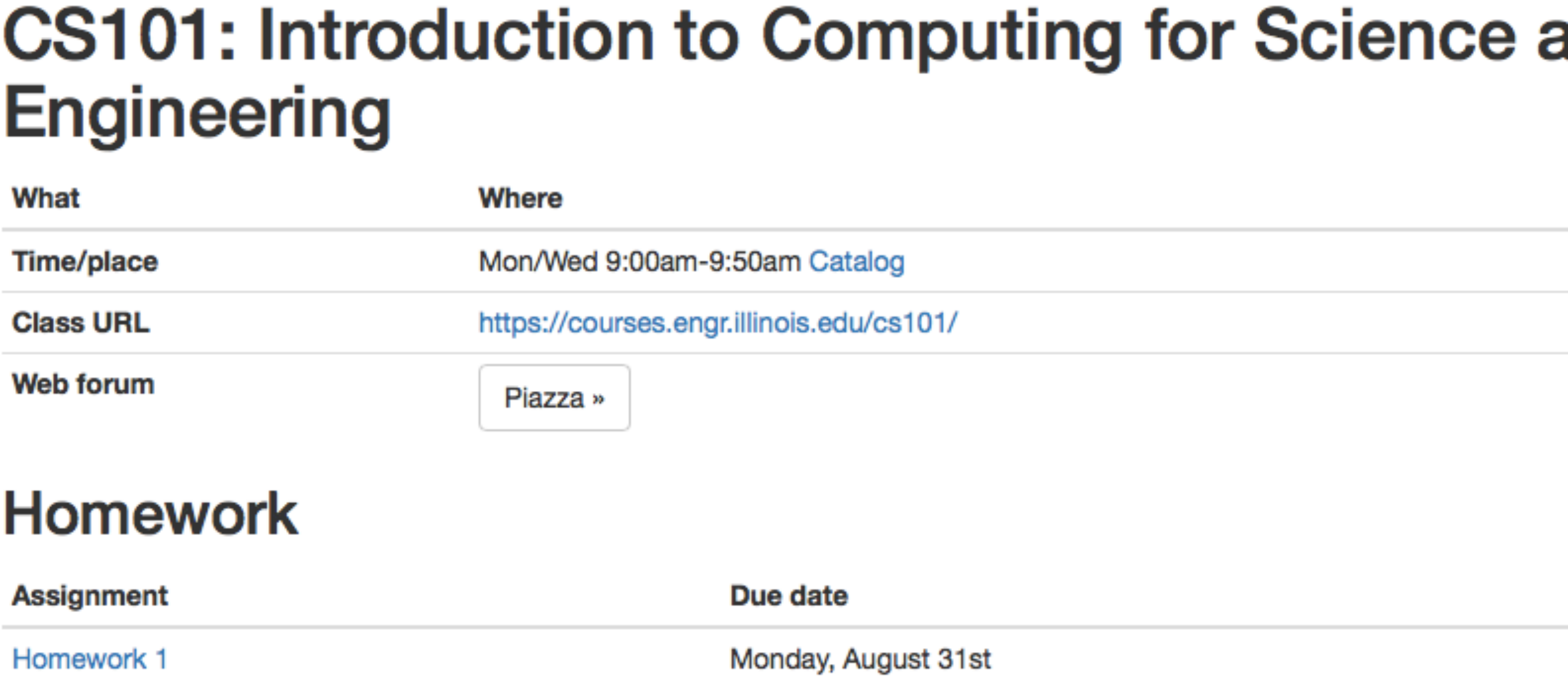
CS101: Intro to Computing
Fall 2015

Lecture 2

Administrivia

- Homework 1 is posted
  - Due Monday



CS101: Introduction to Computing for Science a Engineering

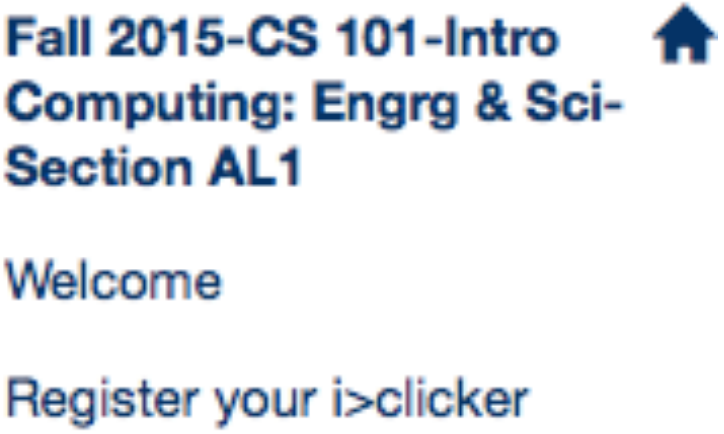
What	Where
Time/place	Mon/Wed 9:00am-9:50am Catalog
Class URL	https://courses.engr.illinois.edu/cs101/
Web forum	Piazza »

Homework

Assignment	Due date
Homework 1	Monday, August 31st

Administrivia

- i>clicker
  - – Still testing today
  - – Need to register device **ON COURSE COMPASS PAGE**



Fall 2015-CS 101-Intro Computing: Engrg & Sci-Section AL1

Welcome

Register your i>clicker

REVIEW

A set of instructions a computer executes to achieve a goal is called…

a) a process.

b) a program.

c) a procedure.

d) a pronoun.

A grouping of 8 bits is called…

a) a nibble.

b) a chomp.

c) a byte.

d) a gobble.

Python is…

a) a high-level language.

b) a low-level language.

