COMP120: Creative Computing: Tinkering

1: Python, Pairs, & PyGame

Learning Outcomes

- Explain the role and basic functions of the IDE
- Produce some basic Python programs
- **Apply** pair programming practices to solve simple problems

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Professional Development

Continuing Professional Development

- Games industry is fast-moving
- Learning does not end at school and university
- A goal of this course is to facilitate your development as self-regulated learners
- Gradually, more independence across each year of study
- This is a science degree, which means you will become a producer of knowledge, not just a consumer of knowledge!

Continuing Professional Development

- It isn't easy!
- Many of you will encounter programming anxiety
- Some will experience a sense of fear or a sense of hopelessness — it is more common than you think
- Some will need more support than others — this isn't a bad thing
- Everyone who puts in the time and effort will eventually achieve mastery

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The PyCharm IDE

Integrated Development Environment (IDE)

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  - Profiling
  - Version control

Setting up your own PC

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  - Runs on Windows, Mac and Linux
  - Other Python IDEs are available

Getting started with PyCharm

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- First run: click "Run $\rightarrow$ Run..." and choose the Python file

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- We want a "Pure Python" project
- Right-click the project in the panel on the left, and choose "New $\rightarrow$ Python File"
- Write some code!
- First run: click "Run $\rightarrow$ Run..." and choose the Python file
- Subsequent runs: click the ▶ button

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Basic Python programs

Your first Python program

```
print "Hello, world!"
```

Your second Python program

```
print "This is a very long line of code which had to ↩
    be split to fit on the slide, but you should type ↩
    it as a single line."
print "This is the second line of code."
```

Assigning to variables

```
a = 10
print a
```

Assigning to variables

```
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```

Variable	Value
a	

Remember!

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- A program is a **sequence of instructions**
- The Python interpreter executes the **first line** of your program, then the **second line**, and so on
- When it reaches the end of the file, it **stops**

Reassigning variables (1)

Socrative room code: `FALCOMPED`

```
a = 10
b = 20
b = a
print a
print b
```

Reassigning variables (1)

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Variable	Value
a	
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Reassigning variables (2)

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a = 10
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```
a = 10
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a = b
print a
print b
```

Variable	Value
a	
b	

Reassigning variables (3)

Socrative room code: `FALCOMPED`

```
big = 10
small = 20
big = small
print big
print small
```

Reassigning variables (3)

Socrative room code: `FALCOMPED`

```
big = 10
small = 20
big = small
print big
print small
```

Variable	Value
big	
small	

Reassigning variables (4)

Socrative room code: `FALCOMPED`

```
a = 10
b = 20
a = b
b = a
print a
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Reassigning variables (4)

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b = a
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```

Variable	Value
a	
b	

Reassigning variables (5)

Socrative room code: `FALCOMPED`

```
a = 10
b = 20
c = 30

a = b
b = c

print a
print b
print c
```

Reassigning variables (5)

Socrative room code: `FALCOMPED`

```
a = 10
b = 20
c = 30

a = b
b = c

print a
print b
print c
```

Variable	Value
a	
b	
c	

Reading input

Reading input

```
print "Enter your name:"
name = raw_input()

print "Enter your age:"
age = int(raw_input())

print "Hello", name
print "On your next birthday, you will be", age + 1, "
    years old"
```

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print "Enter your name:"
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- `raw_input()` reads a **string** as text from the command line

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    years old"
```

- `raw_input()` reads a **string** as text from the command line
- `int(...)` converts a **string** into an **integer** (a number)

Conditionals (1)

Socrative room code: FALCOMPED

```
a = int(raw_input())
b = 30

if a < 15:
    b = a

print a
print b
```

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- PEP-8 recommends **4 spaces** for indentation
  - Some programmers use a tab character
  - **Never** mix tabs and spaces in the same file!
  - PyCharm inserts 4 spaces by default when you press the tab key; other IDEs and text editors can be configured to do this

Conditionals (2)

Socrative room code: `FALCOMPED`

```
a = int(raw_input())
b = 0

if a < 20:
    b = a + 1
elif a == 20:
    b = a * 2
else:
    a = 20
    b = 20

print a
print b
```

Conditionals (2)

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In that order!

Mathematical operators

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- + add

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- + add
- – subtract

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- + add
- – subtract
- * multiply

Mathematical operators

- `+` add
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- `/` divide

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Order of operations: **BIDMAS**

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- Then indices (powers)

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Order of operations: **BIDMAS**

- Brackets first
- Then indices (powers)
- Then division and multiplication (left to right)

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- `+` add
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Order of operations: **BIDMAS**

- Brackets first
- Then indices (powers)
- Then division and multiplication (left to right)
- Then addition and subtraction (left to right)

Comparison operators

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- `a = b` means "make `a` be equal to `b`"

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Note the difference between `=` and `==`

- `a = b` means "make `a` be equal to `b`"
- `a == b` means "is `a` equal to `b`?"

