

Day 2: Basic Syntax

Suggested reading: *Learning Python* (3rd Ed.)

Chapter 10: Introducing Python Statements

Chapter 11: Assignment, Expressions, and print

Chapter 12: if Tests

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

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 prints 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_1 = 42  
variable_name_2 = variable_name_1 + 1
```

- Create by assigning a value
- Must create before use
- Subsequent assignment changes value
- Replaced with current value when used

```
variable = 0  
variable = variable + 1  
  
variable = 'Tim'  
greeting = 'Hello, ' + variable
```

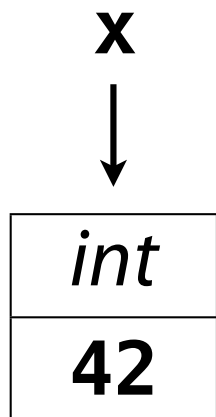


The Elephant in the Room

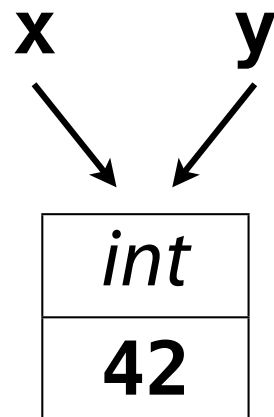
Python Object Model

- **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

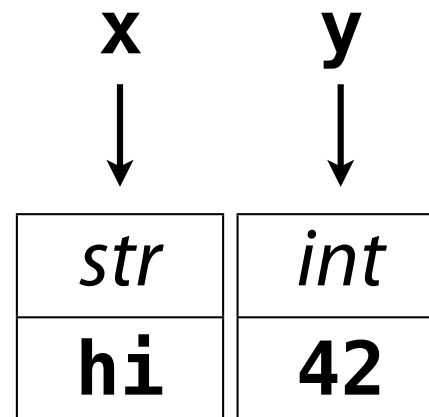
```
x = 42
```



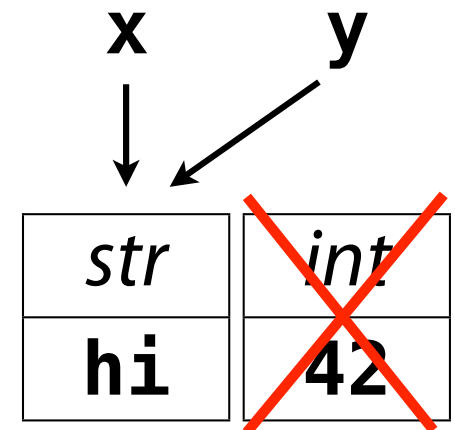
```
y = x
```



```
x = 'hi'
```



```
y = x
```



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 — 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
```

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 368-004
```

```
# Assigned on Day 02, 2011-10-27
```

```
# Written by Your Name Here
```