Python is…

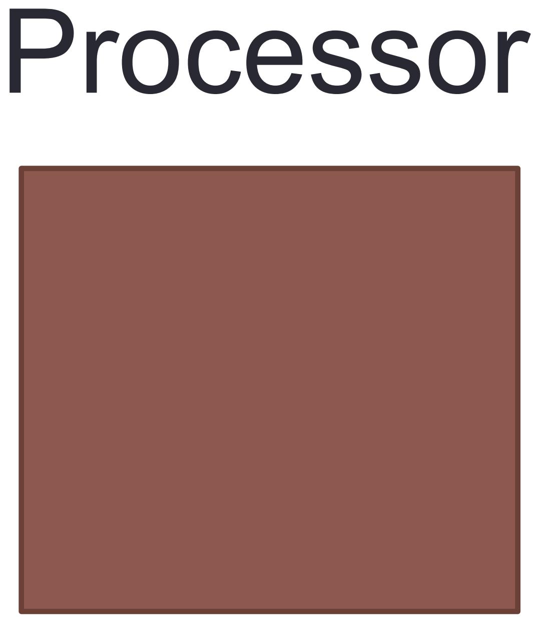
a) a compiled language.

b) an interpreted language.

BASIC PYTHON SYNTAX AND SEMANTICS

Computer

Computer

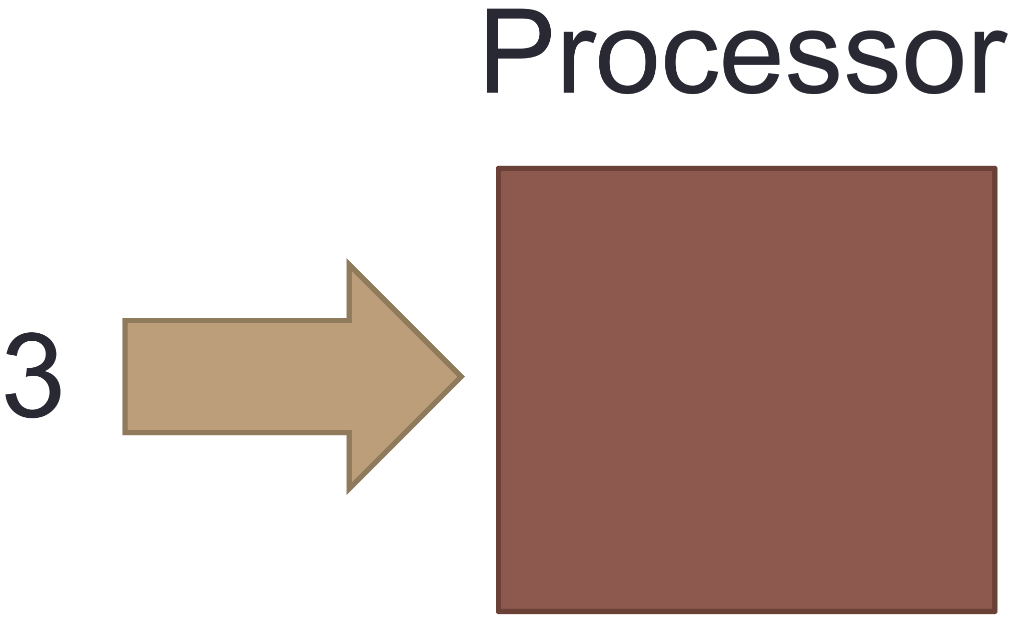


Processor

Literals

- Describe data that ***doesn’t change***
- **ANALOGY**: Literals are ***nouns*** in Python.
- Represent a fixed ***value*** (e.g. 3 or 5,136,833,998).

