Python Basics!

operators, expressions, computing

CS101 Lecture #2

2016-08-24

Administrivia

Administrivia

- Register your i>clickers on the course Compass page.
- Complete homework before NEXT Wednesday at 5:00 p.m.

Warmup Quiz

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

Elements of Programming

What is a **literal**?

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

Executing a literal?

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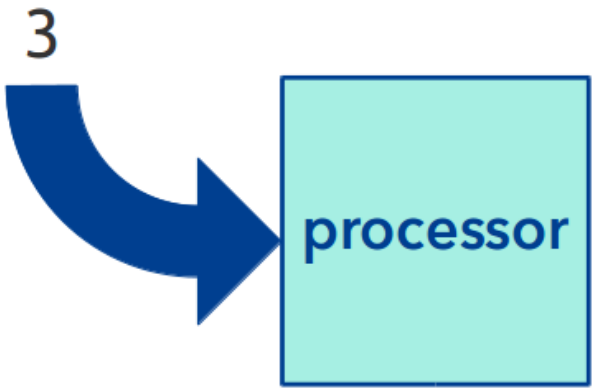
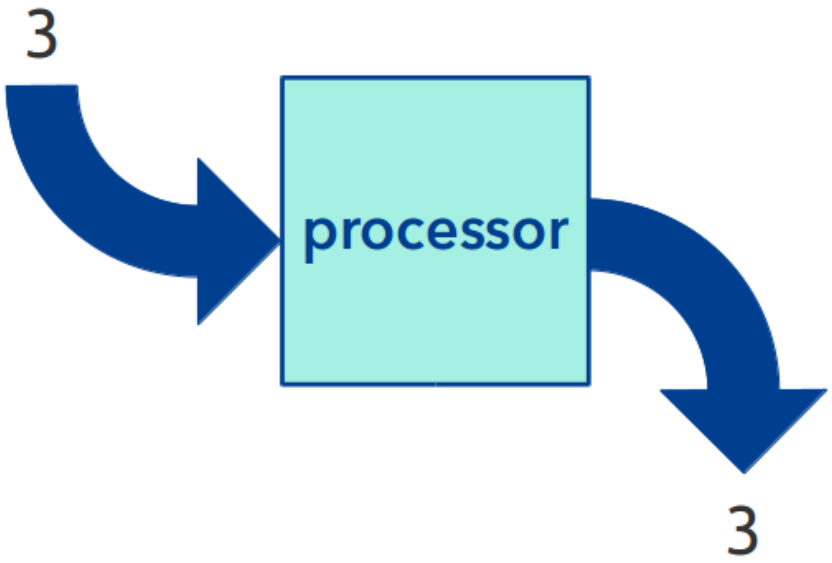


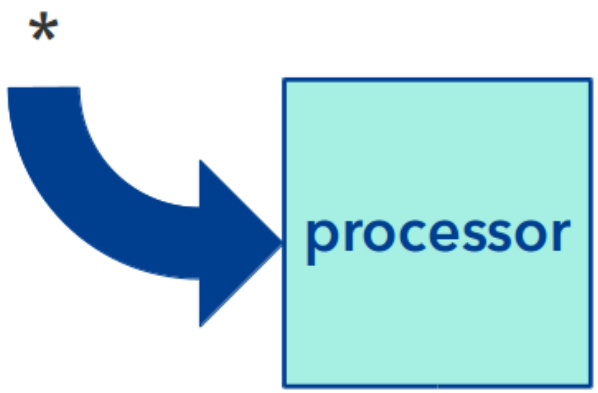
Executing a literal?



