Chapter 2
Writing Simple Programs

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Textbook: Python Programming: An Introduction to Computer Science, John Zelle

Software Development Process

- Figure out the problem - for simple problems - think about how you would do the problem by hand
- Determine the specifications - for a first programming course - the specifications are generally in the assignment handout

Software Development

- Create a Design - In the beginning this is an outline of the major steps
- Implement the design - build your software
- Test and debug the program - make sure to think about different things which might go wrong
- Maintain the program

```
# convert.py
#       A program to convert Celsius temps to Fahrenheit# by: Susan Computewell

def main():

celsius = input("What is the Celsius temperature? ")
fahrenheit = (9.0 / 5.0) * celsius + 32
print "The temperature is", fahrenheit, "degrees Fahrenheit.“

main()
```

Running the Program...

```
$ python convert.py

What is the Celsius temperature? 0
The temperature is 32.0 degrees Fahrenheit.

$ python convert.py
What is the Celsius temperature? 100
The temperature is 212.0 degrees Fahrenheit.
```

Variable Names / Identifiers

- Must start with a letter or underscore _
- Must consist of letters and numbers
- Case Sensitive
- Good: spam eggs spam23
- Bad: 23spam #sign var.12
- Different: spam Spam SPAM

Reserved Words

- You can not use reserved words as variable names / identifiers

and del for is raise assert elif from lambda return break else global
not try class except if or while continue exec import pass yield def finally
in print

Expressions

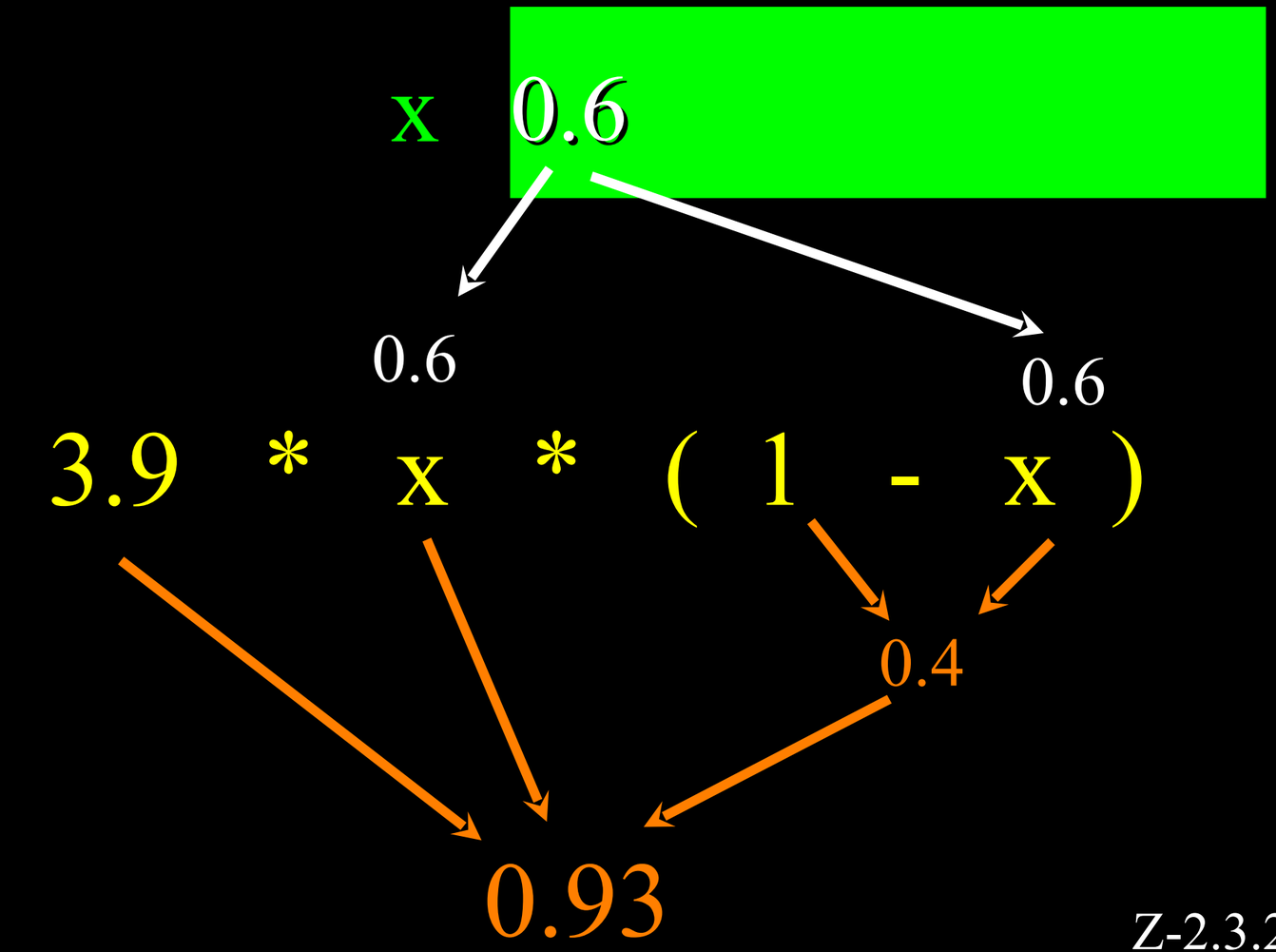
- Programming languages have lots of expressions
- Expressions are things that can be evaluated to a value
- Can be a string, number or virtually anything
- Can be a single value or computed from several values using operators