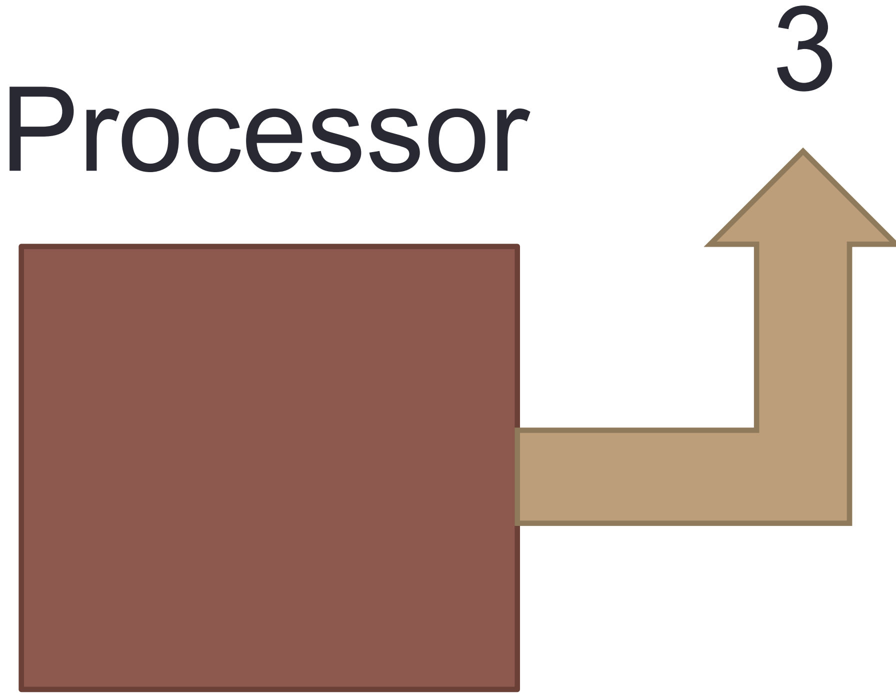
Computer



Processor

3

Computer



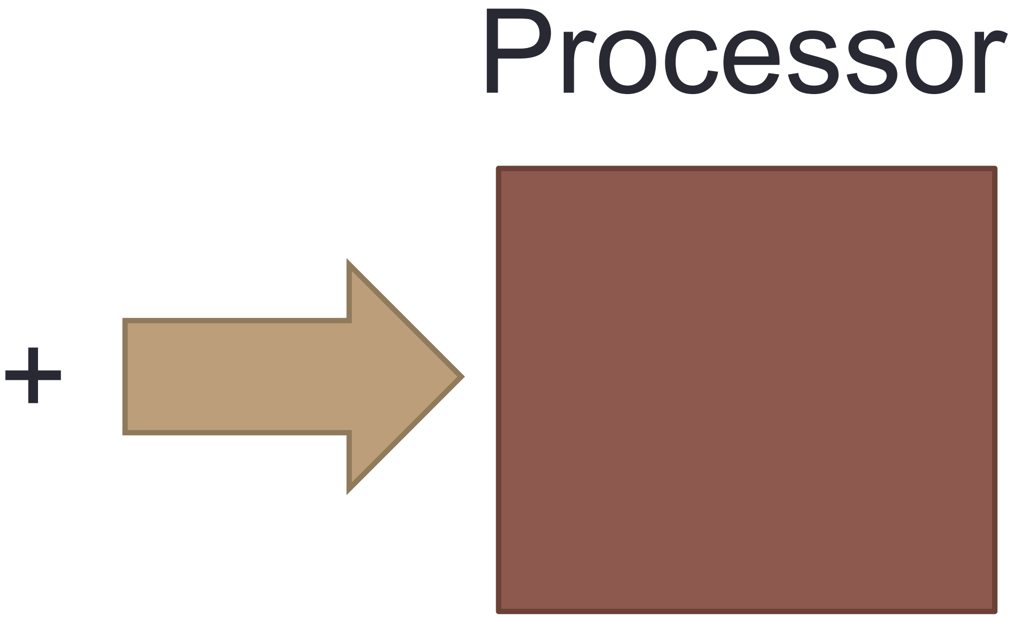
Processor

3

Operators

- Describe how to ***manipulate*** data
- **ANALOGY**: Operators are the ***verbs*** of Python.
- Common mathematical operators (e.g. +, -, *, /) are operators.
- There are ***many*** more operators.

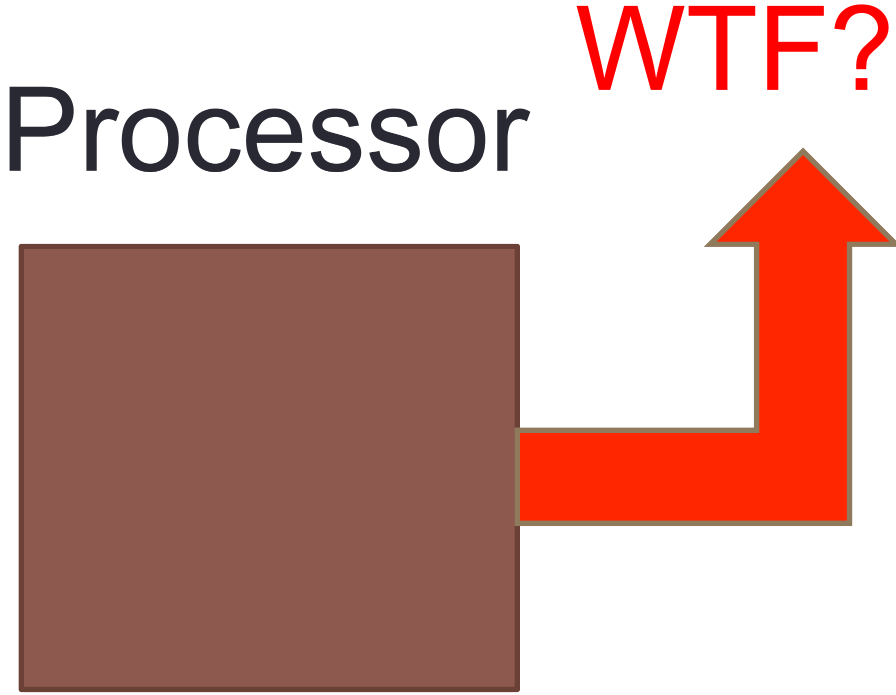
Computer



Processor

+

Computer



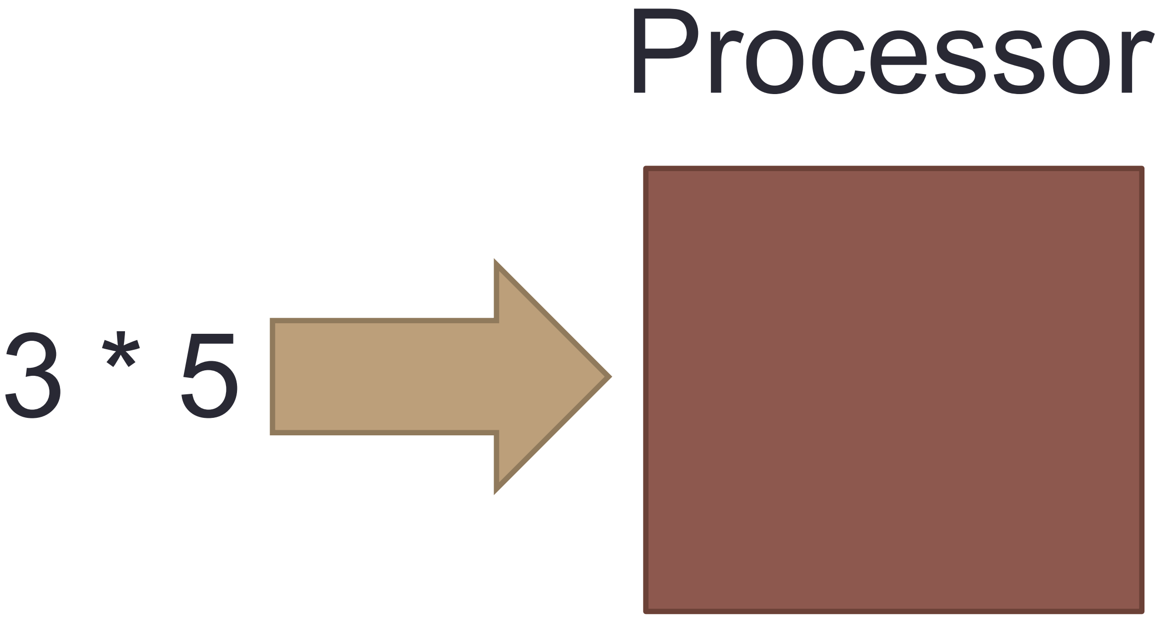
Processor

WTF?

