"There are growing arguments that [certain games could already be regulated under gambling law]... At that stage, the games industry may realise that it has been sleepwalking towards at least some degree of gambling regulation, following which it may wake up and want to do something about it. At that point, expect a debate about the more fundamental question of whether games should be subject to gambling law, or whether their nature qua games means they should be treated separately."

http://www.gamerlaw.co.uk/2012/08/the-converging-worlds-of-games-and.html (legal article)
– Name

– Where from
  • Matt’s lived in VT, NH, CT, MA, WI, TX, CA, PA

– Major
  • Matt was a cs / physics double major

– Something non-academic
  • Matt is on an old video game kick (Starcraft 1, Heroes of Might and Magic, ....)
Python Programming: An Introduction to Computer Science

Chapter 1
Computers and Programs
The Universal Machine

• A modern computer can be defined as
  – “a machine that stores and manipulates information under the control of a modifiable program.”

• Two key elements:
  – Computers are devices for manipulating information
  – Computers operate under the control of a changeable program
The Universal Machine

• What is a *computer program*?
  – A detailed, step-by-step set of instructions
  – If we change the program, the computer performs a different set of actions or a different task
  – The machine stays the same, but the program changes
Why program?

– Fundamental part of computer science
– Helps you become a more intelligent user of computers
– It can be fun
– Helps develop problem solving skills
– Programmers are in great demand
Hardware Basics

- The *central processing unit (CPU)* or brain
- **Memory** stores programs and data
- Input devices
- Output devices
Programming Languages

– Unambiguous and precise
– Every structure in programming language has a precise form, called its syntax
– Every structure in programming language has a precise meaning, called its semantics
– Programmers will often refer to their program as computer code
– Process of writing an algorithm in a programming language often called coding
Programming Languages

• *High-level* computer languages
  – Designed to be used and understood by humans

• Low-level language
  – Computer hardware can only understand a very low level language known as *machine language*
Programming Languages

• *Compilers* convert programs written in a high-level language into machine language of some computer

• *Interpreters* simulate a computer that understands a high-level language
  – Source program not translated into machine language all at once
  – Interpreter analyzes and executes source code instruction by instruction
The Magic of Python

When you start Python, you will see something like:

Python 3.1.2 (r312:79149, Mar 21 2010, 00:41:52) [MSC v.1500 32 bit (Intel)] on win32
Type "copyright", "credits" or "license()" for more information.

>>>
The Magic of Python

• The “>>>” is a Python prompt indicating that Python is ready for us to give it a command. These commands are called statements.

• >>> print("Hello, world")
  Hello, world
  >>> print(2+3)
  5
  >>> print("2+3=", 2+3)
  2+3= 5
  >>>
The Magic of Python

• Usually we want to execute several statements together that solve a common problem. One way to do this is to use a *function*.

• >>> def hello():
    print("Hello")
    print("Computers are Fun")

>>>
The Magic of Python

>>> def hello():
    print("Hello")
    print("Computers are Fun")

>>>  

- The first line tells Python we are defining a new function called hello
- The following lines are indented to show that they are part of the hello function
- The blank line (hit enter twice) lets Python know the definition is finished
The Magic of Python

- >>> def hello():
    print("Hello")
    print("Computers are Fun")

- Notice that nothing has happened yet.
  - Defined function
  - Haven’t told Python to perform it
The Magic of Python

• >>> def hello():
   print("Hello")
   print("Computers are Fun")
   
>>> 

• A function is *invoked* by typing its name.