Expressions Everywhere

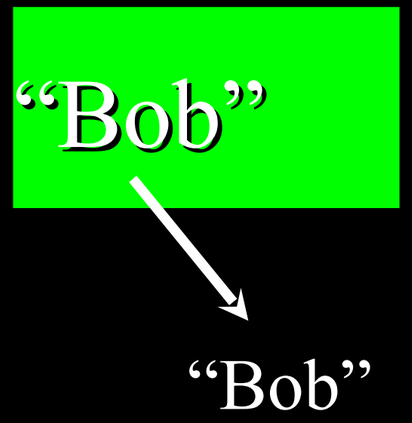
```
celsius = input( "What is the Celsius temperature? " )

fahrenheit =   (9.0 / 5.0)   *   celsius   +   32

print "The temperature is"   ,   fahrenheit   ,   "degrees Fahrenheit."
```

Expressions with Numbers

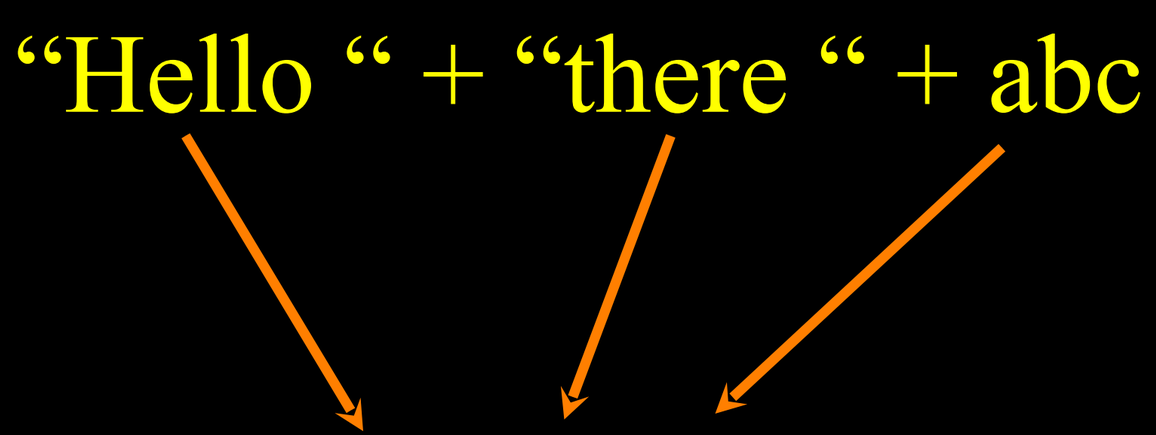
- Look up variables
- Do math operations in order left to right
  - ( )
  - * /
  - + -



