Day 2: Basic Syntax

Suggested reading: *Learning Python* (4th Ed.)

Chapter 6: The Dynamic Typing Interlude
Chapter 10: Introducing Python Statements
Chapter 11: Assignment, Expressions, and Prints
Chapter 12: if Tests and Syntax Rules
Chapter 13: while and for Loops

Turn In Homework

Housekeeping

- If you have ***not*** enrolled:
  - Please consider enrolling or auditing
  - You may attend regardless
  - I cannot provide help (homework, office hours, …)
  - I can add you to the mailing list (email me)

Office Hours

Mondays, 3–4 p.m.
Thursdays, 3–4 p.m.

Computer Sciences 4265

Other times are OK!
Always best to email first

Write code.
At least a little.
Every day.
Play around!

Basic Python Syntax (cont'd)

From Interactive To Scripts

- Numbers/strings and operations form ***expressions***
- Python computes the ***value*** of an expression

```
'Answer: ' + str(6 * 7)
          ⇓
'Answer: 42'
```

- Interactive Python displays values automatically
- Scripted Python does not

print

```
print expression
```

- Prints a value *(to standard output)*
- Separate items with comma (prints space between)
- Prints newline at end
- Suppress newline with trailing comma

```
print 5
print 'Result:', 5.0 / 2.5, 'm/s'
print 'Result of complex calculation:',
print round(532.2 * (4.2 + 1.2), 1)
```

Hello World

```
#!/usr/bin/python

# This line is a comment
print 'Hello, world!'

# Continued line (put nothing after \)
print '2pi = ' + \
      str(2.0 * 3.14159)  # 2 * pi
```

Variables

Variables

```
variable_name = value
other_variable = variable_name + 1
```

- Create name by assigning a value
- Must create name before using it
- Subsequent assignment changes value
- When using ***name***, Python substitutes current ***value***

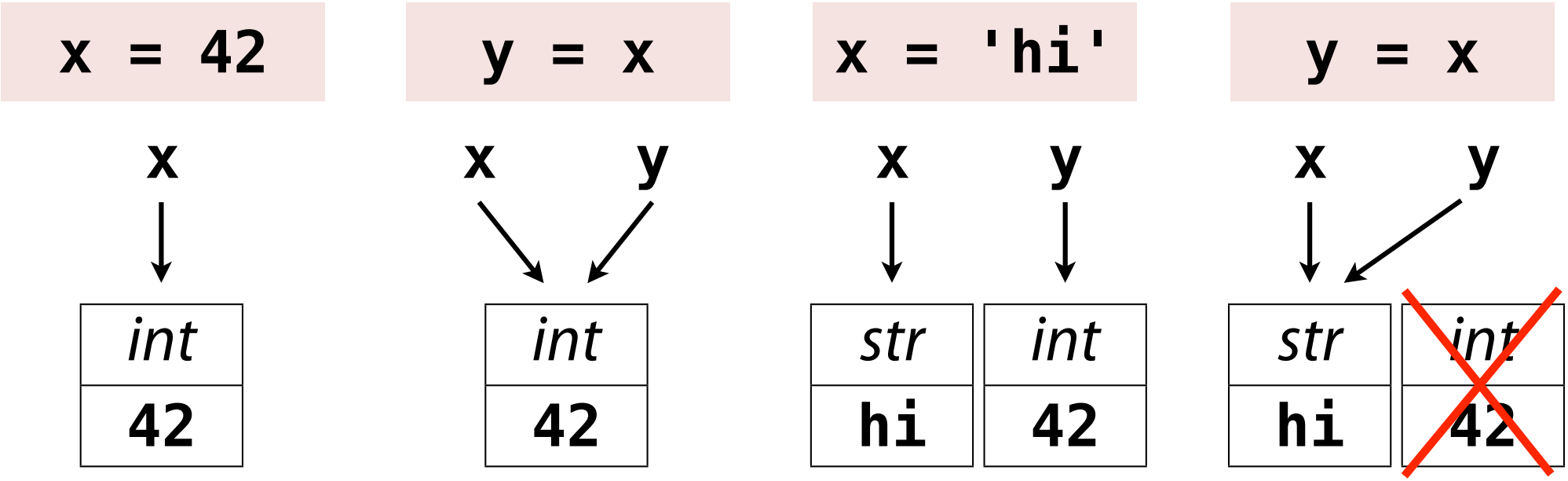
```
my_bucket = 0
my_bucket = my_bucket + 1

my_bucket = 'Tim'
greeting = 'Hello, ' + my_bucket
```

Values? Variables?