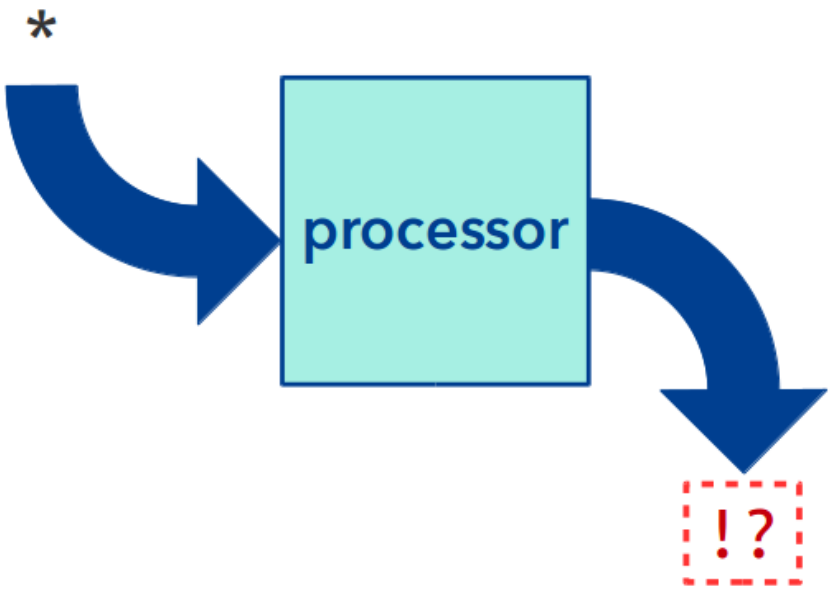
What is an **operator**?

- Manipulates data (verb)

Executing an operator?



It needs a statement to make sense!



What is an **expression**?

- Combines literals and operators (phrase)

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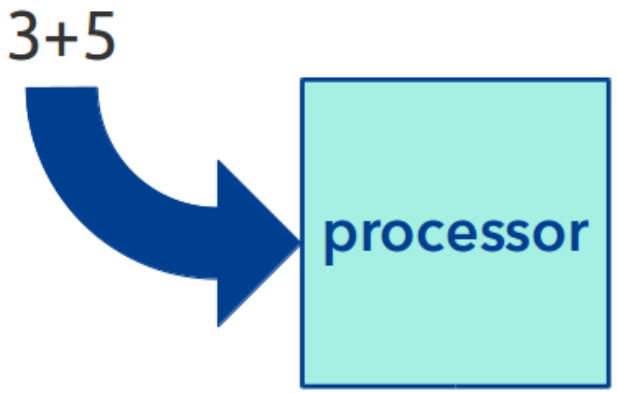
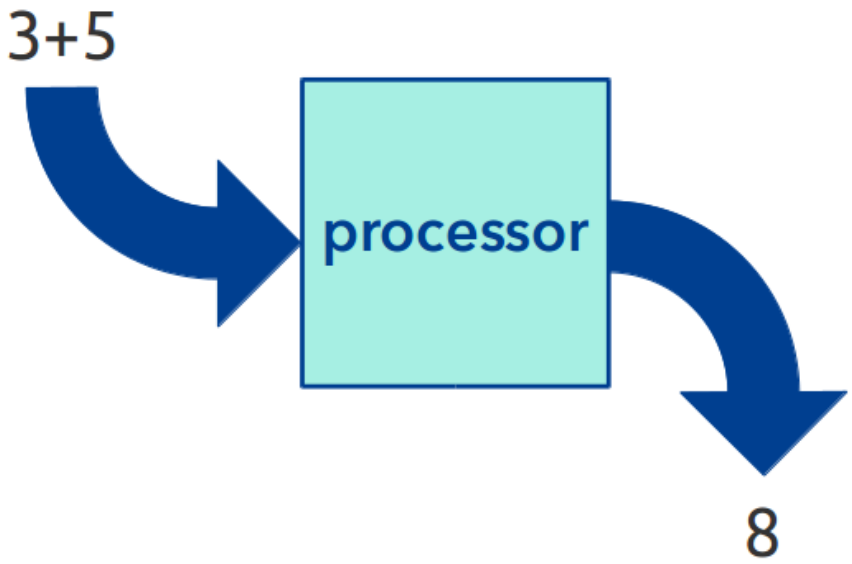
- Combines literals and operators (phrase)
- Produce a new value
  - `3 * 5`
  - `100 - 23`

Executing an expression?



Executing an expression?



What is an **expression**?

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

Question

$1 + 1 * 2 \stackrel{?}{=}$

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, **

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- modulus, % (important)

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

What are some other operators?

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

Example

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

A 0
B 1
C 2
D 3

So what?

- The machine state hasn't changed.

