Lecture 5:

NUMBERS

(AND A LITTLE MORE ABOUT VARIABLES)

CSC111: Introduction to CS through Programming

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Announcements

- We have a grader!

Pritish

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(has interned at Cisco and IBM)

Debrief of Lab 1

- 85 / 94 people submitted
  - NBD this time, but please submit to the right place on Moodle!
- Overall, very impressive!
- Common hacks / mistakes:
  - Manually typing pipes (“ | “) inside the strings themselves
  - Confusion about syntax, esp.

```
for name in ["Aleah", "Belle", "Chen"]:
```

(not surprising! this language is totally new…
we’ll talk more about loops in 2 weeks)

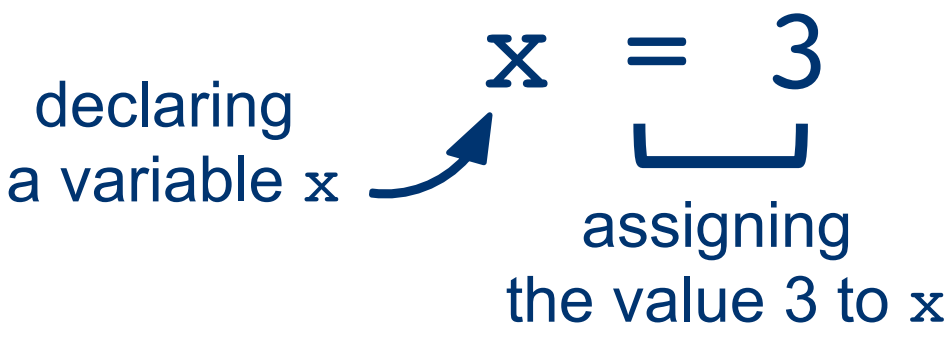
- **Important note**: whenever possible, turn in a program that doesn’t have syntax errors (i.e. that **runs**)

Overview of the week

- More about variables
- Numeric values and basic operations
- Converting between floats and int
- Lab: Cash Machine
- Conditional (“if”) statements

(RECAP) Core concept 1: `variables`

- In CS, a **`variable`** is a place to store a piece of data
- In Python, variables are:
  - **declared** by giving them a name
  - **assigned** using the equals sign
- Example:



Keywords

- Some words in Python* are reserved as **keywords**, and cannot be used as a variable name:

```
and as assert break class continue def del elif else
except exec finally for from global if import in is lambda
not or pass raise return try while with yield
```

- We saw a few in lab last week:

* other languages have their own set of reserved words

More about naming variables

- **Rule 1**: variable name must be at least 1 character long
- **Rule 2**: 1st character must be alphabetic
  (uppercase letter, lowercase letter, or underscore)
- **Rule 3:** variable names can contain letters, numbers, and underscores (but not spaces or other punctuation)

Naming conventions

- These aren't *rules* (i.e. Python won't throw an error), but they make life a lot easier if you follow them

Naming conventions

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- **Convention 1**: the name of the variable should tell you something about what the variable contains, e.g.

```
name = "Jordan"
```

is better than

```
blah = "Jordan"
```

Naming conventions

- These aren't *rules* (i.e. Python won't throw an error), but they make life a lot easier
- **Convention 1**: the name of the variable should tell you something about what the variable contains, e.g.
- **Convention 2**: if you want to use multiple words as a variable name, separate them using _underscores_, e.g.

```
first_name = "Jordan"
last_name = "Crouser"
```

Naming conventions

- These aren't *rules* (i.e. Python won't throw an error), but they make life a lot easier
- **Convention 1**: the name of the variable should tell you something about what the variable contains, e.g.
- **Convention 2**: if you want to use multiple words as a variable name, separate them using _underscores_, e.g.
- **Convention 3:** if the value isn't going to change (i.e. the variable is a constant), use ALL CAPS, e.g.

```
PI = 3.14159
```


DEMO
TIME

(RECAP) Core concept 2: numeric values

- Two kinds of **numbers** in CS:
  - integers (“whole numbers”)
  - floats (“decimals” or “floating point numbers”)
- In Python, the kind of number is implied by whether or not the number contains a **decimal point**
- Example:

```
x = 3

x = 3.0
```

Discussion

Why do we care about

whether or not a number has a **decimal point**?

(RECAP) Math

- Basic operators:
  - addition: `+`
  - subtraction: `-`
  - multiplication: `*`
  - division: `/`
  - exponentiation: `**` (power)
  - modular arithmetic: `%` (modulo)

- **Negative** values are allowed!

```
x = -3
```

Overwriting variables

- What happens if we do the following?

Python 3.6.5 Shell

```
>>> age = 23
>>> new_value = 18
>>> age = new_value
>>> print(age)
```

Ln: 7 Col: 14

Incrementing variables

- What about this?