Python Object Model

- ***All*** variables refer to objects
- Objects = Data *(in memory)* + Operations
- Assignment binds a variable name to an object
- Types live in objects, ***not*** variables
- No more references? Python can remove object



Types

type(*object*)

- Python can tell you type of object
- Example of ***introspection***

```
type(42)          =>  <type 'int'>
type(3.141)       =>  <type 'float'>
type('hi')        =>  <type 'str'>

x = 5.0 / 2
type(x)           =>  <type 'float'>

type(type(42))    =>  <type 'type'>
```

None

```
x = None
```

- Special object which means "no value"
- In other languages: undef, nil, null, …
- In Python, still an object…

```
>>> x = None
>>> x
>>> print x
None
>>> type(x)
<type 'NoneType'>
```

Built-In Help I

dir(*object or type*)

- Lists ***all*** operations for that object or type
- For now, ignore everything that starts with __
- Use as ***object.operation*(…)**

```
>>> dir(str)
[..., 'capitalize', 'center', 'count', 'decode',
'encode', 'endswith', 'expandtabs', 'find', 'index',
'isalnum', 'isalpha', 'isdigit', 'islower', 'isspace',
'istitle', 'isupper', 'join', 'ljust', 'lower', 'lstrip',
'replace', 'rfind', 'rindex', 'rjust', 'rsplit',
'rstrip', 'split', 'splitlines', 'startswith', 'strip',
'swapcase', 'title', 'translate', 'upper', 'zfill']
```

Built-In Help II

```
help(something)
```

- Shows built-in documentation
- Works on objects, types, and their operations

```
>>> help(str.lower)
...
lower(...)
    S.lower() -> string

    Return a copy of the string S
    converted to lowercase.
```

Back to Variables

Assignment

```
a = 42
a += 1    # a = 43
a -= 3    # a = 40
a *= 2    # a = 80
a /= 8    # a = 10
...
```

- `a += 1` is slightly more efficient than `a = a + 1`
- `+=` and `*=` work on strings, too

```
a = b = c = 0
```

- OK but not recommended

Basic Input

```
a = raw_input()
a = raw_input('Enter a number: ')
```

- Gets input from user
- Strips trailing newline automatically
- Result is always a string object — convert if needed

```
name = raw_input('Enter your name: ')
print 'Hello, %s!' % name
age = raw_input('Enter your age: ')
print 'Age next year: %d' % (int(age) + 1)
```

Comparisons

Booleans

```
True      False
```

```
>>> x = True
>>> x
True
>>> print x
True
>>> print False
False
>>> type(False)
<type 'bool'>
```

Boolean Operations

x	not x
True	False
False	True

x	y	x or y	x and y
True	True	True	True
True	False	True	False
False	True	True	False
False	False	False	False

Comparison Operators

same values	`==`
not same values	`!=`
same object	`is`
not same object	`is not`
less than	`<`
less than or equal to	`<=`
greater than	`>`
greater than or equal to	`>=`

- All comparison operations yield a Boolean value
- Use **`is`**/**`is not`** with **`None`**, **`True`**, and **`False`**
- Can chain inequalities: **`1 < x <= 4`**

Conditionals

```
if condition:
    # do when condition is True
elif other-condition:
    # do when condition is False
    # and other-condition is True
else:
    # do when all conditions are False
```

0–*n* times

opt.

```
name = raw_input('Name? ')
if name == 'Tim Cartwright':
    print 'Instructor'
else:
    print 'Student'
    student_count += 1
```

Indentation

- Blocks of code must be indented consistently
- ***Strongly*** suggest using 4 spaces…
  (see PEP 8: http://www.python.org/dev/peps/pep-0008/)

```
user_input = raw_input('Number: ')
user_num = int(user_input)

if user_num > 0:
    print 'Non-negative'
    if user_num > 999:
        print 'But too large'
else:
    print 'Negative'
```

Basic Loop

```
while condition:
    # do when condition is True
    # then return to top and re-evaluate
    if condition-a:
        continue   # return to top now
    if condition-b:
        break      # exits loop
    # more stuff
```

```
count = 0
while count < 10:
    print count
    count += 1
```

You Made It!

Other Scripting Languages

- The cellphone metaphor…
- Check for different or additional:
  - **Literals** ('/", true/false, null/nil/undef, 1_234)
  - **Operators** (===, =~)
  - **Conditionals** (elsif ***vs.*** elseif ***vs.*** else if; unless)
  - **Loops** (do … while, unless, foreach)
  - **Block syntax** ({…} ***vs.*** do…end ***vs.*** indentation)
  - **Object syntax** (Perl…)

Homework

- Simple number-guessing game
  - ***You*** pick the number & the ***computer*** guesses
  - Seek a straightforward solution
- **BE SURE TO LABEL YOUR PRINTOUT!!!**

```
#!/usr/bin/python

"""Homework for CS 368-4 (2012 Fall)
Assigned on Day 02, 2012-10-25
Written by <Your Name>
"""
```