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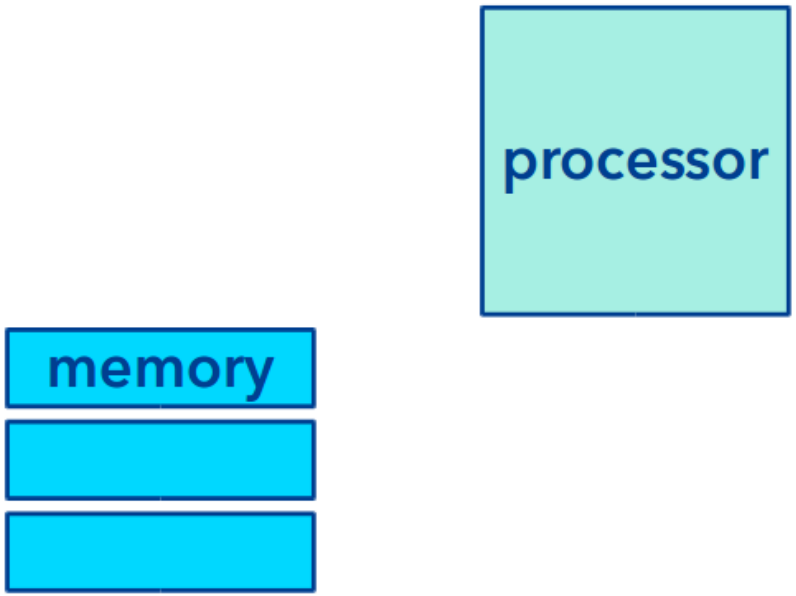
- The machine state hasn't changed.
- Programs are complex, and we need to remember results.

How do we keep values around?



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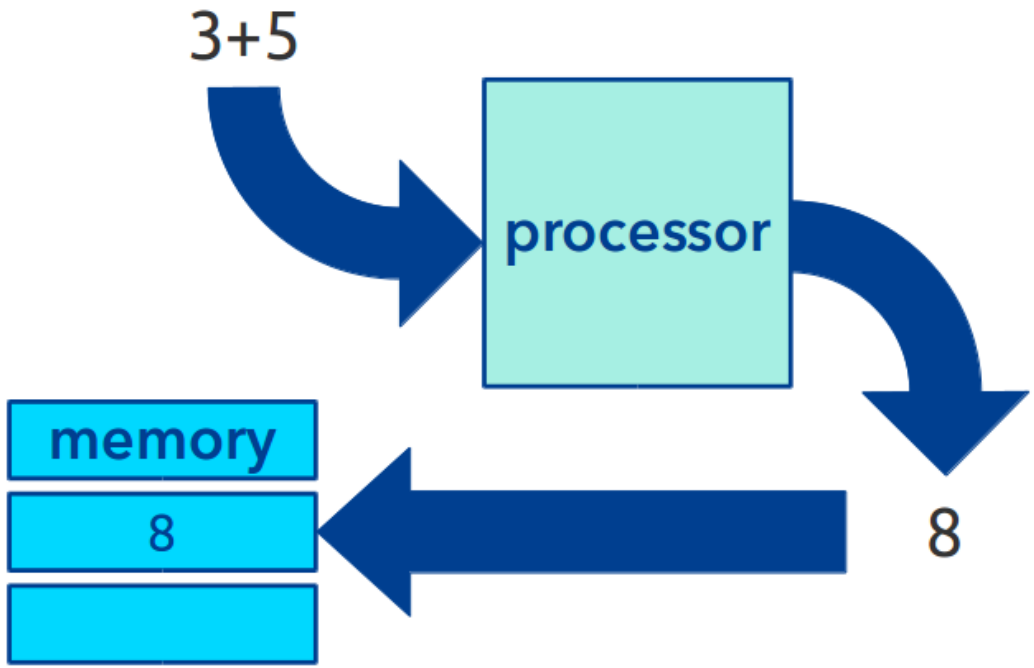

How do we reuse values?

- 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!

