UC Berkeley's CS10 Fall 2017 Midterm 1: Instructor Dan Garcia

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Your Name (first last) *SID* *Lab TA's Name*

_____ _____

← *Name of person on left (or aisle)* *Name of person on right (or aisle)* →

What's that Smell? Oh, it's Potpourri! (2 pts each for 1-6, low score dropped)

Fill in the correct circles & squares completely…like this: ● *(select ONE)* ■ *(select ALL that apply)*

Question 1: Which of the following is true based on the *Programming Paradigms* lecture? (select ONE)
○ *Object Oriented Programming* allows us to program by describing "what"; the "how" comes automatically.
○ The *Imperative* programming paradigm allows code written in the *Functional* paradigm within it.
○ The *Declarative* programming paradigm is characterized by the sending of messages back and forth.
○ The *Functional* paradigm allows for global variable mutation, state changes and side-effects within its code.
○ None of these

Question 2: What was one of the lessons from the *HCI lecture*? (select ONE)
○ Significant HCI innovations are almost always initially funded by the Department of Defense.
○ There may be many nay-sayers as you are working to "invent the future"; history may prove them wrong.
○ To create a new mobile device, your very early prototypes *must* be mobile, like it was with the iPhone.
○ The way to build "invisible technology"? Start with science and engineering.
○ none of these

Question 3: Which of the following is a *true statement* based on the *Privacy* lecture? (select ONE)
○ The benefit of doing work online is that the digital "bits" you leave behind aren't valuable to anyone.
○ By default, all data on the internet is encrypted and secure.
○ Once something is shared (via social media), it has the potential for near-instant worldwide distribution.
○ To remove something that has been shared (via social media), you just have to "unshare" it, and it's gone from any computer that had originally had access.
○ None of these

Question 4: Which of the following is *true* based on the *International Politics of Computing* lecture? (select ONE)
○ No country has attacked the *critical infrastructure (e.g., power grid)* of another country yet..thank goodness!
○ Calls for *Internet Sovereignty* have been led by the USA, extending physical boundaries into cyberspace.
○ DDOS attacks are named for "Denial of DOS (Disk Operating System)", a precursor to MS Windows.
○ *StuxNet* was an attack championed by the US and Israeli intelligence agencies on Iran's centrifuges.
○ None of these

Question 5: Which is a *true statement* based on the *Computing in Education* lecture? … (select ONE)
○ cMOOC means "computing" MOOC; they use this acronym because of the number of CS-related MOOCs.
○ Judah Schwartz defined three categories for computers in education: Research, Teaching, and Service.
○ Prof Brian Harvey makes a strong case that the most important use of computing in education is MOOCs.
○ Sir Ken Robinson believed the current education system was conceived in the economic culture of the Enlightenment, and in the intellectual circumstances of the Information Revolution (that we're currently in).
○ None of these

Question 6: What number do I need to add to 9_{16} to get 10_{16}? (select ONE)

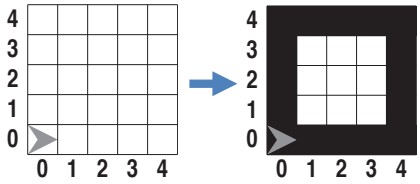
○ 1_2	○ 10_2	○ 11_2	○ 100_2	○ 101_2	○ 110_2	○ 111_2	○ 1000_2	○ 1001_2	○ None of these

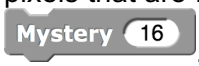
…use this area for your scratch work, should you need it…

Question 7: *Magical mystery Tour, step right this way!* (9 pts = 6+3) SID _____

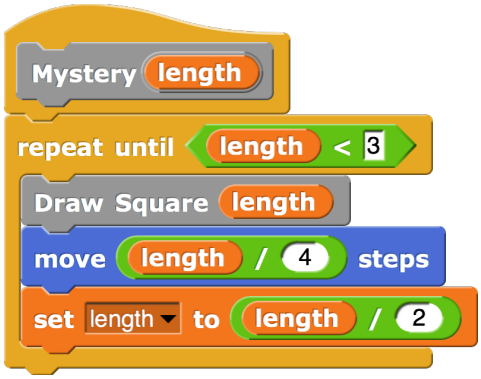
Consider a block that draws a square and keeps the sprite in the same position at the end. E.g., if the sprite were at (0,0), facing to the right (as shown below on the left), after a call to 

