

Problem Set 8: Programming

due Wednesday, 3 January 2007, by 5:30 P.M. ET

You must submit this problem set via upload to the dropbox on the course's website.

“Waiter, there’s a bug in my ~~soup~~ pancake.”

1. (10 points.) Suppose that the International House of Pancakes (IHOP) that just opened in Harvard Square has just purchased a robot to serve as its hostess. That is, the job of this robot is to seat the restaurant’s patrons as they arrive. The restaurant’s manager has configured this robot with the following program.

```
while restaurant is open for business
  if a group of patrons is waiting to be seated then
    if the group contains fewer than five patrons then
      seat the group at a small table
    else if the group contains more than five patrons then
      seat the group at a large table
  else
    wait for a group of patrons to arrive
```

Sadly, this program contains a bug, the result of which is that certain groups are never seated. Figure out which type of group is never seated and suggest how to fix the bug.

Programming Your Lunch.

2. (25 points.) Suppose that IHOP has decided to replace its newly purchased hostess with a human being. Rather than discard the robot, the restaurant has decided to put it to work in the kitchen. You have been hired to re-program this robot to make peanut butter and jelly (PBJ) sandwiches. (The pancake business has been slow.)

Write, in English, a program that instructs this robot how to make PBJ sandwiches. Think carefully about the steps involved in this process; leave nothing out of your instructions. Your program must comprise at least ten steps, and it must include at least one condition and at least one loop. Its lines should be nicely indented and numbered. Your program will be graded on the basis of its correctness and thoroughness. That is, we will grade your answer by debugging your program.¹

The first step of your program must be the following.

```
Locate jars of peanut butter and jelly, a loaf of bread, and a knife.
```

¹ Frankly, we’ll be surprised if you can write a correct and thorough program for making PBJ sandwiches in only ten steps. Try to break (and then fix) your program before we get the chance!

Itching to Program?

If you need help with any of the problems below, contact the course's staff immediately, well before the problem set's deadline.

3. (0 points.) If not already installed on the computer you're using, download Scratch from the URL below.

<http://scratch.mit.edu/beta/>

To "install" it, simply double-click the .zip file you downloaded, moving, if you so choose, the folder within to your desktop or elsewhere on your hard drive.

Then, download Lecture 11's examples from the URL below.

<http://www.fas.harvard.edu/~cscie1/lecture11.zip>

Double-click `lecture11.zip`, once downloaded, and drag the folder called "lecture11" therein into Scratch's "Projects" directory (which is inside the folder you unzipped earlier).

4. (1 point.) Go ahead and launch Scratch by opening its folder and double-clicking its whiskered icon. Once it loads, click the "Open" button toward its top-left corner. In the window that appears, you should see categorized folders of sample projects. Open Oscartime within the "lecture11" folder. Enter "Presentation Mode" by clicking the icon of an easel below Oscartime's lamp post; Oscartime should fill most of your screen. Click the green flag toward the screen's top-right corner.

Yes, go ahead and play Oscartime. As many times as you'd like, in fact.

When done procrastinating, stop the game, if necessary, by clicking the red button toward the screen's top-right corner. To exit "Presentation Mode," hit Esc on your keyboard.

For one point, what was your high score?

5. (0 points.) Go ahead and open a few more projects, even some of those that you already saw in Lecture 11. For each project of interest to you, run it to *see* how it works; then, look over its scripts to *understand* how it works. Feel free to make changes to scripts and observe the effects. Once you can say to yourself, "Okay, I think I get this," you're ready to proceed to the next problem.

6. (0 points.) If you'd like to be walked through the process of making a project from scratch,² surf on over to Scratch's home page at the URL below.

<http://scratch.mit.edu/>

Click the link entitled "Getting Started Guide" on that page and peruse the guide's PDF or PowerPoint version for some step-by-step instructions.

7. (0 points.) Read "Scratch for Budding Computer Scientists," available at the URL below.

<http://www.eecs.harvard.edu/~malan/scratch/>

Realize that the goal of this tutorial is not to teach you how to use Scratch but, rather, how various constructs in Scratch relate to constructs found in languages like Java.

8. (0 points.) Be aware of Scratch's Help Screens, available at the URL below.

<http://llk.media.mit.edu/projects/scratch/help/>

9. (1 point.) Here's a point for making it through so many 0-point questions!

10. (53 points.) And now your adventure begins. Your task for this problem is, quite simply, to have fun with Scratch and implement a project of your choice (be it a game, an animation, or something else), subject only to the following requirements.

- i. Your project's filename must be `username.scratch`, where `username` is your FAS username.
- ii. Your project must have at least two sprites, none of which may be a cat.
- iii. Your project must have at least three scripts total (*i.e.*, not necessarily per sprite).
- iv. Your project must use at least one condition, one loop, and one variable.
- v. Your project must use at least one sound.
- vi. Your project should be more complex than the projects in your "lecture11" folder (all of which, though instructive, are quite short) but it can be less complex than Oscartime. Its complexity should be more on par with the other projects that come with Scratch. As such, your project should probably use a few dozen puzzle pieces overall.

Feel free to look through the projects that come with Scratch for inspiration, but your own project should not be terribly similar to any of them. Try to think of an idea on your own, and then set out to implement it. If, along the way, you find it too difficult to implement some feature, try not to fret: alter your design or work around the problem. If you set out to

² Pun intended. Ha!

implement an idea you find fun, you should not find it hard to satisfy this problem's requirements.

If you suspect your program might fall short of our expectations, feel free to ask us for our opinion prior to submitting.

Alright, off you go. Impress us.

11. (10 points.) In a short paragraph, tell us what your project does (or how to use it). In one or more longer paragraphs, explain how your project works, noting the purpose of each sprite and script.
12. (0 points.) That's all! Feel free to show your projects to family and friends (provided they, too, are not in E-1)!

Extra Credit.

13. (5 points.) Implement Pong in Scratch.³

³ Call your project `Pong.scratch`.