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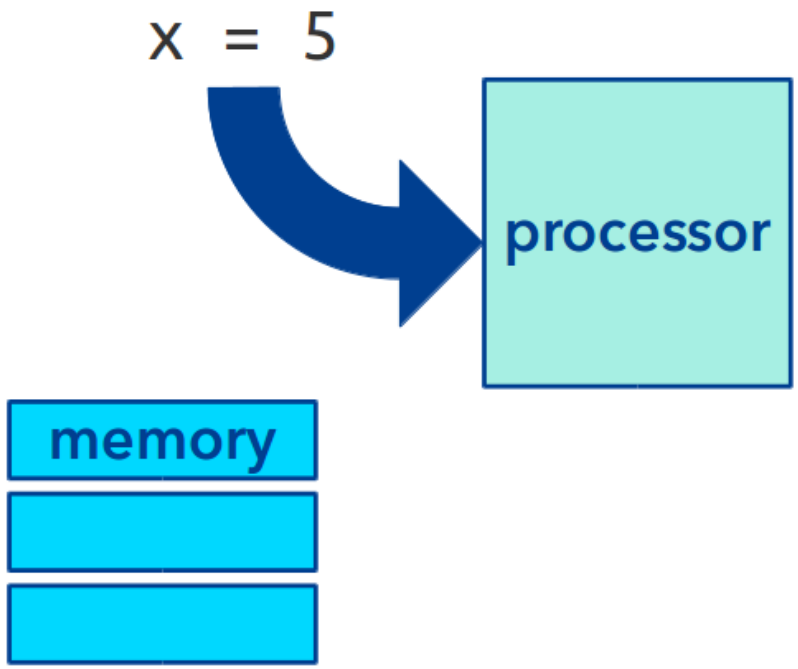
What is a **variable**?

- 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?



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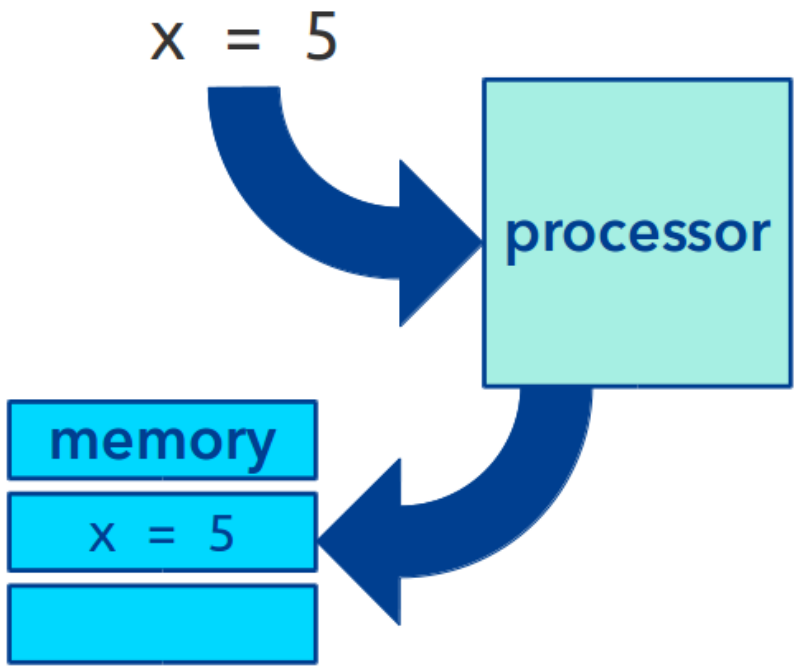

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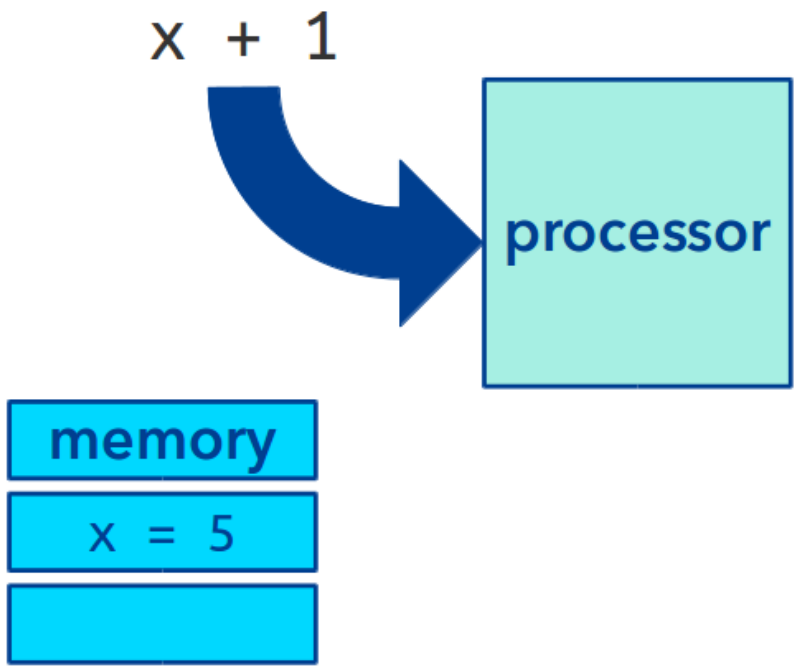