Expressions

- Combining constants and operators, we can build ***expressions.***
- **ANALOGY**: Expressions are ***sentence fragments*** in Python.
- Expressions are ***evaluated*** to produce a new value (e.g. 3*5 or 23-100).
- Expressions can be very complicated (e.g. 3+8*5+4-7/100)

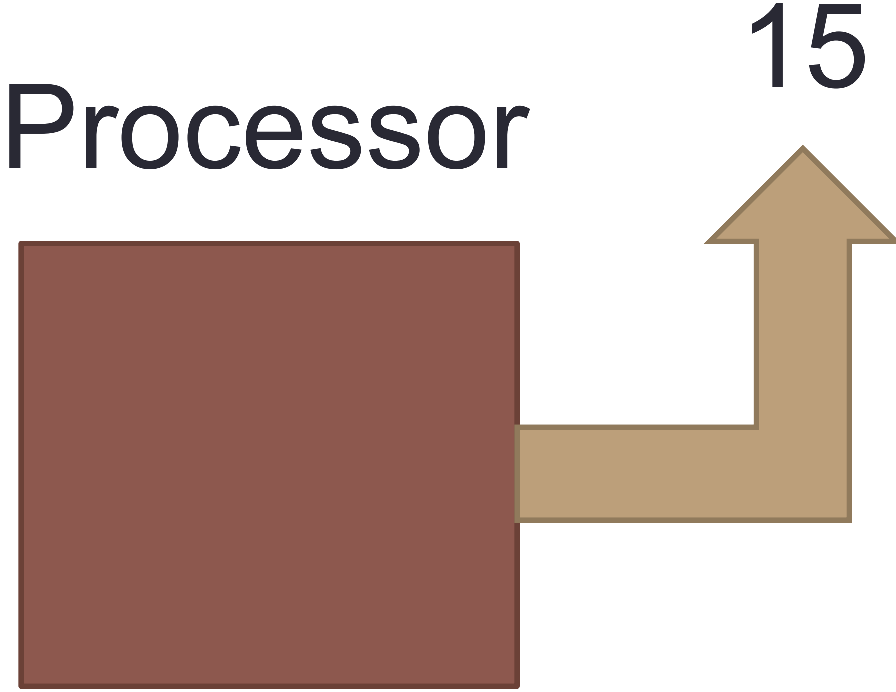
Computer



Processor

3 * 5

Computer



Order of Operations

- 1+1*2
  a) 4
  b) 3
  c) None of the above
- Like math, Python has order of operations
- Not always intuitive.
- When in doubt, use parenthesis!

Evaluate this expression:
23+6/2-4

a) 22

b) 18

c) -9

d) None of the above

Other operators

- Modulo
  - Symbol: %
  - Description: remainder after division
  - Example: 9%2
- Exponentiation
  - Symbol: **
  - Description: base to the exponent power
  - Example: 3**2

Evaluate this expression:
(28%5)**3

a) 8

b) 27

c) 64

d) None of the above

Bitwise operators

- **YOU DON’T NEED TO KNOW THESE**
- Operate on ***binary*** representation
- Bitwise or |
- Bitwise xor ^
- Bitwise and &
- Shift left <<
- Shift right >>

Evaluate this expression:

