hw02 extended, due 2/6
exam1 this week (lec00-lec04)
Check posted grades on Compass regularly.
hw02 extended, due 2/6
exam1 this week (lec00–lec04)
Check posted grades on Compass regularly.
Office hours begin today.
Also I will meet students after lecture if you’re interested.
hw02 extended, due 2/6
exam1 this week (lec00-lec04)
Check posted grades on Compass regularly.
Office hours begin today.
Also I will meet students after lecture if you’re interested.
Readings are on website! HPL = Langtangen
Recap
def fun():
    return True and False

x = fun() and not (True or False)

What is the value of x?
A True
B False
```python
def fun():
    return True and False
x = fun() and not (True or False)
What is the value of `x`?
x = (True and False) and not (True or False)
```
def fun():
    return True and False

x = fun() and not (True or False)

What is the value of x?

x = (True and False) and not (True or False)

x = (False) and not (True)
def fun():
    return True and False
x = fun() and not (True or False)
What is the value of x?
x = (True and False) and not (True or False)
x = (False) and not (True)
x = (False) and (False)
a = 5
b = 3

x = (a < 5) and ((b <= 5) or (a != b))

What is the value of x?
A True
B False
Methods
Like variables as attributes, functions can be stored inside a data type as well.
Like variables as attributes, functions can be stored inside a data type as well.

Use attribute operator . to access.
Like variables as attributes, functions can be stored inside a data type as well.

Use attribute operator . to access.
"STOP SHOUTING!".lower()
(1 + 1j).conjugate()
Like variables as attributes, functions can be stored inside a data type as well.

Use attribute operator . to access.

"STOP SHOUTING!".lower()
(1 + 1j).conjugate()

Value is treated like an argument.

Most (not all) RETURN their value.
"GATTACA".count('A')
"MVEMJSUN".find('J')
"ABACADABRA".replace('AB','G')
' FNORD '.strip()
'high king of narnia'.title()
'wEiRd'.swapcase()
Example

```
s = "WATER MAIN"
x = s[ 0:s.find( ' ' ) ].lower()
x = x.title().swapcase()
```

What is the value of x?

A 'wATER'
B 'Water'
C 'wATE'
D 'aTER'
s = "WATER MAIN"
x = s[0:s.find(' ')].lower()
s[0:5].lower()  
'WATER' .lower()  
'water'  

x = x.title().swapcase()  
'Water' .swapcase()  
'wATER'
Example

```python
s = "WATER MAIN"
x = s[0:s.find(' ')] .lower()
x = x.title().swapcase()
```

What is the value of `x`?

A 'wATER'  
B 'Water'
C 'wATE'
D 'aTER'
Loops
print( "QUADRATIC SOLVER" )
print( "a x**2 + b x + c = 0" )

a = float( input( 'a = ' ) )
b = float( input( 'b = ' ) )
c = float( input( 'c = ' ) )

root = ( b**2 - 4*a*c ) ** 0.5
denom = 2 * a

pos = (-b + root) / denom
neg = (-b - root) / denom

message1 = "%.2f + %.2fi" % (pos.real,pos.imag)
message2 = "%.2f + %.2fi" % (neg.real,neg.imag)

print("Solution 1: %s" % message1)
print("Solution 2: %s" % message2)
ans = input( "Enter a number:" )
ans = float( ans )
if ans < 0:
    print( "The number was negative." )
if ans > 0:
    print( "The number was positive." )
if ans == 0:
    print( "The number was zero." )


```
i = 0

i = i + 1

i > 100?

F

stop
```
```
i = 0
while i < 100:
    i = i + 1
    print(i)
print(i)
```
Example: `while` Loop

```python
data = 10
while data > 0:
    print(data)
    data = data - 1
print('Blast off!')
```
Defining loops: \textit{while}

- A \textit{while} loop has only:
  - the keyword \textit{while}
  - a logical comparison (\texttt{bool}-valued result)
  - a \textbf{block} of code
The following code should increment \( x \) if the hundreds place contains a zero:

\[
x = 3 \\
\text{while } x > 0: \\
\quad \text{print(“Hello”)} \\
\quad x -= 1
\]

How many times is ’Hello’ printed?

A zero  
B once  
C twice  
D thrice  
E four times
The following code should increment \( x \) if the hundreds place contains a zero:

\[
x = 3 \\
\text{while } x > 0: \\
\quad \text{print(”Hello”) } \\
\quad x -= 1
\]

How many times is ’Hello’ printed?

Unroll the loop in a spreadsheet!
Example

The following code should increment x if the hundreds place contains a zero:

```python
x = 3
while x > 0:
    print("Hello")
    x -= 1
```

How many times is 'Hello' printed?

A zero
B once
C twice
D thrice ★
E four times
Infinite loops

Make sure that your code always has a way to end!
while True:
    print('Hello!')
Infinite loops

- Make sure that your code always has a way to end!
  ```python
  while True:
    print('Hello!')
  ```
- Use Ctrl+C to break free.
Design patterns are common structures we encounter in writing code.

The accumulator pattern uses an accumulator variable to track a result inside of a loop:

```python
i = 0
sum = 0
while i <= 4:
    sum += i
    i += 1
```


Example

Loops

```
i = 0
sum = 0
while i <= 4:
    sum += i
    i += 1
```

What is the value of sum?

A 6  
B 10  
C 15  
D None of the above.
\[
i = 0 \\
\text{sum} = 0 \\
\text{while } i \leq 4: \\
\quad \text{sum} += i \\
\quad i += 1
\]

What is the value of \text{sum}?

A 6
B 10 * 1 + 2 + 3 + 4
C 15
D None of the above.
```python
i = 0
sum = 0
while i < 7:
    if (i % 2) == 1:
        sum += i
    i += 1

What is the value of `sum`?
A 9
B 12
C 16
D 21
E None of the above.
```
i = 0
sum = 0
while i < 7:
    if (i % 2) == 1:
        sum += i
    i += 1

What is the value of sum?
A 9
B 12
C 16
D 21
E None of the above. *(infinite loop occurs)*
Exercise

Write a function to sum all of the digits in a number. I.e.,

$$12145 \rightarrow 1 + 2 + 1 + 4 + 5 \rightarrow 13$$
def sum_digits(n):
    s = str(n)
    i = 0
    result = 0
    while i < len(s):
        result = result + int(s[i])
        i = i + 1
    return result
```python
for i in range(0, 100):
    print(i)
```
for i in range( 0,100 ): 
    print( i )
A for loop requires:
- the keyword `for`
- a loop variable
- the keyword `in`
- a set of values (often `range`)
- a **block** of code

*for* loops iterate over *iterable* types one at a time.
s = 'abcdefg'
t = ''
for c in s:
    t = c + t
What is the value of t?
A 'abcdefg'
B 'gfedcba'
C 'a'
D 'g'
```python
s = 'abcdefg'
t = ''
for c in s:
    t = c + t
```
s = 'abcdefg'
t = ''

for c in s:
    t = c + t

stop
Write a function to sum all of the digits in a number. \( \text{i.e.}, \)

\[ 12145 \to 1 + 2 + 1 + 4 + 5 \to 13 \]
def sum_digits(n):
    result = 0
    for letter in str(n):
        result += int(letter)
    return result
Next steps
Next steps

- Complete quiz05 (due 2/7)
- Prepare for exam1 (2/7–2/9)
  - HPL 1.10, 3.31a, 3.45
- Watch for hw03 (probably due 2/10)
- Read for the next class