Expressions With Strings



- For strings the + operator means "concatenate"



Output Statements

- The print statement takes one or more expressions separated by commas and prints the expressions on the output separated by spaces

```
x = 6
print 2                    → 2
print 2 + 3                → 5
print "Hello", 4+5         → Hello 9
```

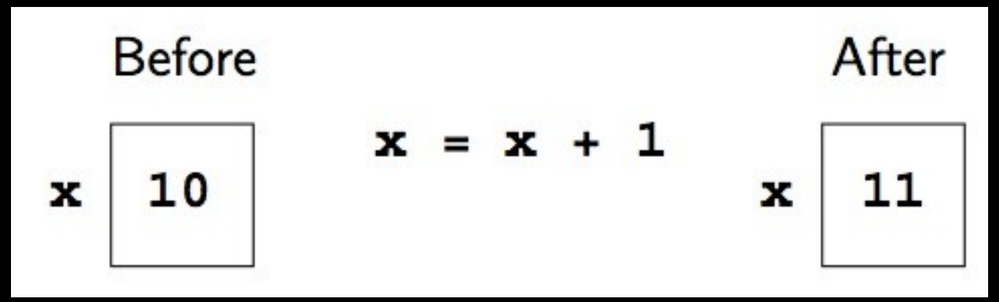
Assignment Statements

- variable = expression
- Evaluate the expression to a value and then put that value into the variable

```
x = 1
spam = 2 + 3
spam = x + 1
x = x + 1
```

Slow Motion Assignment

- We can use the same variable on the left and right side of an assignment statement
- Remember that the right side is evaluated *before* the variable is updated



Input Statements

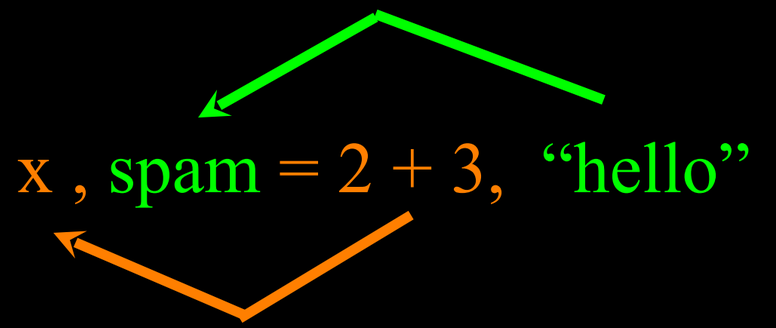
- input("Prompt") - displays the prompt and waits for us to input an expression - this works for numbers
- In Chapter 4 we will see how to read strings

```
>>> x = input("Enter ")
Enter 123
>>> print x
123
```

Simultaneous Assignment

- variable, variable = expression, expression
- Both expressions on right hand side are evaluated before the right hand side variables are updated

```
>>> x = 1
>>> y = 2
>>> x ,
y = y , x
>>> print x, y
2 1
>>>
```



Definite Loops

Definite Loops

- Loops that run a fixed (aka definite) number of times
- Loops that "iterate" through an ordered set
- Loops that run "for" a number of times

```
for abc in range(5) :
    print "Hi"
    print abc
```

```
Hi
0
Hi
1
Hi
2
Hi
3
Hi
4
```

Definite Loops

- Loops that run a fixed (aka definite) number of times
- Loops that "iterate" through an ordered set
- Loops that run "for" a number of times
- The iteration variable change for each iteration of the loop