1^2

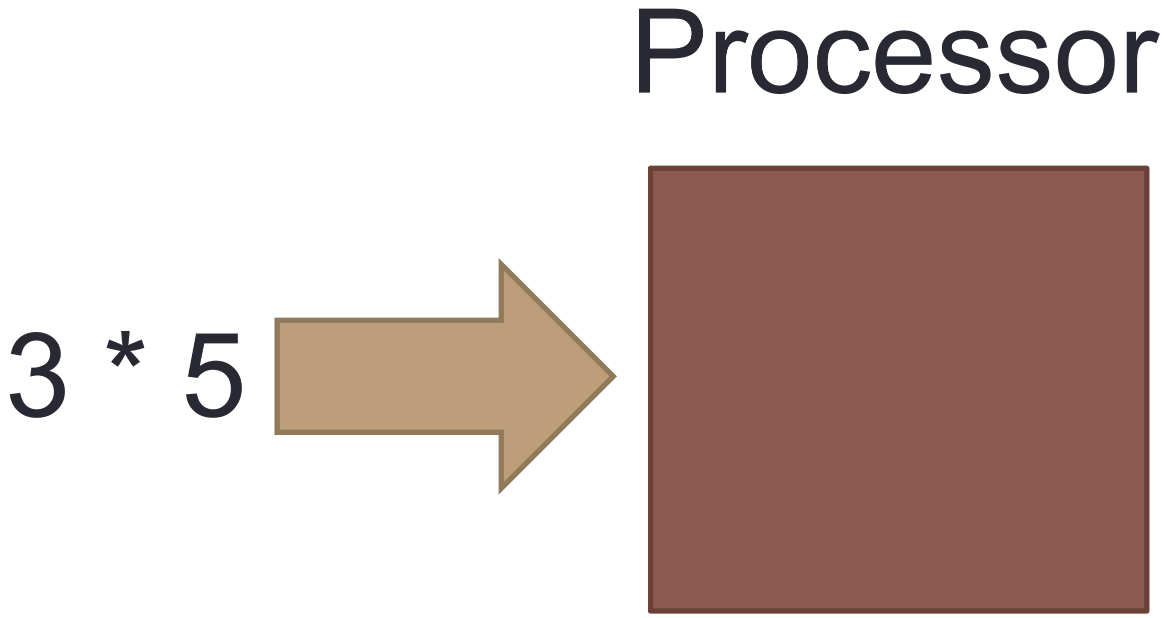
a) 0

b) 1

c) 2

d) 3

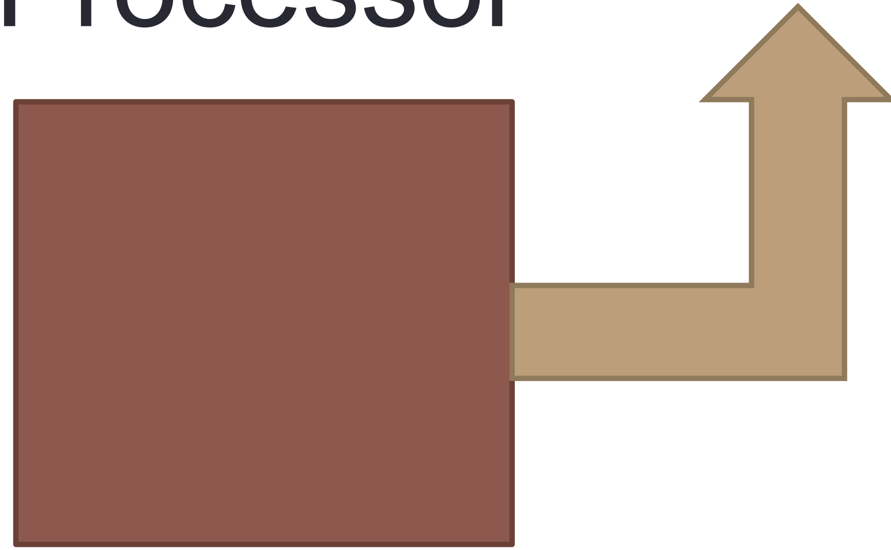
Computer



3 * 5

Processor

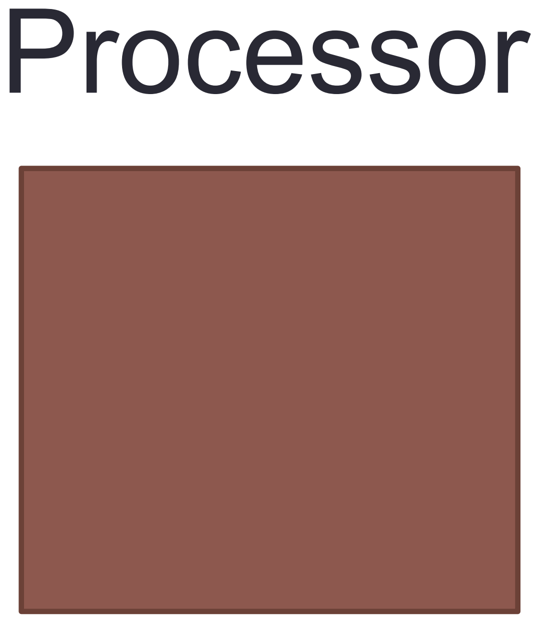
Computer



Processor

15

Computer

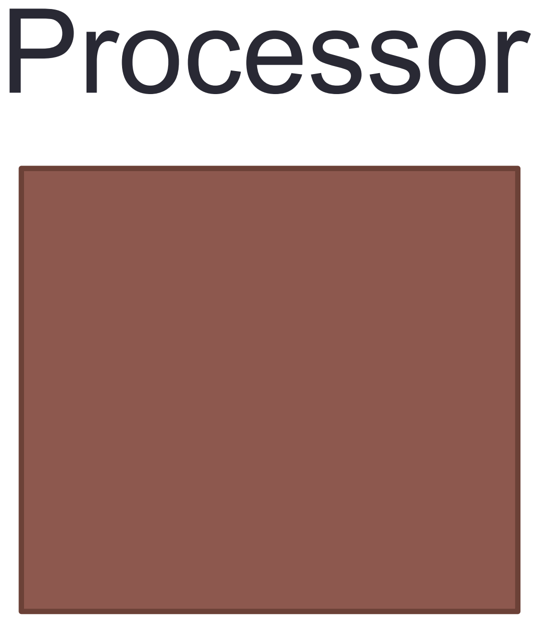


Processor

Problem

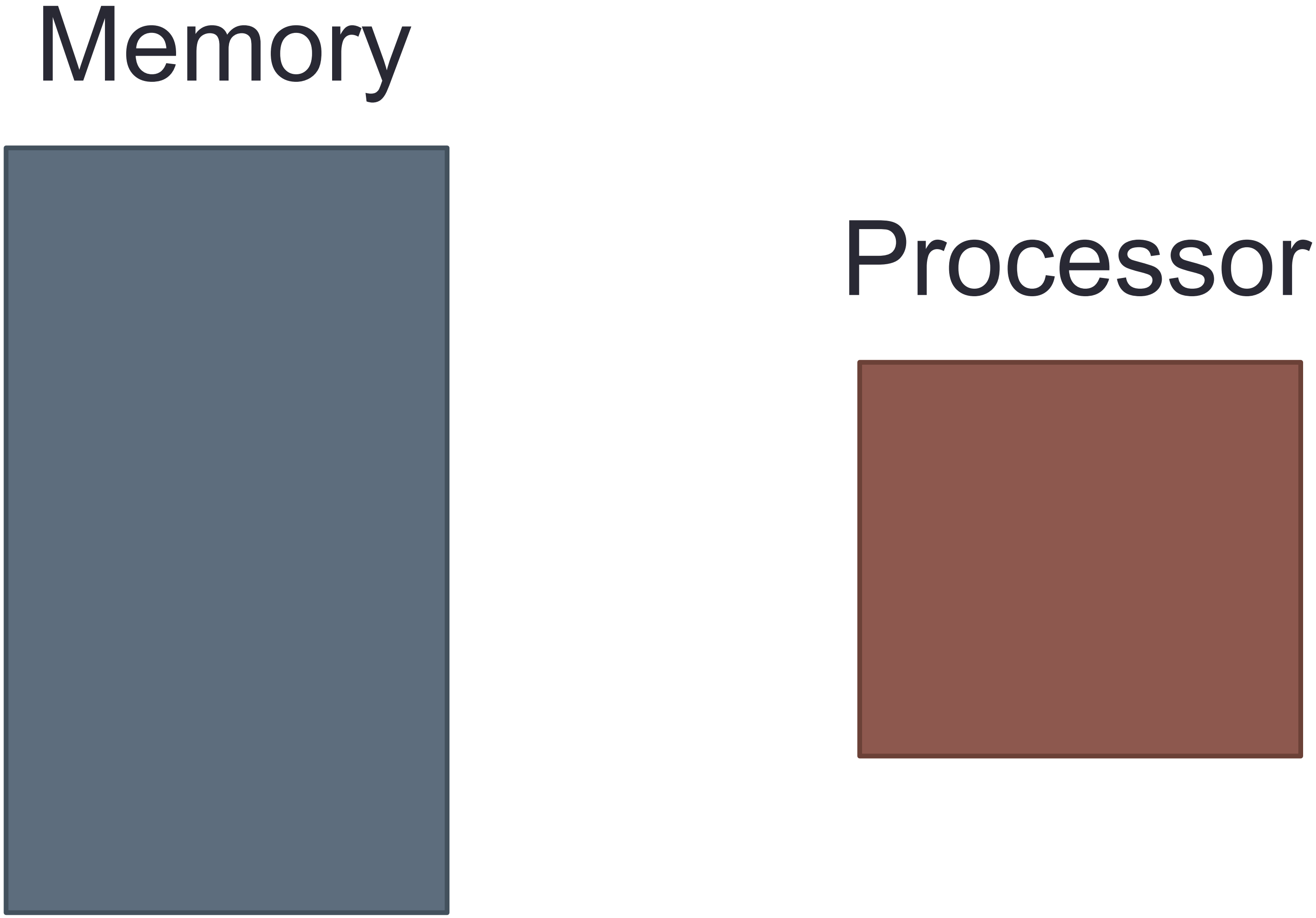
- Computer is in the same ***state*** as when we started.
- Programs are ***complex***.
- We computer to ***remember*** the results.
- We need to ***store*** the resulting value.

