements: instead of semi-colons, EOL
  - blocks: instead of curly braces, indentations
- Comments:
  `# ...single line comments`
- Variables
  - no `var` keyword, just create a *name*
- Operators - all same (including the assignment operator) except…
  - `and` (instead of `&&`)
  - `or` (instead of `||`)

Functions

- A block of code
- Unique name, verb/object (typically)
- Parenthesis for passing data
- "Call" the function by its name
  - Note: doesn't run unless called
- Functions can contain other functions

```
def calculateScore():
    # programming statements go here...


# Then "call" the function...
calculateScore()
```

Python syntax, continued

- Functions
  - Use `def` keyword
  - Use colon at the end
  - whitespace sensitive! EOL and indentations

```
def helloWorld():
→# Python statements go here...
→print "Hello World!"

# "call" the function...
helloWorld()
```

- Conditionals
  - If, Else, Elif
  - ~~Switch~~ (none)

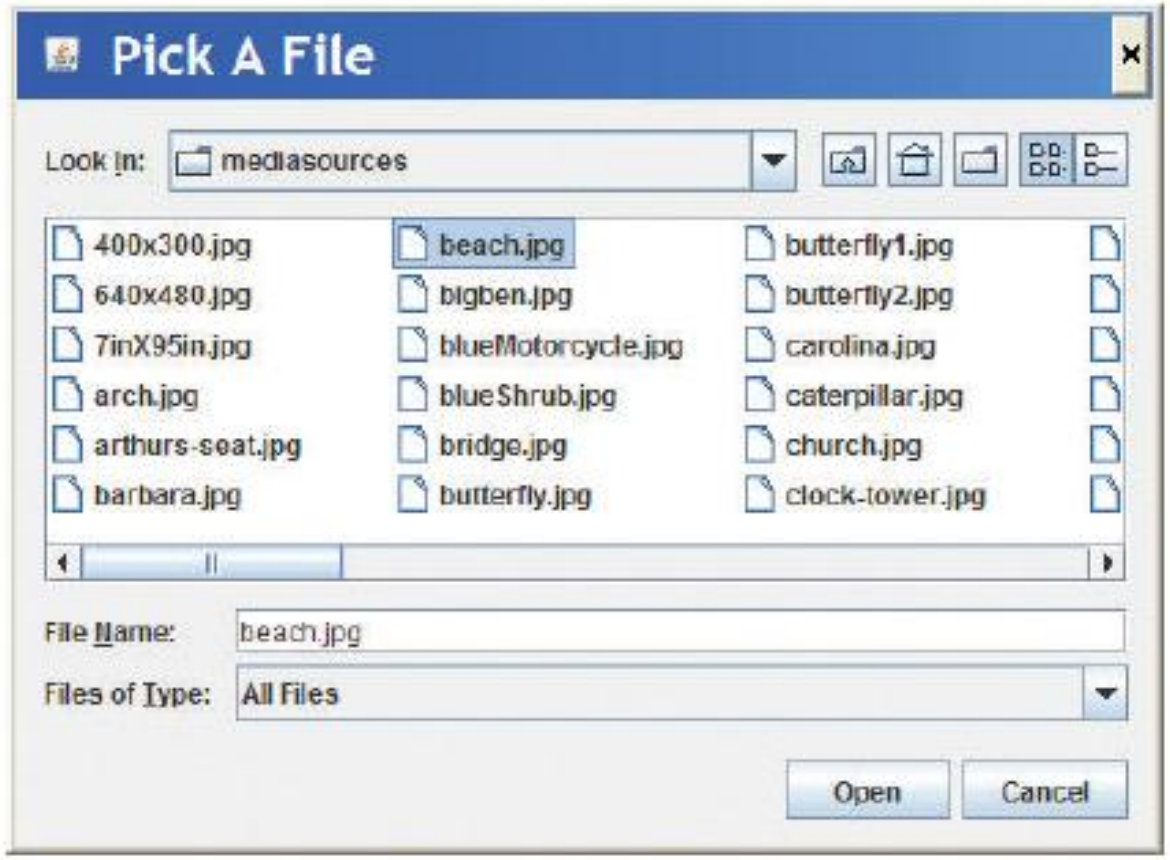
```
if temperature < 55:
  print "It's cold outside today!"
elif (temperature >= 55) and (temperature <= 75):
  print "The weather is fine today."
else:
  print "It's a scorcher!"
```

JES Built-in Functions

- A bunch of functions are pre-defined in JES for sound and picture manipulations

```
pickAFile()
makePicture()
makeSound()
show()
play()
explore()
```

- Note: some of these functions require *input* values (arguments) and return objects



Media Computation in JES

- Up/Down arrows in JES (and most programming environments)
- "print"
  - `System.out.println()` (Java)
  - `echo` (PHP)
  - `print` (Basic)
  - `printf()` (C)
  - `std::cout <<` (C++)
- Data casting
  - Try this…

```
>>> print 1.0 / 2.0
>>> print 1 / 2
```

- Try:
  - Program 1: Pick and Show a Picture
  - Program 2: Pick and Play a Sound

Functions that takes input: parameter(s)

- Functions: like a box (with a name)
- The box has a "hole" (with a name): pass objects in
- The *named input* can only be used within the function ("scope")
- "parameters" …when you write a function
  "arguments" …when you use a function
- Lab Assignment 1b: Saving Programs in JES