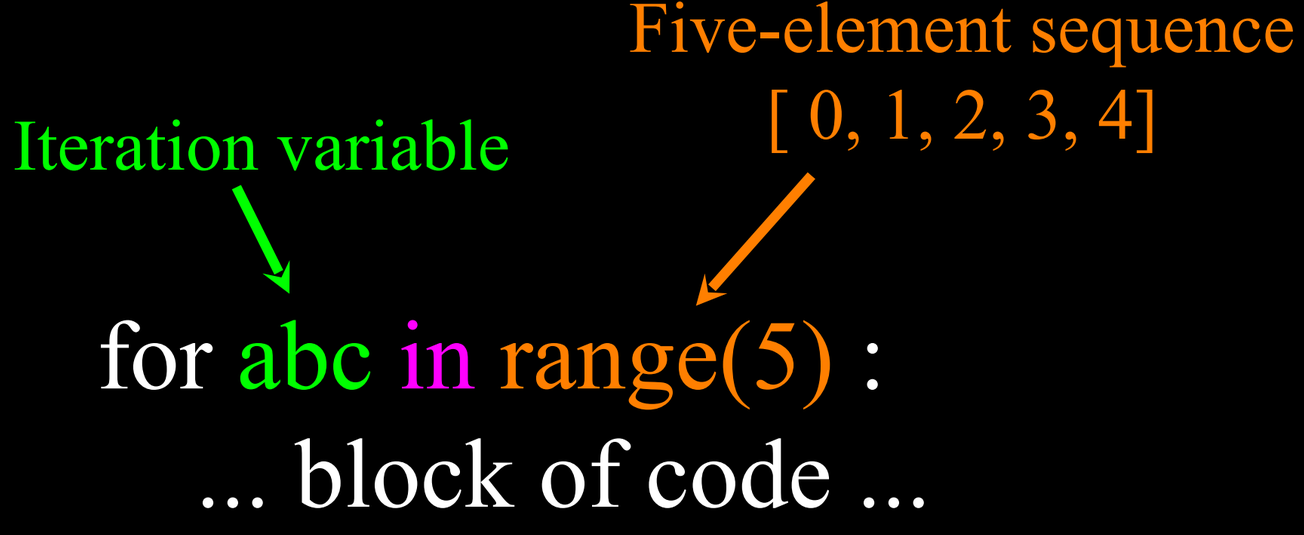
```
for abc in range(5) :
    print "Hi"
    print abc
```

```
Hi
0
Hi
1
Hi
2
Hi
3
Hi
4
```

Colon (:) defines the start of a block. Indenting determines which lines belong to the block.

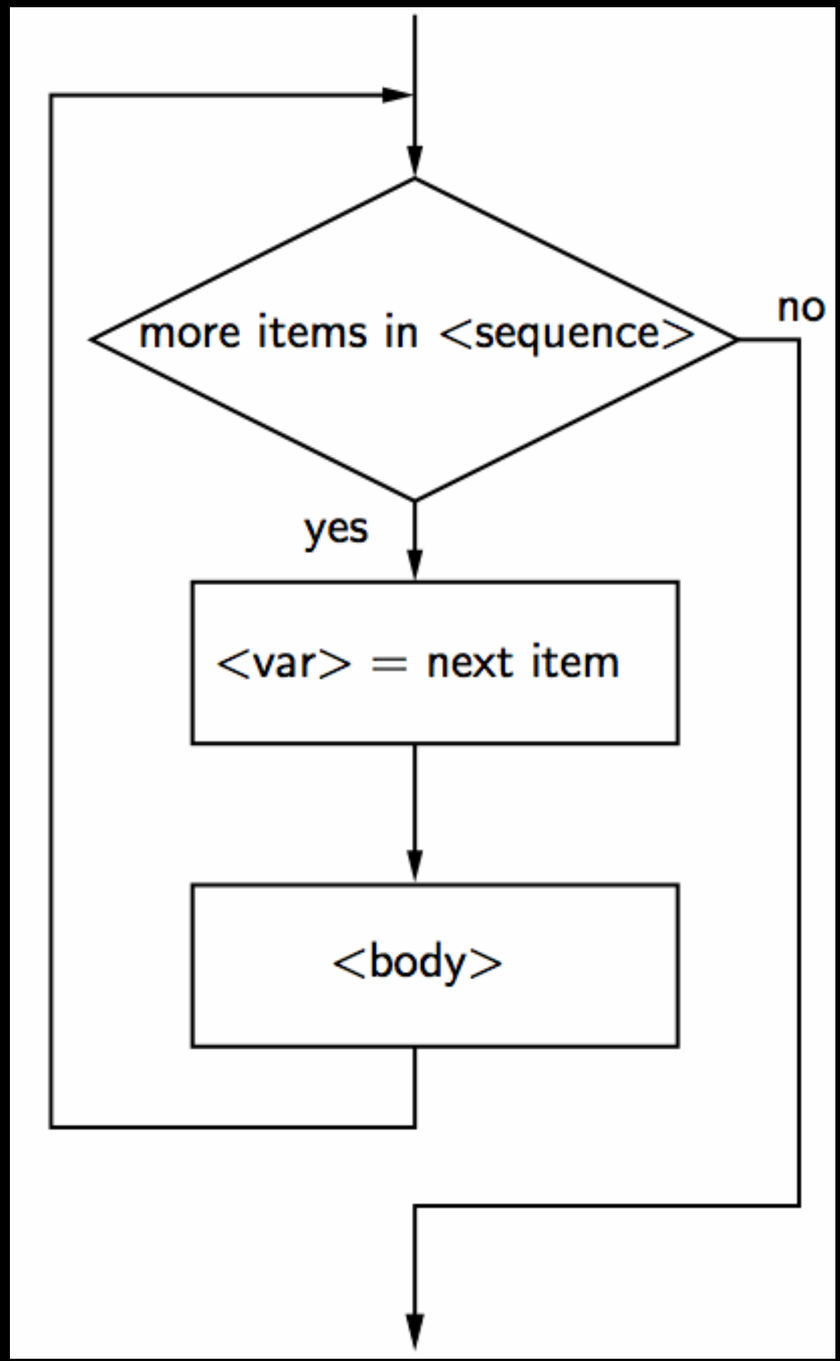
Looking at In...