Computer



Processor

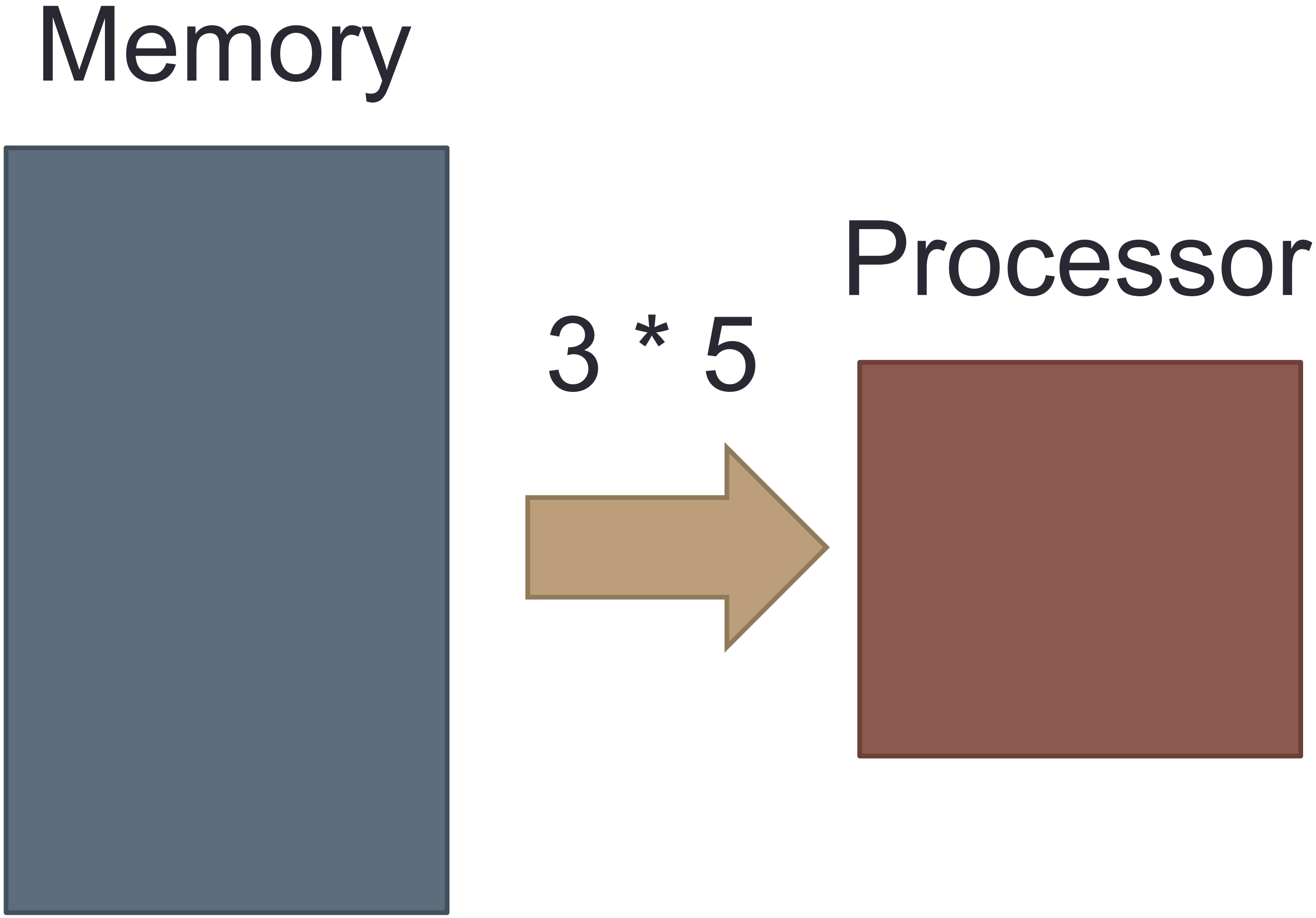
Computer



Memory

Processor

Computer

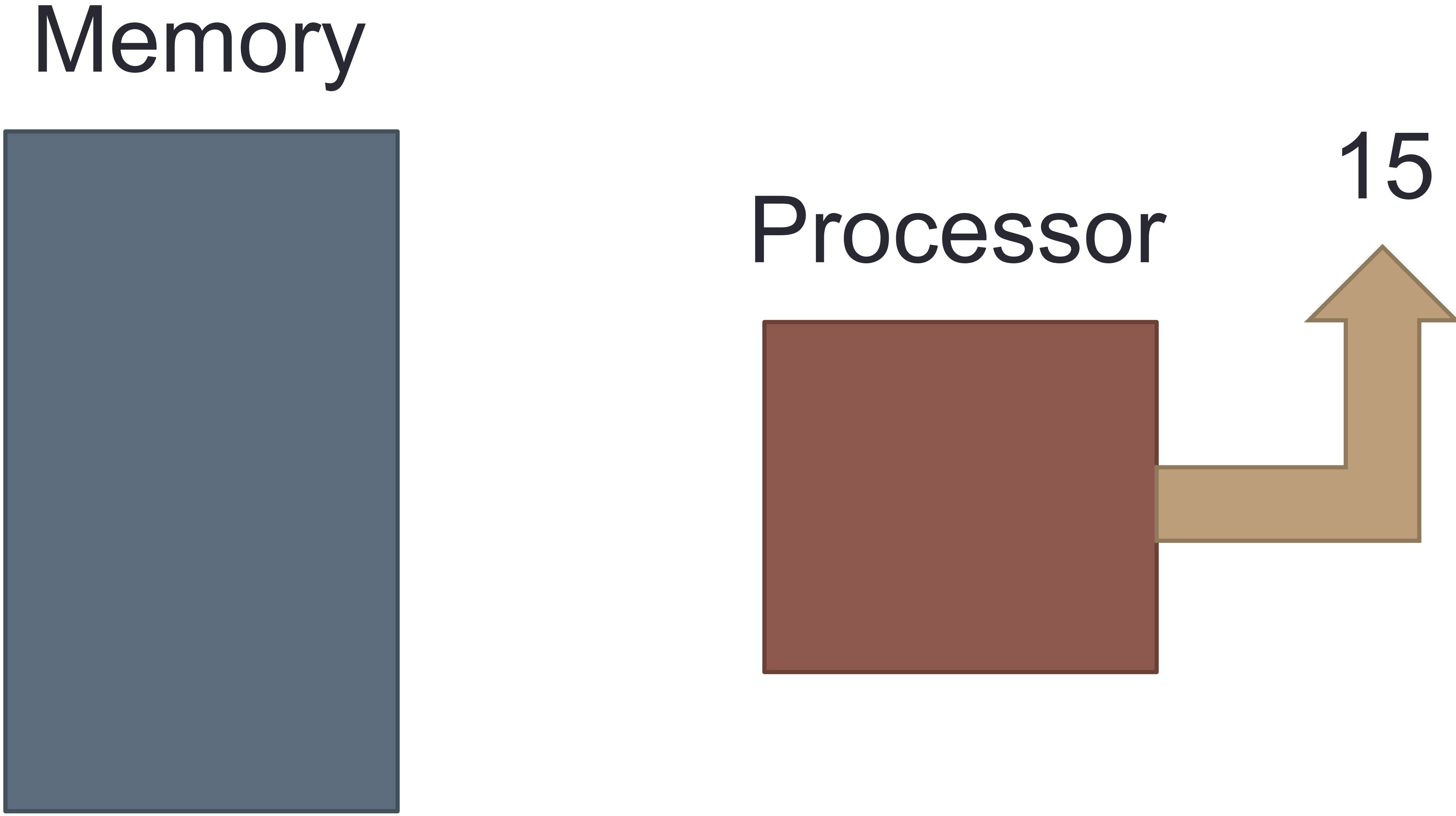


Memory

3 * 5

Processor

Computer

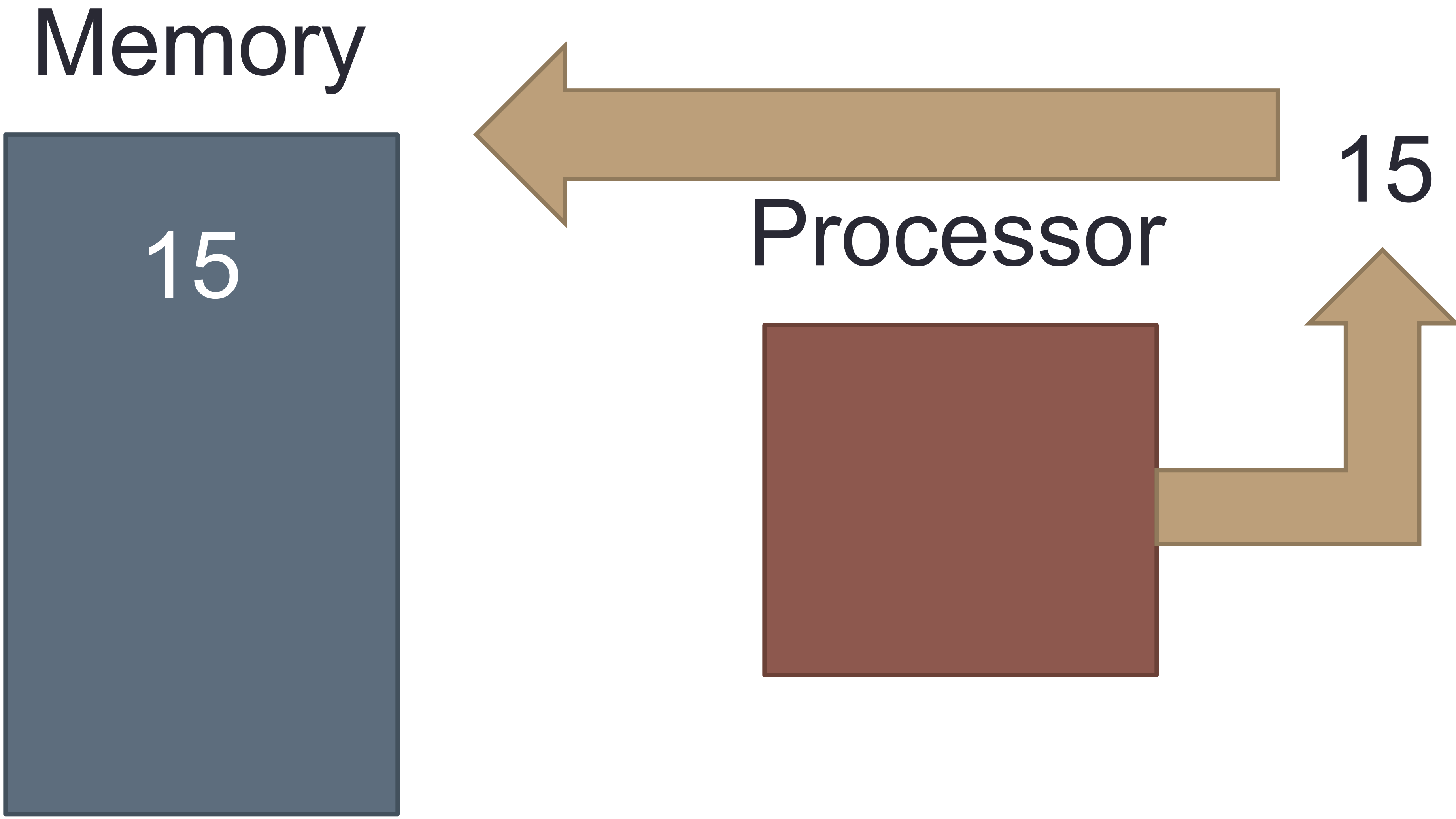


Memory

Processor

15

Computer



Problem

- How do we know where data “lives”?
- In low-level languages, data has an “address” represented in binary.

```
ADD DATA AT   1010110111010100
TO DATA AT    1101010001001001
STORE RESULT 0000110101001110
```

YUCK!!!!

Solution

- Give the memory locations a “name”

Variables

- A name for a memory location used to store data.
- **ANALOGY**: Variables are ***nouns*** in Python.
