# CSC 221: Introduction to Programming

# Fall 2011

See online syllabus (also accessible via BlueLine):

http://dave-reed.com/csc221

Course goals:

- To develop problem solving and programming skills to enable the student to design solutions to non-trivial problems and implement those solutions in Python.
- To master the fundamental programming constructs of Python, including variables, expressions, functions, control structures, and arrays.
- To build a foundation for more advanced programming techniques, including object-oriented design and the use of standard data structures (as taught in CSC 222).

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## What is programming?

programming is *applied problem-solving*

1. understand a problem
2. identify relevant characteristics
3. design an algorithm (step-by-step sequence of instructions to carry out a task)
4. implement the algorithm as a computer program
5. test the program by repeated (and carefully planned) executions
6. GO BACK AND REPEAT AS NECESSARY

in short: *programming* is the process of designing, writing, testing and debugging algorithms that can be carried out by a computer

we encounter algorithms everyday: directions to dorm, instruction manual, recipe

- people are smart, so spoken languages can be vague
- computers are not smart, so programming languages are extremely picky

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## Problem-solving example

Sudoku is a popular puzzle craze

given a partially filled in 9x9 grid, place numbers in the grid so that

- each row contains 1..9
- each column contains 1..9
- each 3x3 subsquare contains 1..9

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 1 | | | 2 | | | |
| | 3 | 7 | 8 | | | | | 2 |
| 2 | 4 | | | | | | 7 | 3 |
| 4 | | | | | | 7 | 1 | |
| | | | 6 | | 8 | | | |
| | 8 | 2 | | | | | | 9 |
| 9 | 5 | | | | | | 3 | 7 |
| 6 | | | | | 5 | 4 | 8 | |
| | | | 4 | | | 5 | | |

how do people solve these puzzles?

if we wanted to write a program to solve Sudoku puzzles, must/should it use the same strategies?

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## Programming is a means to an end

important point: programming is a tool for solving problems

- computers allow people in many disciplines to solve problems they couldn't solve without them
  - — natural sciences, mathematics, medicine, business, …
- to model this, many exercises will involve writing a program, then using it to collect data & analyze results

PAPER FOLDING PUZZLE: if you started with a regular sheet of paper and repeatedly fold it in half, how many folds would it take for the thickness of the paper to reach the sun?

- what information do you need (e.g., distance of sun)?
- what data values do you need to store and update?
- what is the basic algorithm?

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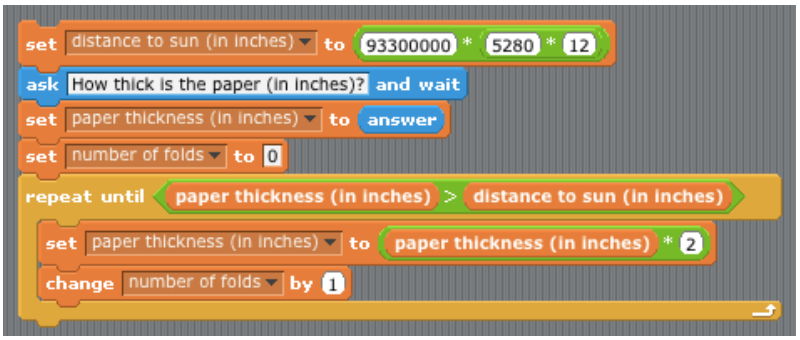
## Folding puzzle solution in Scratch

recall, distance to sun is ~93.3 million miles

→ 93,300,000 mi x 5,280 ft/mi x 12 in/ft

→ 5,911,488,000,000 inches

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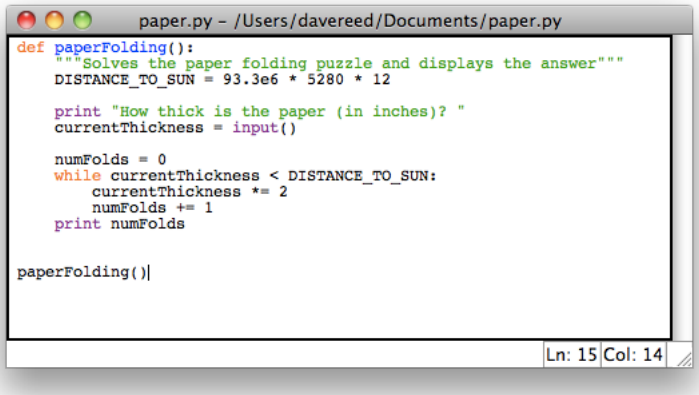
## Folding puzzle solution in Python

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## Where do we start?

### explore programming concepts using Scratch

SCRATCH
imagine • program • share

- a fun, interactive environment for creating animations & games
- we will explore your creative side, while building the foundation for programming
- learn-by-doing, so be prepared to design & experiment & create
- no previous programming experience is assumed

### will then segue into Python programming

python™

- transfer Scratch programming concepts into a powerful & flexible scripting language
- classes will mix lecture and hands-on experimentation, so be prepared to do things!

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