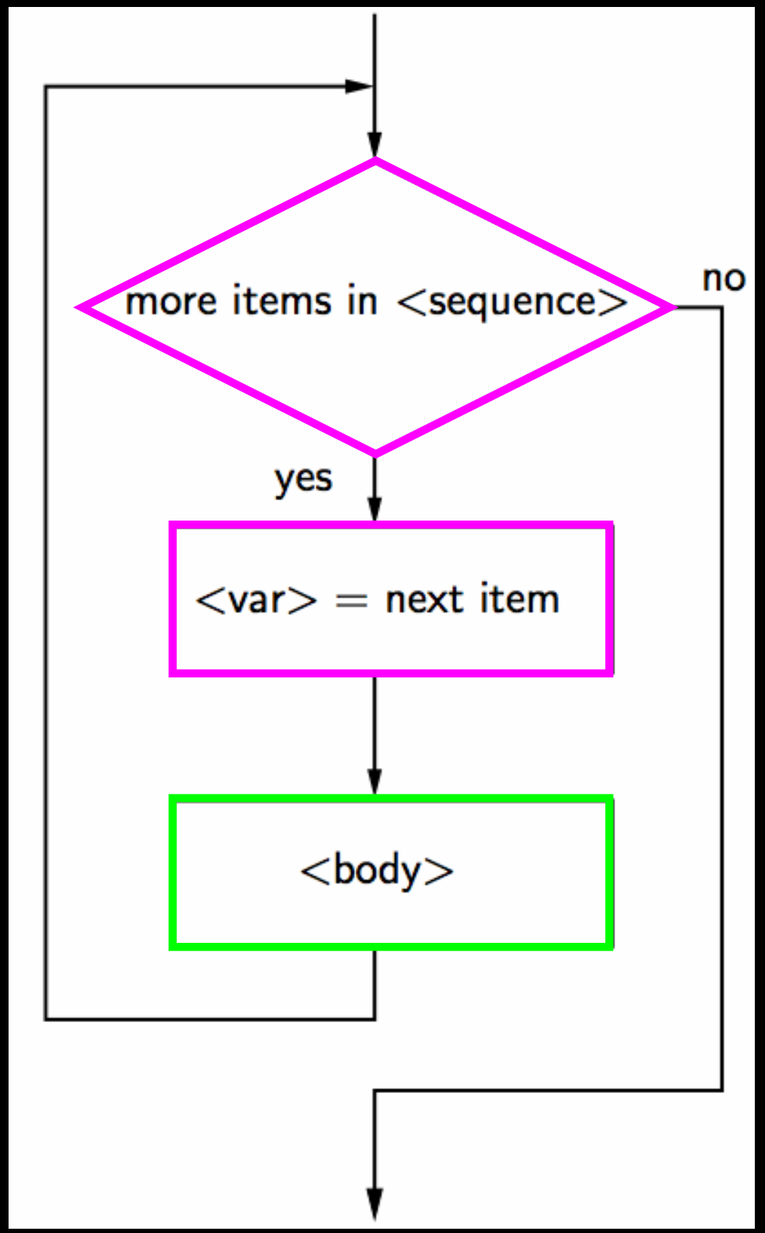
- The iteration variable "iterates" though the sequence (ordered set)
- The block (body) of code is executed once for each value in the sequence
- The iteration variable moves through all of the values in the sequence