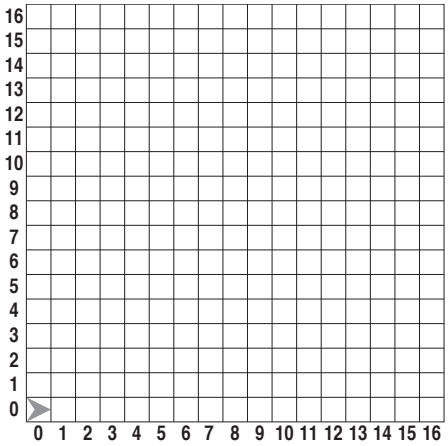
it would draw a square of size 4… (as shown below on the right). If given input ≤ 1, it just fills in a single pixel.



a) Shade in (completely!) *all* the pixels that are filled in after 

. The sprite starts at (0,0) facing right.





b) If the test in the **`repeat until`** were changed to 

, what would happen after the call in (a) above? (select ONE)

- ○ It would only draw a *single square of size 3*.
- ○ It would be the *same as the result of (a)*.
- ○ It would be the same as the result of (a), *except* this time it would draw *an additional square of size 3*.
- ○ It would *run forever*.
- ○ It would *cause an error*.
- ○ None of the above

…use this area for your scratch work, should you need it…

Question 8: *Al Gore's new dance? Algorithm!* (11 pts = 2+2+4+3) SID _____

Due to security concerns in the CS10 lab, the department replaces the normal door to the outside with a special door that can only be used by a single student at a time in a single direction. Assume that only students will be using the lab, they "wall off" the internal door to the self-paced center so there's only one exit/entrance, and it's possible two students have the same name. They also install a special camera by the door of the lab that records, for each person passing through the door, a "snapshot" of student entry data. These are…

- The student's name, unique SID, timestamp, and whether the student was entering or exiting the lab (which it knows based on which way the student was walking through the door).

This is all stored in a central database called **`DB`** (a big, global Snap! list), which is initialized to be empty when the system is booted. They boot it in the middle of the night and nobody is in the lab. The goal is to use **`DB`** to determine *who is in the lab at any given time*. Here's an example of **`DB`**: (by 9:00 only Alan is in the lab)

- Grace Murray Hopper, 12345678, 2017-10-25@08:00, enter
- Alan Turing, 87654321, 2017-10-25@08:30, enter
- Grace Murray Hopper, 12345678, 2017-10-25@09:00, exit

The following four questions are independent. They each assume you have just read the setup and ask about a particular situation.

a) (for this Q only) If they didn't boot the system when the lab was empty, what could happen? (Select ONE)

○ Even a perfect algorithm could think a student was *not* in the lab when they were	○ Even a perfect algorithm could think a student was *in* the lab when they were not	○ All of the above	○ None of the above

b) (for this Q only) If they didn't store the SID, what could happen? (Select ONE)

○ Even a perfect algorithm could think a student was *not* in the lab when they were	○ Even a perfect algorithm could think a student was *in* the lab when they were not	○ All of the above	○ None of the above

c) (for this Q only) What could you do if we only want to know *if the lab is empty*? (select all that apply)

☐ Not store the students' name
☐ Not store the students' SID
☐ Not store the timestamp
☐ Store a Boolean value for each student (like a light switch), all reset to False initially, and "flipped" every time that student entered or exited (effectively ignoring which way they were going).
☐ Store a Boolean value for each student (like a light switch), all reset to True initially, and "flipped" every time that student entered or exited (effectively ignoring which way they were going).
☐ None of the above

d) (for this Q only) To find out *who* is in the lab, assume we have no control structures other than higher-order functions **`map`** and **`keep`**. I.e., no **`repeat`**, no **`repeat until`**, no **`for`**, no **`for each`**, no **`combine`**, and no recursion. Also assume there are no global variables, and we only have access to **`DB`** which can't be edited, but would simply be fed into the **`map`**(s) and/or **`keep`**(s). What "machinery" would we need to be able to report all the students who are in the lab, reported as a list of SIDs? (Select ONE)

○ **`map`** only	○ **`keep`** only	○ **`map`**'s output fed into **`keep`**	○ **`keep`**'s output fed into **`map`**	○ **`map`**'s output fed into another **`map`**	○ **`keep`**'s output fed into another **`keep`**	○ None of the above

…as an example, here is "**`map`**'s output fed into **`keep`**": 

, with appropriate functions passed into the grey rings.