- Variables store a ***value.***
- The value stored in a variable ***can change over time***.
- A variable is a place holder.

Assignment

- Stores a value in a variable (memory.)
- Uses the = symbol
  - Variable on the left
  - Expression on the right
- Example: x=3 stores the value 3 in variable x
- *Defines* (names) the variable if we have not already used it.

```
x=15+7*9
```

What value is stored in variable x?

a) 3

b) 31

c) 55

d) 78

```
x=15+7*9
x=3
```

What value is stored in variable x?

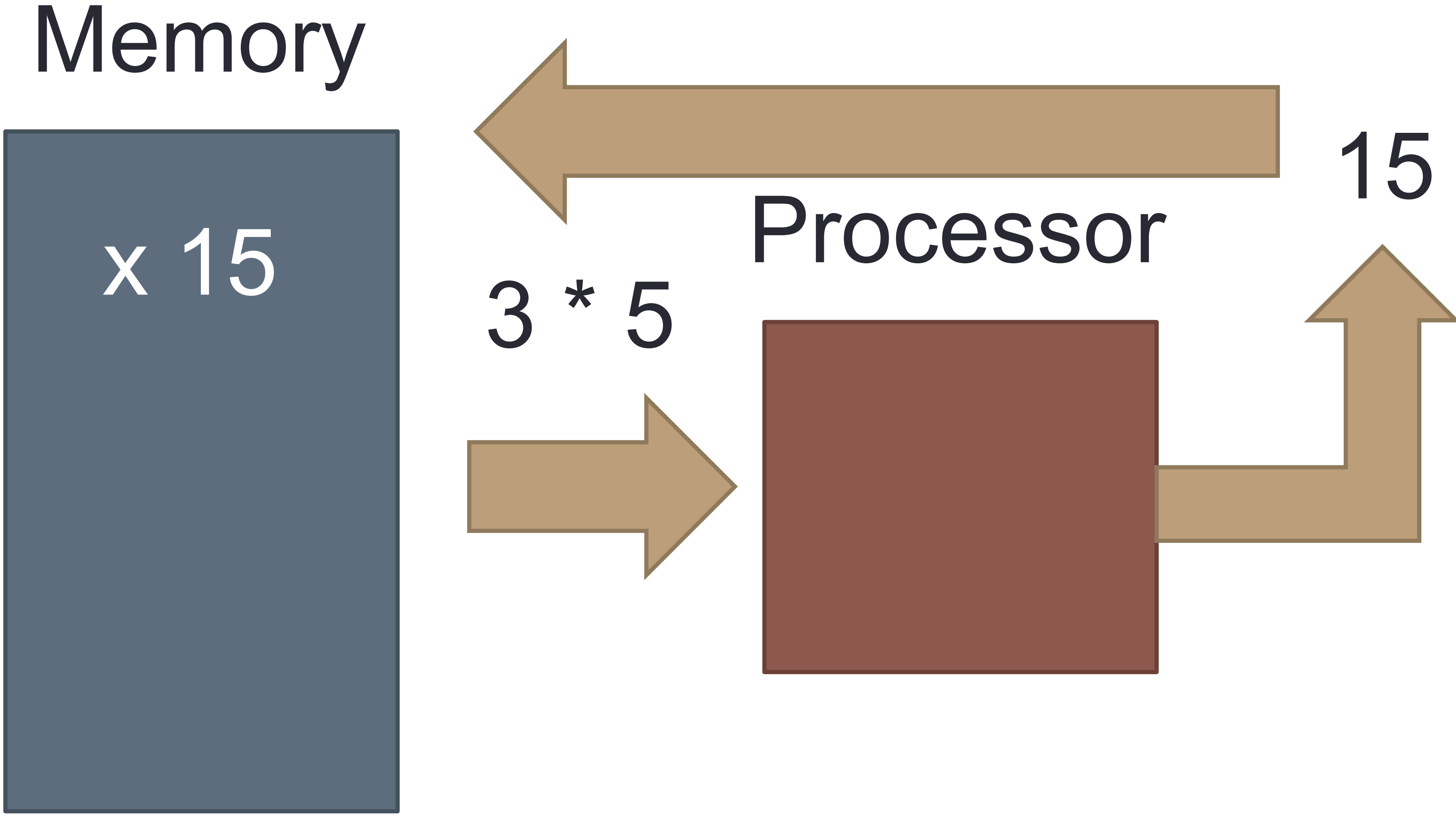
a) 3

b) 31

c) 55

d) 78

Computer



Memory

x 15

3 * 5

Processor

15

Statement

- A statement changes the ***state*** of the computer.
- **ANALOGY**: Statements are ***sentences*** in Python.
- An ***assignment*** is a statement.
- Our programs will be a series of statements.

Script

- A file containing a series of Python statements
- Stored in text (no magic, ***<u>just</u>*** text)
- Each instruction is executed top to bottom
  - Starting from the first line
- Together, the statements form a program

Example Program

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

Print statement

- Prints out the value of an expression

Example Program

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