Logistics

• Piazza: make sure you have access to it! Send me email ASAP if not!

• TA Drop-In Shifts
  *Sunday 1:30 - 3:30 Lujun/Esther
  *Sunday 7:30 - 9:30 Julia, Muriel
  Monday 7:30 - 9:30 Kaitlyn, Cordelia, Sharon
  Tuesday 7:30 - 9:30 Erika, Maria, Galen
  *Thursday 7:30 - 9:30 Cordelia
  *Sunday 1:30 - 3:30 Maria
The Programming Process

Variables

Definite Loops

Input
The Programming Process
The Programming Process

- Analyze the Problem
The Programming Process

- Analyze the **Problem**
- Determine **Specifications**
The Programming Process

• Analyze the Problem
• Determine Specifications
• Create a Design
The Programming Process

- Analyze the **Problem**
- Determine **Specifications**
- Create a **Design**
- **Implement**
The Programming Process

- Analyze the **Problem**
- Determine **Specifications**
- Create a **Design**
- **Implement**
- Test & Debug
The Programming Process

- Analyze the **Problem**
- Determine **Specifications**
  Refine the
- Create a **Design**
- **Implement**
- **Test & Debug**

iterate many times

D. Thiebaut, Computer Science, Smith College
The Programming Process
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The Programming Process

Variables

Definite Loops

Input
Where do Variables Live?
Where do Variables Live?
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Random Access Memory (RAM)
Where do Variables Live?

Random Access Memory (RAM)

Single In-line Memory Module (SIMM)
Where do Variables Live?

- RAM: 4, 8, 12, 16 GigaBytes
- **Giga** = billion: $10^9$ bytes
- In RAM: room for approximately 2 billion integers
  - 1 number takes **4 bytes**
  - 1 character takes **2 bytes**
2 Billion Something?

2 billion integers

2 billion quarters?
2 Billion Something?

2 billion integers

2 miles, or 3.2 km!
Variables and Assignment

age = 3
Variables and Assignment

age = 3
name = "Smith"
rate = 0.06
Variables and Assignment

age = 3
name = "Smith"
rate = 0.06

literals
Variables and Assignment

age = 3
name = "Smith"
rate = 0.06

age = age * 2  # double the age
age = age + 1  # increment the age
Variables and Assignment

age = 3
name = "Smith"
rate = 0.06

age = age * 2  # double the age
age = age + 1  # increment the age

name = name + " College"  # name will contain
                         # "Smith College"
Variables and Assignment

age = 3
name = "Smith"
rate = 0.06

age = age * 2  # double the age
age = age + 1  # increment the age

name = name + " College"  # name will contain "Smith College"

In a programming language operators may have different meanings depending on the context
Variables and Assignment

age = 3
name = "Smith"
rate = 0.06

age = age * 2  # double the age
age = age + 1  # increment the age

name = name + " College"  # name will contain "Smith College"

Overloaded operators
Exercises

age = 3
name = "Smith"
rate = 0.06

age = age * rate  
name2 = "his + hers"  

age = 3
name = "Smith"
rate = 0.06

age = age * rate  # age will contain 0.18
name2 = "his + hers"  # name will contain "his + hers"
rate = name * rate  #
Exercises

age = 3
name = "Smith"
rate = 0.06

age = age * rate  # age will contain 0.18
name2 = "his + hers"  # name will contain "his + hers"
rate = name * rate  # TypeError: can't multiply
# sequence by 'float'

col = name + "College" * 2
#
age = 3
name = "Smith"
rate = 0.06

age = age * rate  # age will contain 0.18
name = "his + hers"  # name will contain "his + hers"
rate = name * rate  # TypeError: can't multiply
# sequence by 'float'

col = name + "College" * 2
# this will depends on which
# operator is executed first
# operator priority: * / + -
Exercises

age = 3
name = "Smith"
rate = 0.06

age = age * rate  # age will contain 0.18
name = "his + hers"  # name will contain "his + hers"
rate = name * rate  # TypeError: can't multiply
                  # sequence by 'float'

col = ( name + "College" ) * 2
      # "SmithCollegeSmithCollege"
Exercises

age = 3
name = "Smith"
rate = 0.06

age = age * rate  # age will contain 0.18
name = "his + hers"  # name will contain "his + hers"
rate = name * rate  # TypeError: can't multiply
# sequence by 'float'

col = name + ( "College" * 2 )
  # "SmithCollegeCollege"
Simultaneous Assignments

\[
a, b, c = 10, 20, 30
\]

# a = 10, b = 20, c = 30

\[
a, b = b, a
\]

# a = 20, b = 10 (swap!)

\[
a, b, c = 10, 20, 30
\]

\[
a, b, c = a+1, b*2, a-b
\]

# a = 11, b = 40, c = -10
a, b, c = 10, 20, 30
# a = 10, b = 20, c = 30
trio = a, b, c  #
a, b, c = 10, 20, 30  # a = 10, b = 20, c = 30
trio = a, b, c       # trio contains (10, 20, 30)
x, y, z = trio       #
a, b, c = 10, 20, 30

