

UC Berkeley's CS10 Spring 2019 Midterm: Prof. Dan Garcia

Your Name (first last)

SID

Lab TA's Name

← _____
Name of person on left (or aisle)

_____ →
Name of person on right (or aisle)

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

WHEN YOU HEAR THIS:



YOU KNOW YOU'RE IN A
SOFTWARE PROJECT

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

Question 1: What was shared with you in the *Testing + HW3* lecture? (select ONE)

- Unit testing* is when you test all your code together (i.e., the top-level function), as *one unit*.
- Black-box testing* is when you test only the commands that have no inputs or outputs (just like a black box).
- Glass-box testing* is when you only need one test to break the code (which is considered fragile, like glass).
- Regression testing* is when you pretend you've regressed to a younger age, and test with nonsense inputs.
- None of these

Question 2: What was shared with you in the *Computing & the Environment* lecture? (select ONE)

- Even though *80% of E-waste is properly recycled*, the other 20% is many millions of tons of waste!
- Affected people in countries receiving e-waste have become dependent on it*, even though it's killing them.
- The *appetite for compact discs*, with more and more people having disposable income (and access to Amazon and similar delivery services that can ship them to you so easily), *hasn't stopped growing!*
- Nobody has found any real uses for old cell phones*, since their hardware/software is so outdated.
- None of these

Question 3: What was shared with you in the *Computers in Education* lecture? (select ONE)

- Judah Schwartz classifies the uses of computers in education into: { Individual, Collaborative, Computer-led }.
- xMOOCs are known for their highly collaborative structure, where folks are as much teachers as students.
- Sir Ken Robinson believes that education should be based on industrialism for efficiency and better learning.
- Prof. Brian Harvey argued that standardized testing has changed what counts as knowledge in schools.
- None of these

Question 4: What was shared with you in the *Concurrency* lecture? (select ONE)

- Moore's law is the exponential growth in number of cores in CPUs (essentially doubling every 18 months!).
- In 2005, a sea change in computers happened, and we couldn't keep making parallel computers faster!
- The "sea change" to multi-core meant the computing community had to rethink its languages and algorithms.
- Deadlock can happen with three or more "workers", but not with only one or two "workers".
- None of these

Question 5: If 5% of a program is serial, what's the max speedup we can get with ∞ cores? (select ONE)

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5x	10x	20x	95x	None of these

Question 6: What is $1010_2 \times 2_{10}$? (select ONE)

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2020_{20}	2020_{16}	10100_{16}	$A0_{16}$	24_{16}	22_{16}	20_{16}	18_{16}	16_{16}	14_{16}	12_{16}

Question 7: Two keeps are better than one! (...or are they?) (12 pts)

You are given seven expressions:

- a)
- b)
- c)
- d)
- e)
- f)
- g)

	a	b	c	d	e	f
b	<input type="checkbox"/>					
c	<input type="checkbox"/>	<input type="checkbox"/>				
d	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
e	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
f	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
g	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Which pairs are *always equivalent* for **all** **DATA** lists and **all** predicates ? Said another way, which pairs will *always* report the same value? (select ALL that apply; selecting a particular box means you are declaring that the expression in the row will always have the same value as the expression in the column **for all input**. (there is at least ONE, so if you mark no boxes, we'll assume you skipped it and you'll receive no points))

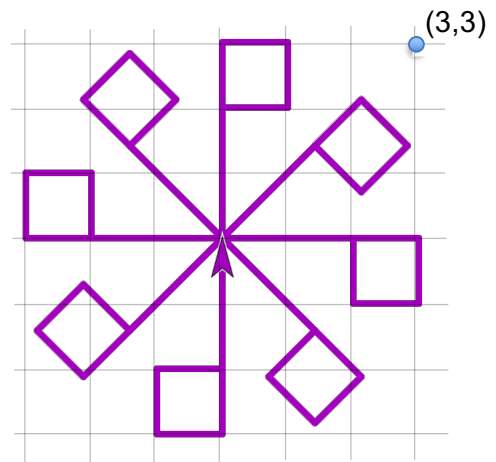
Question 8: Match each programming paradigm with the description. (select ONE per row, 2 pts)

	Declarative	Object-Oriented	Functional	Imperative
You're not allowed to have any side-effects! Works great with parallelism.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Classes are "factories" producing instances; inheritance saves code.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Programs are like a recipe: first do this, then that, and next that, etc.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tell the computer <i>what</i> you want, not <i>how</i> to do it. It works like "magic".	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Question 9: Chasing windmills... (6 pts, 1+1+1+1+2) SID: _____

```

+ Windmill + A + B + C + D +
repeat A
  move B steps
  repeat C
    move D steps
    turn 360 / C degrees
  move 0 - B steps
  turn 360 / A degrees
  
```



a) The sprite starts at the origin at (0,0). The upper right grid corner is the point (3,3). The pen is down. As you might imagine, the pen thickness is very small and we zoomed in on the screen. What are the values of **A**, **B**, **C** and **D** for the **windmill** block that yield the image on the right? (select ONE for each)