• >>> hello()
Hello
Computers are Fun
>>>
The Magic of Python

• What’s the deal with the ()’s?
• Commands can have changeable parts called *parameters* that are placed between the ()’s.

  ```python
  >>> def greet(person):
      print("Hello",person)
      print ("How are you?")
  
  >>>
  ```
The Magic of Python

• >>> greet("Terry")
  Hello Terry
  How are you?
• >>> greet("Paula")
  Hello Paula
  How are you?
>>>  

• **Parameters let us** customize output of function
The Magic of Python

• When exit Python prompt, definitions cease to exist
• Programs are usually composed of functions, *modules*, or *scripts* that are saved to be used again
• A *module file* is a text file created in text editing software (saved as “plain text”) that contains function definitions
• A *programming environment* is designed to help programmers write programs and usually includes automatic indenting, highlighting, etc.
  – IDE
  – emacs/vi/vim/pico/Visual Studio
The Magic of Python

# File: chaos.py
# A simple program illustrating chaotic behavior

def main():
    print("This program illustrates a chaotic function")
    x = eval(input("Enter a number between 0 and 1: "))
    for i in range(10):
        x = 3.9 * x * (1 - x)
        print(x)

main()

• We’ll use filename.py when we save our work to indicate it’s a Python program
• In this code we’re defining a new function called main
• The main() at the end tells Python to run the code
The Magic of Python

>>> This program illustrates a chaotic function
Enter a number between 0 and 1: .5
0.975
0.0950625
0.335499922266
0.869464925259
0.442633109113
0.962165255337
0.141972779362
0.4750843862
0.972578927537
0.104009713267
>>>
Inside a Python Program

# File: chaos.py
# A simple program illustrating chaotic behavior

• Lines that start with # are called comments
• Intended for human readers and ignored by Python
• Python skips text from # to end of line

• Useful?
Inside a Python Program

def main():

    • Beginning of the definition of a function called main
    • Since our program has only this one module, it could have been written without the main function
    • The use of main is customary, however
Inside a Python Program

print("This program illustrates a chaotic function")

• Print a message introducing the program
Inside a Python Program

```python
x = eval(input("Enter a number between 0 and 1: "))
```

- `x` is an example of a `variable`
- Used to assign name to some value: can refer to it later
- The quoted information is displayed
- Number typed in response stored in `x`
Inside a Python Program

```python
for i in range(10):
    # Code block to be repeated 10 times
```

- For is a *loop* construct
- A loop tells Python to repeat the same thing over and over
- In this example, the following code will be repeated 10 times
Inside a Python Program

\[ x = 3.9 \times x \times (1 - x) \]

\texttt{print(x)}

- These lines are the \textit{body} of the loop
- Body gets repeated each time through the loop
- The body of the loop is identified through indentation
- Effect of the loop is same as repeating these two lines 10 times
Inside a Python Program

```python
for i in range(10):
    x = 3.9 * x * (1 - x)
    print(x)
```

• These are equivalent!
• Useful?
Inside a Python Program

\[ x = 3.9 \times x \times (1 - x) \]

• This is called an *assignment statement*

• The part on the right-hand side (RHS) of the “=" is a mathematical expression.

• * is used to indicate multiplication

• Once the value on the RHS is computed, it is stored back into (assigned) into \( x \)

• \( x \) gets something
Inside a Python Program

main()

- This line tells Python to execute the code in the function main
Chaos and Computers

• The chaos.py program:

```python
def main():
    print("This program illustrates a chaotic function")
    x = eval(input("Enter a number between 0 and 1: "))
    for i in range(10):
        x = 3.9 * x * (1 - x)
        print(x)
main()
```

• For any given input, returns 10 seemingly random numbers between 0 and 1

• It appears that the value of x is chaotic
Chaos and Computers

- The function computed by program has the general form \( k(x)(1 - x) \) where \( k \) is 3.9
- This type of function is known as a logistic function
- Models certain kinds of unstable electronic circuits
- Very small differences in initial value can have large differences in the output
Chaos and Computers

• Input: 0.25
  0.73125
  0.76644140625
  0.698135010439
  0.82189581879
  0.570894019197
  0.955398748364
  0.166186721954
  0.540417912062
  0.9686289303
  0.118509010176

• Input: 0.26
  0.75036
  0.73054749456
  0.767706625733
  0.6954993339
  0.825942040734
  0.560670965721
  0.960644232282
  0.147446875935
  0.490254549376
  0.974629602149