# a = 10, b = 20, c = 30

trio = a, b, c

# trio = (10, 20, 30)

x, y, z = trio

# x = 10
# y = 20
# z = 30
Trick Question

```
a, b = 10, 20

a, b = b, a  # what happens?
```
The Programming Process

Variables

Definite Loops

Input
for <var> in <sequence>:
<body>
for <var> in <sequence>:
<body>

for can in [Pepsi, Coca-Cola, Crush, Dr. Pepper, Srita Mist]:
open( can )
drink( can )
throwAway( can )
for $\var$ in $\text{sequence}$:

$\text{body}$

```
for can in [ Pepsi, Coca-Cola, Crush, Diet Dr. Pepper, Sierra Mist ]:
    open( can )
    drink( can )
    throwAway( can )
```

Sequence

Many actions repeated, e.g. for each can.
for `<var>` in `<sequence>`:

`<body>`

```python
for name in [ "Alex", "Max", "Rui" ]:
    print( "Hello", name + "!" )
    print( "－－－－－－－－－－－" )
```
for <var> in <sequence>:
<body>

for x in range(10):
    print(x)
http://docs.python.org/3.0/
The Python interpreter has a number of functions and types built into it that... The bytearray class is a mutable sequence of integers in the range $0 \leq x < 256$. 
Examples to Try Out:

```python
for x in range( ... ): # replace ... with
    print( x )         # range expression
    # below:

# range( 10 )
# range( 2, 10 )
# range( -5, 5 )
# range( 0, 10, 2 )
# range( 0, 10, 3 )
# range( 9, 0, -1 )
```
Exercise

Generate an equivalency table of temperatures in Fahrenheit and Celsius. 100 F should be on the first line, and -30F on the last line. Show only Fahrenheit temperatures that are multiples of 10.

Celsius = (Farhenheit - 32) * 5 / 9
The Programming Process

Variables

Definite Loops

Input
name = input( "What is your name?" )
Demo Time!

```
20
>>> c
30
>>> trio = a, b, c
>>> trio
(10, 20, 30)
>>> x, y, z = trio
>>> x
10
>>> y
20
>>> z
30
>>> i, j = trio
Traceback (most recent call last):
  File "<pyshell#10>", line 1, in <module>
    i, j = trio
ValueError: too many values to unpack
```
We stopped here last time...
review lab2.  eval(input) vs input(eval)

Programming Practice: Example 1

Programming Practice: Example 2
\texttt{eval(}\textit{input}(\ldots)\texttt{)} \textit{vs} \texttt{input( eval(\ldots) )}
eval(input(…) ) vs input( eval(…) )
\texttt{eval}(\text{input}(\ldots)) \text{ vs } \text{input}(\texttt{eval}(\ldots))
```python
a = input( eval( "Enter a number" ) )
```
\textbf{eval}(\textit{input}(\ldots)) \textit{vs} \textit{input}(\textbf{eval}(\ldots))

\begin{itemize}
\item \texttt{a = input(eval("Enter a number"))}
\end{itemize}
\[ \text{eval(} \text{input(\ldots)} \text{)} \text{ vs } \text{input( eval(\ldots) )} \]

\[ a = \text{input( eval( "Enter a number" ) )} \]

\[ \text{PYTHON ERROR!} \]
\texttt{eval} ( \texttt{input(…)} ) \ vs \ \texttt{input} ( \texttt{eval(…)} )
`eval(input(…))` vs `input(eval(…))`

```python
a = eval(input("Enter a number"))
```
\[
\text{\texttt{eval(input(\ldots))}} \text{ vs } \text{\texttt{input( eval(\ldots) )}}
\]

\[
a = \text{eval( input( "Enter a number" ) )}
\]
```python
a = eval( input( "Enter a number" ) )
```

**eval** *(input(...)) vs input( eval(...) )*

Enter a number 32
\texttt{eval(input(...))} vs \texttt{input(eval(...))}

\begin{align*}
a &= \texttt{eval(input("Enter a number") )}
\end{align*}
\texttt{eval(input(...)) vs input(eval(...))}

\begin{itemize}
  \item \texttt{a = eval("32")}
  \item \texttt{"32"}
  \item Enter a number 32
\end{itemize}
\( \text{eval}(\text{input}(...)) \) vs \( \text{input}(\text{eval}(...)) \)
The Programming Process
Example 1
The Programming Process

Example 1
Problem 1

Get first name, last name, Id from student, and final grade, as a number (0-100).

Also known is class average, as a number (0-100).

Display student information in a box, and horizontal bar graph of 2 grades.
Problem 1

First name? Dominique
Last name? Thiebaut
Id? 990123456
Final grade? 90

+--------------------------------------------------+
|Dominique Thiebaut 990123456 |
+--------------------------------------------------+
00...10...20...30...40...50...60...70...80...90...100
grade: #############################################
class: ##################################################
Problem 2
(if time permits)

Write a python program that displays an 8x8 chessboard. Black cells should be 3x3 with #-signs in them, and white cells should be 3x3 with spaces inside.
(and if you are ambitious, when you are done, make the program ask the user for the number of cells wanted, horizontally and vertically.)