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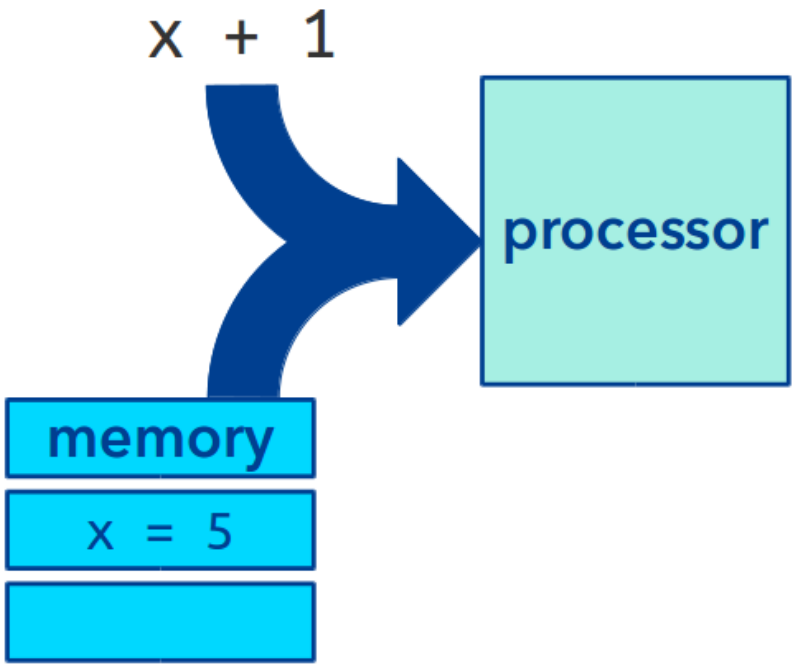

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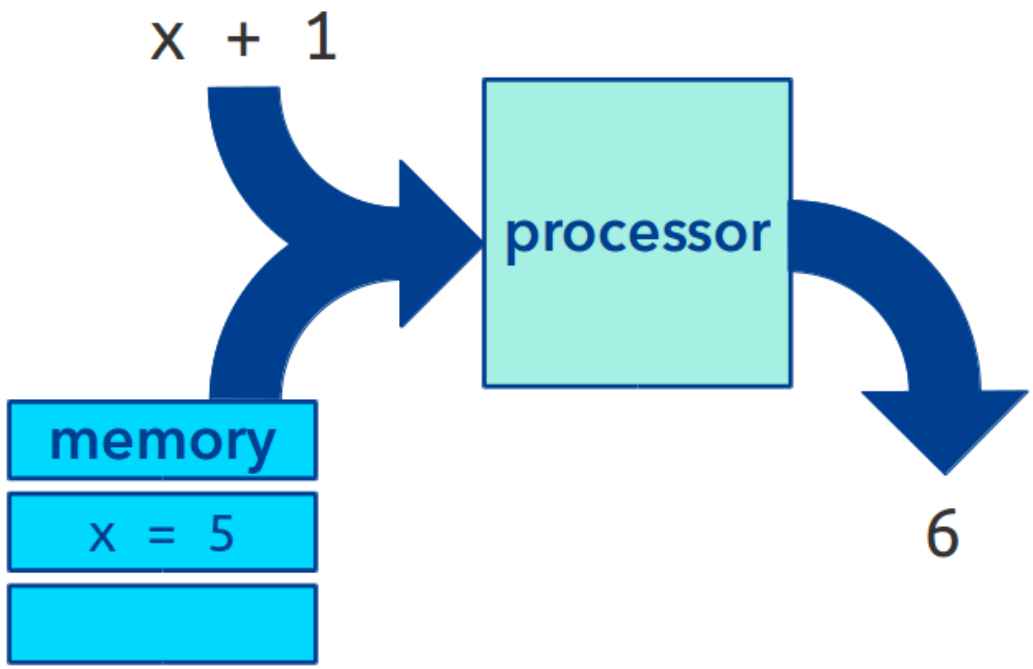

Example

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**?

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- Example: an assignment

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  - These are stored in text (there's no magic, just text).

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- 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 (there's no magic, just text).
- Each instruction is executed in order from top to bottom—together, these statements make up a program.

Our first program

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

Reminders

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- Register your i>clicker on Compass.
- Homework #1 due Wednesday, Aug. 31, 5:00 p.m.