1) The Python Shell (a.k.a. Python Console)
2) Expressions
3) Variables and the Assignment Statement

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Assignments

- Due Thursday, Jan 22 (for class):
  - Read *Invent Your Own Computer Games with Python, 2nd Edition*
    Chapter 4: GUESS THE NUMBER

- Due Tuesday, Jan 27 (midnight):
  - Lab 2: Modified Guess The Number
How to Read a Computer Programming Book

1) Sit down at a desk with working space.
2) Turn on your computer and start up PyCharm.
3) Open your Textbook.
4) Read a bit.
5) Type the examples from the book into PyCharm.
6) If it does not work, try again.
7) Think of something you might change and try to guess what the result will be. Then try it.
8) Think of something you want to do that is slightly different from what the example does, ..... and do it.
9) Then, read a bit more....

The Python Shell (a.k.a. Python Console)

Click here to show the Python Console.
Quiz: The Last Expression Evaluates to?

```python
>>> foo = 5
>>> foo = 10
>>> Foo = 20
>>> foo + Foo
```

a) 15  
b) 25  
c) 30  
d) 35  
e) 40

A Python Expression

- A Python expression is made up of values and operators.
Storing Values in Variables

>>> eggs = 15
>>> fizz = 10
>>> eggs + fizz
25

In Python, = is the assignment operator.

Changing the Value Stored in a Variable

>>> fizz = 5
>>> fizz = 10
>>> print(fizz)
10

>>> fizz = fizz + 1
>>> fizz = fizz + 2
>>> print(fizz)
13
**Python is Case Sensitive**

```python
>>> foo = 10
>>> Foo = 20
>>> foo + Foo
>>> print(foo, Foo, foo)
10 20 10

>>> print(foO)
NameError: name 'foO' is not defined
```

**Quiz: Evaluating an Expression**

What is the value of the 4th Python 3.4 expression below?

```python
>>> a = 2
>>> b = 3
>>> c = 5
>>> a + b + b + c
```

- a) a+b+b+c
- b) a + b + b + c
- c) abbc
- d) 13
- e) 2335
Order of Operations

```python
>>> 2 + 3 * 10
32
```

```python
>>> (2 + 3) * 10
50
```

Quiz: Evaluating an Expression

What is the value of the Python 3.4 expression below?

```python
>>> 1 + 2 * 5
```

a) `1+2*5`
b) `125`
c) `15`
d) `11`
e) `1212121212`
In Python, the + Operator is **Overloaded**

```python
>>> 5 + 5
10
+ means *Addition*.

>>> 'Joel' + '5'
'Joel5'
+ means *Concatenation*.

>>> '5' + '5'
'55'

>>> 5 + '5'
TypeError: unsupported operand type(s) for +: 'int' and 'str'
```

**Quiz: Evaluating an Expression**

What is the value of the 4th Python 3.4 expression below?

```python
>>> a = '2'
>>> b = '3'
>>> c = '5'
>>> a + b + b + c
```

a) 'a+b+b+c'
b) 'a + b + b + c'
c) 'abbc'
d) '13'
e) '2335'
Incrementing Variables

\[ \text{guessesTaken} = \text{guessesTaken} + 1 \]

- When one is added to a variable, programmers say: "the program is **incrementing** the variable" (because it is increasing by one).

- When one is subtracted from a variable, programmers say: "the program "is **decrementing** the variable" (because it is decreasing by one).

Writing verses Using Software

Authoring a computer program is like writing an essay.

NOT like learning to use software such as Photoshop, PowerPoint or League of Legends.

Software, such as Photoshop, is often learned by "**click and explore**"
A computer programming language is a set of symbols and rules designed for humans to more easily represent computer instructions.

Usually, one symbol or "command" in a "high level" computer language, such as Python, represents long sequences of actual computer instructions.

Syntax Errors Verses Semantic Errors

**Syntax Errors**

"I getted the milk and putted them into me coffee."

```
'Hello' + 5
```

**Semantic Error**

1) Place two slices of Mozzarella cheese, a slice of tomato and some small fresh basil leaves between two slices of bread.

2) Lightly spread outside of sandwich with butter.

3) Place skillet on medium heat and cook sandwich in skillet for 3 hours.
In the Computer it is All Just Numbers

- Bach's Sonata No. 5 in F minor
- Owl City's Fireflies
- The motion picture: Shrek Forever After
- Hamlet, Prince of Denmark.
- World of Warcraft

A Computer File is Just a List of 1s & 0s
Computers Do Simple Things

- Set the intensity of the red, green and blue light given off by a particular pixel on a display.
- Send a precisely timed sequence of hi and low voltage values to a hard disk controller, USB port, or wireless transmitter.
- Add, Subtract, Multiply or Divide two numbers.
- Read or Set the voltage state of a particular memory circuit.

Small Language with Complex Usage

- Programming Languages are much smaller and easier to learn than natural languages.
- However, programming languages are primarily used to express complex conditional (branching) logic that far surpass common uses of natural languages.
- Logic skills have strong carryover from one programming language to another.
Window into How Computers Think

Easy:
- Using only standard arithmetic operations, it takes no more than a few hours to write a Java program that can solve large systems of differential equations.
- Furthermore, any desktop computer can calculate the solution of such a system from a given initial value in less than a second.

Hard:
- Being given a bunch of photographs of everyday life, the world's most powerful computer running the world's best artificial intelligence software is currently incapable of deciding this is a photo of a woman walking a dog.