

# Python Basics!

operators, expressions, computing

CS101 Lecture #2

2016-09-28

# Administrivia

Complete homework before THIS Friday at 6:00 p.m.

## Question #1

A set of instructions executed by a computer to achieve a goal is called:

- A a process
- B a program
- C a procedure
- D an algorithm

## Question #2

A group of eight bits is called:

- A a nybble
- B a chomp
- C a byte
- D a gobble

## Question #3

Python is:

- A a high-level language
- B a low-level language

## Question #4

Python is:

- A an interpreted language
- B a compiled language

# What is a **literal**?

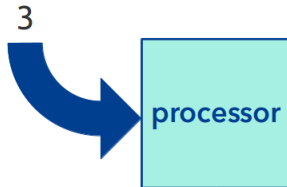
Fixed value (noun) Represents data that doesn't change(3 or 'firefly')

# Executing a literal?

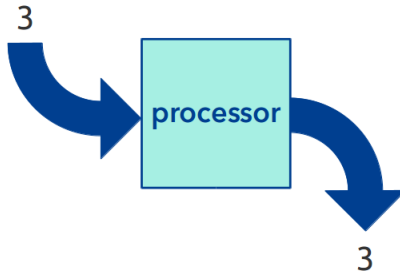




# Executing a literal?



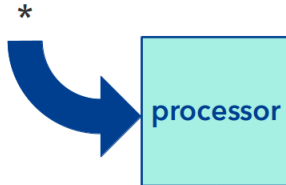
# Executing a literal?



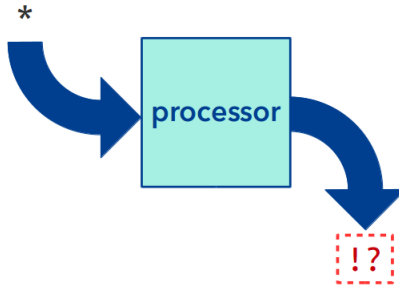
# What is an **operator**?

Manipulates data (verb)

# Executing an operator?



# It needs a statement to make sense!



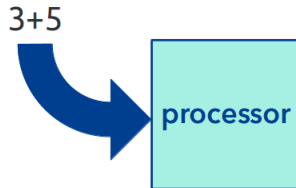
# What is an **expression**?

Combines literals and operators (phrase)

# What is an **expression**?

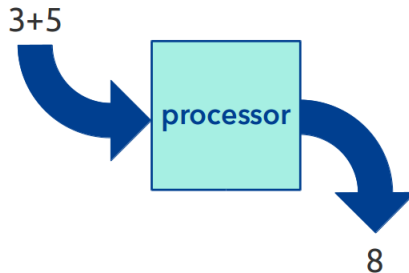
Combines literals and operators (phrase) Produce a new  
value  $3 * 5$   $100 - 23$

# Executing an expression?





# Executing an expression?



# What is an **expression**?

Can be arbitrarily complicated  $3 + 8 * 5 + 4 - 7 / 100$

# Question

$$1 + 1 * 2 = ?$$

A 4

B 3

C Something else

## Question

$$23 + 6/2 - 4 \stackrel{?}{=}$$

- A 22
- B 18
- C -9
- D Something else

# Use parentheses!

$23 + (6/2) - 4$  is always clearer.

# What are some other operators?

exponentiation, `**`

# What are some other operators?

exponentiation, `**` modulus, `%` (important)

# What are some other operators?

exponentiation, `**` modulus, `%` (important) floor division, `//`



# What are some other operators?

bitwise OR, `|` bitwise XOR, `^` bitwise AND, `&` bitwise left shift,  
`<<` bitwise right shift, `>>`

# Example

$$1 \sim 2 \stackrel{?}{=}$$

A 0

B 1

C 2

D 3

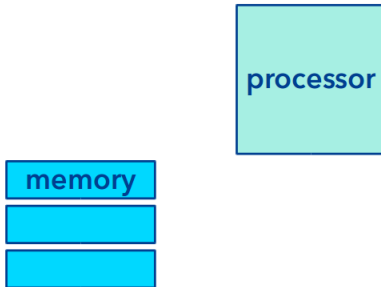
# So what?

The machine state hasn't changed.

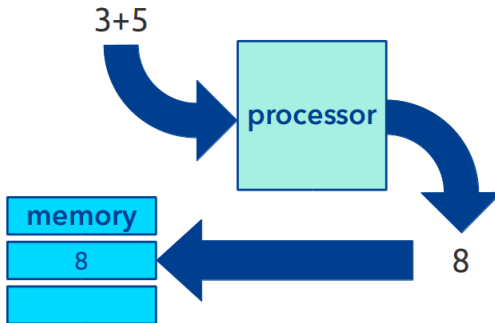
# So what?