For loops and ranges

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for i in xrange(5):
    print i
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- The `for` loop iterates through the items in a sequence **in order**

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- So `xrange(5)` is the **sequence** $0, 1, 2, 3, 4$
- Note: `xrange(n)` **does not include** n
- The `for` loop iterates through the items in a sequence **in order**
- Can also use `range` instead of `xrange`, but `range` is less efficient
  - Homework (advanced): what is the difference between `range` and `xrange`?

For loops (1)

Socrative room code: `FALCOMPED`

```
a = 0
b = 0

for i in xrange(5):
    a = i
    b = b + i

print a
print b
```

For loops (1)

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for i in xrange(5):
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print b
```

Variable	Value
a	
b	
i	

For loops (2)

Socrative room code: FALCOMPED

```
a = 0
b = 0

for i in xrange(10):
    if i < 3 or i > 7:
        a += i
    else:
        b += i

print a
print b
```

For loops (2)

Socrative room code: FALCOMPED

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Variable	Value
a	
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While loops

Socrative room code: `FALCOMPED`

The `while` loop keeps executing while the condition is **true**

```
a = 1

while a < 100:
    a = a * 2

print a
```

While loops

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The `while` loop keeps executing while the condition is **true**

```
a = 1

while a < 100:
    a = a * 2

print a
```

Variable	Value
a	

Looping forever

```
a = 1

while True:
    a = a * 2
    print a
```

Summary

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We have seen some basic code constructions in Python

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We have seen some basic code constructions in Python

- `print` and `raw_input` for command-line input and output
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- `if` statements for choosing whether or not to execute a block of code
- `for` loops to execute a block of code a specified number of times
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We have seen some basic code constructions in Python

- `print` and `raw_input` for command-line input and output
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These are enough to write some simple programs, but you will see several more in coming weeks...

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Professional Practice

Pair Programming

Pair programming is an agile software development technique in which two programmers work together at one workstation.

One, the driver, writes code while the other, the observer or navigator, reviews each line of code as it is typed in.

The two programmers switch roles frequently.

Pair Programming

Watch the video at:

`https://www.youtube.com/watch?v=ET3Q6zNK3Io`

(5 minutes)

Pair Programming

Review the guidelines at:

`http://www.pairprogramming.co.uk/`

(10 minutes)

Pair Programming

Watch the video at:

`https://www.youtube.com/watch?v=ONnYCT_LJio`

(5 minutes)

Pair Programming Challenge

- In pairs
- **Implement** the code excerpt
- **Fix** the errors in the code excerpt
- **Modify** the code excerpt to incorporate functions and arguments
- **Post** your solution to the `#comp120` slack channel

You can learn more about functions and arguments at:

`https://docs.python.org/3/tutorial/controlflow.html#defining-functions`

(20 minutes)

Pair Programming Challenge

The function:

```
def madlib()
```

Should become:

```
def madlib(name, pet, verb, snack)
```

Pair Programming Challenge

```
def madlib():
    name = 'Link'
    pet = 'Spyro'
    verb = 'ate'
    snack = 'doughnuts'
    line1 = 'once upon a time,' + name + ' walked'
    line2 = ' with ' + pet + ', a trained dragon.'
    line3 = 'Suddenly, ' + pet + ' announced,'
    line4 = 'I really want some ' + snack + '!'
    line5 = name + ' complained. Where am I going to
        get that?'
    line6 = 'Then ' + name + 'found a wizard's wand.'
    line 7 = 'With a wave of the wand, '
    line8 = pet + ' got ' + snack + '. '
    line9 = 'Perhaps surprisingly, ' + pet + ' ' +
        verb + '  ' + snack
    print line1 + line2 + line3 + line4
    print line5 + line6 + line7 + line8 + line9
```

Stretch Goal — PyGame

- In pairs
- **Incorporate** your code into the PyGame framework
- **Post** your solution to the `#comp120` slack channel

Stretch Goal — PyGame

```
import pygame

pygame.init()
screen = pygame.display.set_mode((640, 480))
font = pygame.font.SysFont(None, 14)
text = font.render(madlib(), True, (0, 128, 0))

done = False
while not done:
    for event in pygame.event.get():
        if event.type == pygame.QUIT:
            done = True
        if event.type == pygame.KEYDOWN and event.key
            == pygame.K_ESCAPE:
            done = True

    screen.fill((255, 255, 255))
    screen.blit(text,(0,0))
    pygame.display.flip()
```