Python 3.6.5 Shell

```
>>> age = 21
>>> age = age + 1
>>> print(age)
```

Ln: 13 Col: 14

Incrementing variables

- There's a shorthand version for this:

Python 3.6.5 Shell

```
>>> age = 21
>>> age += 1
>>> print(age)
```

Ln: 21 Col: 14

Quick exercise

```
a = 10
b = 20
c = 30
a = b          # a =
b = a          # b =
c = c * 2      # c =
d = d - 10     # d =

# NameError:
# name 'd' is not defined
```

these are called **comments:**

they are not executed by the interpreter, but are useful for making code readable

Some more useful shorthand

- Simultaneous assignment:

```
a = 10
b = 20
c = 30
a = b
b = a
c = c * 2
```

Some more useful shorthand

- Simultaneous assignment:

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

```
a = b
b = a
c = c * 2
```

Some more useful shorthand

- Simultaneous assignment:

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

- Swapping variables:

```
a = b
b = a
c = c * 2
```

Some more useful shorthand

- Simultaneous assignment:

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

- Swapping variables:

```
a, b = b, a
c = c * 2
```

Quick exercise: unit conversion

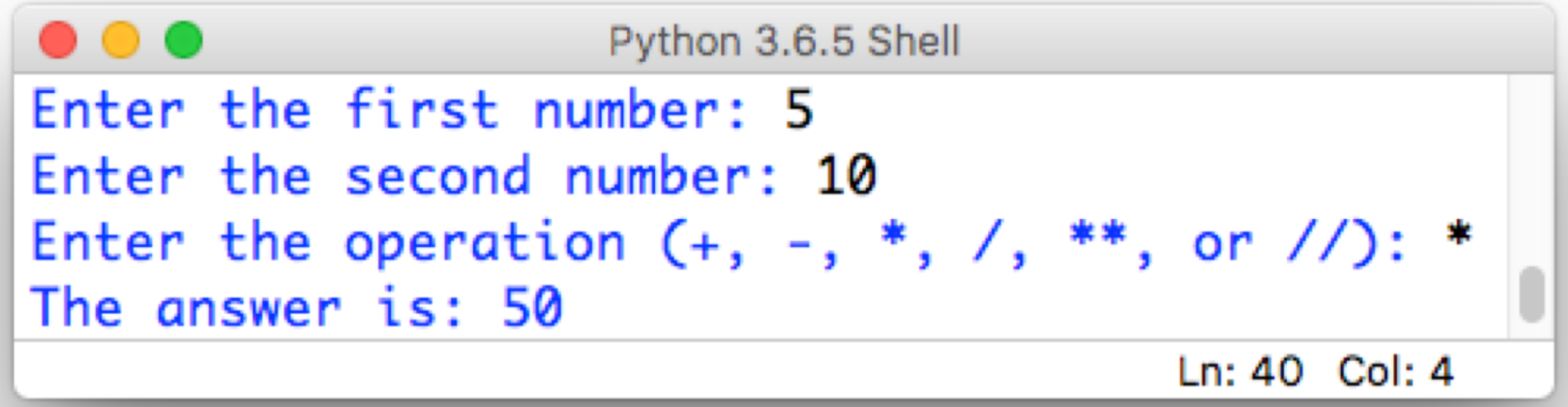
- Find a partner, and write a program that asks the user to `input()` a number representing a file size in **Kb**
- Store the user input in an appropriate **variable**
- Calculate the equivalent size in **bits**, **bytes, Mb, and Gb:**
  - **1 byte = 8 bits**
  - **1 Kb = 1024 bytes**
  - **1 Mb = 1024 Kb**
  - **1 Gb = 1024 Mb**
- `print()` the **converted sizes** to the screen (ascending)
- Want a **challenge**? See if you can print the **units** beside each of the values (try the `str()` method)

Discussion

What did you come up with?

Assignment #2: clunky calculator

- In this assignment, you will write a short python program that simulates **basic calculator functionality**.
- The user interface of your calculator should ask the user to input **two numbers**, and then a **string** indicating which mathematical operation to perform. For example:



Assignment #2: clunky calculator

- Your calculator should support **add**, **subtract, multiply**, **divide** and **power** (exponentiation) operations.
  - Optional: support **integer division** with a remainder.
  - Your calculator should be able to handle both **integers** and **floats**.
- It's important that your **input goes in the prescribed order**, and your **output is formatted like the example**
  - there are ~100 of you, and just me and Pritish to grade
- **Note**: your ability to do this assignment will build as we learn things in lecture and lab this week. Remember: S^4!
- Submit your **`calculator.py`** on Moodle by **11:55pm on Sunday**