The machine state hasn't changed. Programs are complex, and we need to remember results.

# How do we keep values around?



# How do we keep values around?



# How do we reuse values?

Low-level languages refer directly to memory address:

```
ADD DATA AT      10101101 11010100
TO DATA AT       11010100 01001001
STORE RESULT AT   00001101 01001110
```

# What is a **variable**?

The solution: name memory locations!



# What is a **variable**?

The solution: name memory locations! Variables name a memory location

# What is a **variable**?

The solution: name memory locations! Variables name a memory location Variables store a value

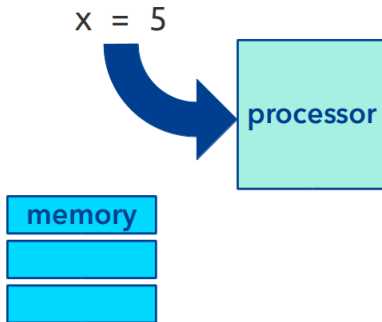
# What is a **variable**?

The solution: name memory locations! Variables name a memory location Variables store a value This value can change over time—it is a placeholder.

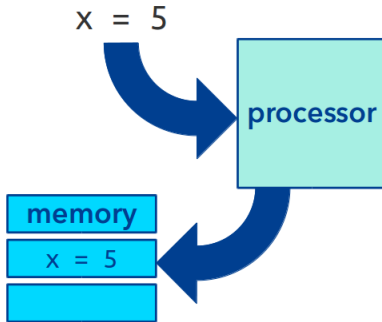
# What new operator do we need?

assignment, = (single equals sign)

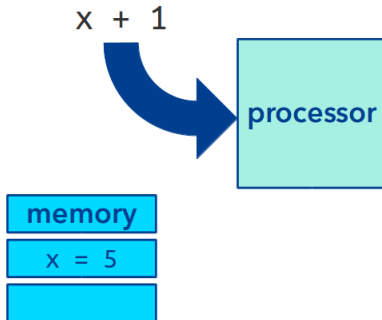
# How do we reuse values?



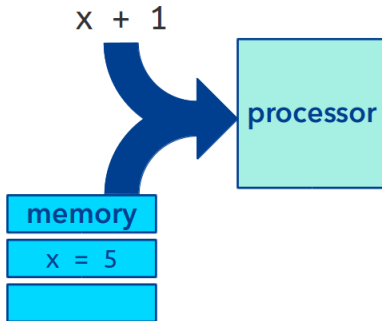
# How do we reuse values?



# How do we reuse values?

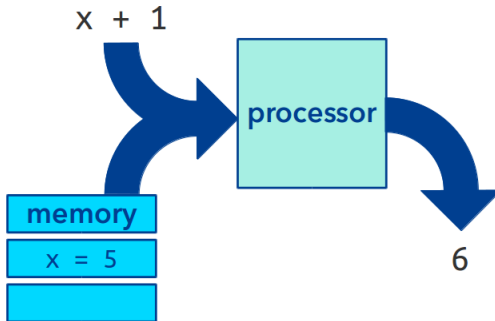


# How do we reuse values?





# How do we reuse values?



## Example

What value is stored in the variable `x`?

```
x = 17 + 7*9
```

- A 3
- B 31
- C 55
- D 78

# Example

What value is stored in the variable `x`?

```
x = 17 + 7*9
```

```
x = 3
```

A 0

B 1

C 2

D 3

# What is a **statement**?

A statement changes the state of the computer (sentence)

# What is a **statement**?

A statement changes the state of the computer (sentence)

Example: an assignment

# What is a **program**?

Programs consist of series of statements:

# What is a **program**?

Programs consist of series of statements: A script is a file containing a series of Python statement.

# What is a **program**?

Programs consist of series of statements: A script is a file containing a series of Python statement. A notebook (as we use in the lab) also collects series of Python statements.



# What is a **program**?

Programs consist of series of statements: A script is a file containing a series of Python statement. A notebook (as we use in the lab) also collects series of Python statements. These are stored in text (theres no magic, just text).

# What is a **program**?

Programs consist of series of statements: A script is a file containing a series of Python statement. A notebook (as we use in the lab) also collects series of Python statements. These are stored in text (theres no magic, just text).

Each instruction is executed in order from top to bottomtogether, these statements make up a program.

# Our first program

```
x = 10  
y = x ** 2  
y = y + y
```

# Reminders

Homework #1 due Friday, Sept. 30, 6:00 p.m.