In a FlowChart

- The iteration variable "iterates" though the sequence (ordered set)
- The block (body) of code is executed once for each value in the sequence
- The iteration variable moves through all of the values in the sequence

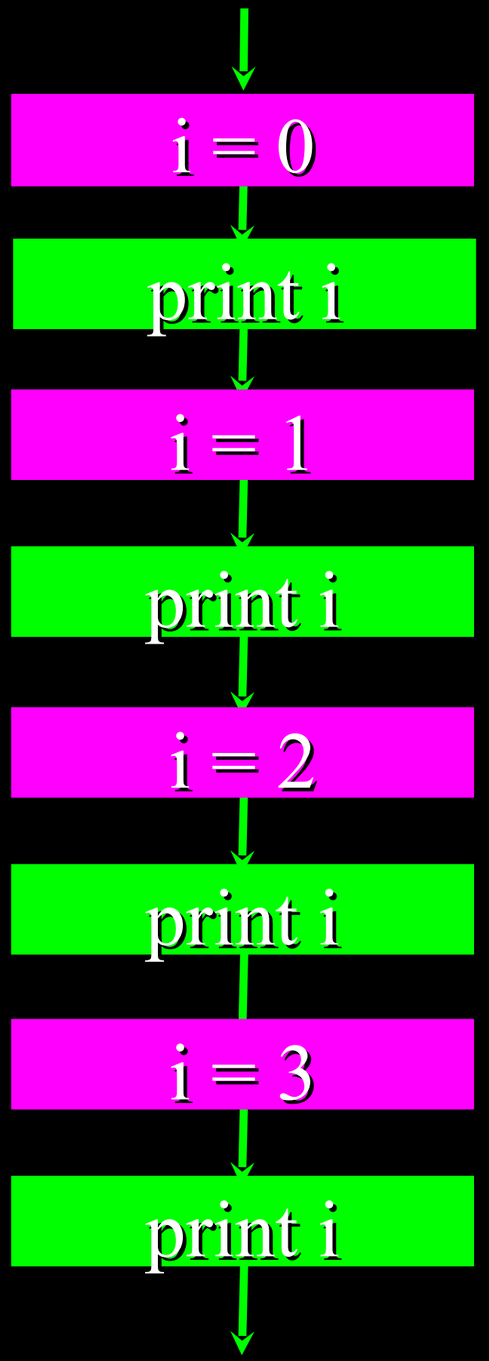




Program:

```
for i in range(4) :
    print i
```

Loop body is run repeatedly



What is range(10) ?

- range(10) is a built in function that returns a sequence of numbers
- The for statement can iterate through any sequence
- A sequence can have values of different types

```
>>> range(10)
[0, 1, 2, 3, 4, 5, 6, 7, 8, 9]
>>> for i in [0, 1, 2] :
...         print I
...
0
1
2
>>> for i in [0, "abc", 9, 2, 3.6] :
...         print I
...
0
abc
9
2
3.6
```

Summary

- Software Development
- Input Processing Output Pattern
- Variable Names / Identifiers
  - What are legal identifiers
  - Which identifiers are unique
- Reserved Words
- Expressions
- Output Statements
- Assignment Statements
- Input Statements
- Simultaneous Assignments
- Definite Loops
- Sequences