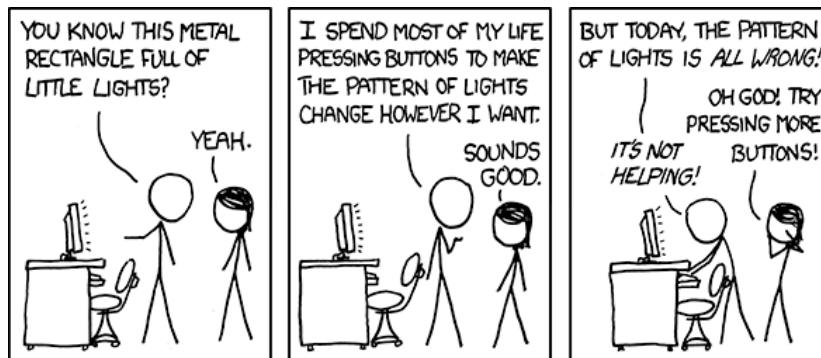
- A:** 1 2 3 4 5 6 7 8 9 10 None of these
- B:** 1 2 3 4 5 6 7 8 9 10 None of these
- C:** 1 2 3 4 5 6 7 8 9 10 None of these
- D:** 1 2 3 4 5 6 7 8 9 10 None of these

```

Windmill N some B N some D
  
```

b) What is the running time of **Windmill N some B N some D** (as a function of **N**)? Assume moving and turning take constant time. (select ONE)

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Constant	Logarithmic	Linear	Quadratic	Cubic	Exponential



NOVICE PROGRAMMER




EXPERIENCED PROGRAMMER



Question 10: どうもありがとうミスターロボット *Dōmo arigatō, Mr. Roboto...* (10 pts, 3+5+2)


Here are helper blocks for controlling a robot (shaped like an arrowhead) on a grid world, looking down on it.

move forward	rotate  right
The robot moves <i>one square</i> forward in the direction it's facing.	The robot turns right, in-place. (That is, it makes a 90° right turn)

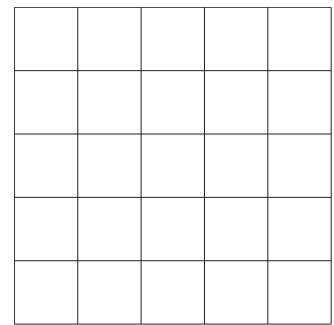
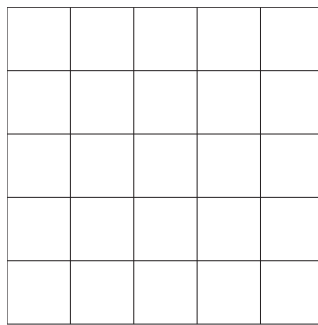
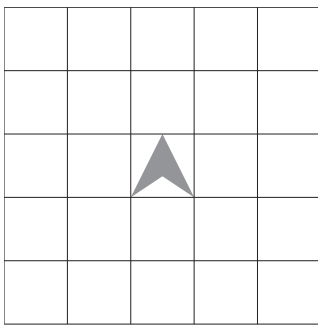
+ Meander + N +

repeat N

repeat pick random 1 to 4

rotate  right

move forward



<p>For both (a) and (b), we start with the robot in the middle of the grid, facing up, as shown above.</p>	<p>a) In the grid above, shade in all the squares that the robot could end up in after a call to</p> <p>Meander 1</p>	<p>b) In the grid above, shade in all the squares that the robot could end up in after a call to</p> <p>Meander 2</p>
--	--	--

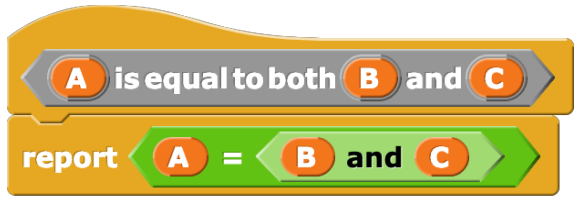
c) What is the running time of **Meander N**? (select ONE)

<input type="radio"/> Constant	<input type="radio"/> Logarithmic	<input type="radio"/> Linear	<input type="radio"/> Quadratic	<input type="radio"/> Cubic	<input type="radio"/> Exponential
--------------------------------	-----------------------------------	------------------------------	---------------------------------	-----------------------------	-----------------------------------



Question 11: *Inside, we're all the same!* (8 pts, 2 each)

You author the following (possibly buggy) code because you want to check if **A** is the same as **B**, and **A** is also the same as **C**. That is, whether **A** is equal to both **B** and **C**.



For the following cases, choose the appropriate values for **A**, **B** and **C**. (There may be multiple right answers) (For each (a)-(d), select ONE per row, or select "This is impossible to achieve!" if it can't be done)

a) **A is equal to both B and C** is supposed to return **false**, and *does* return **false**.

			This is impossible to achieve!
A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
B	<input type="radio"/>	<input type="radio"/>	
C	<input type="radio"/>	<input type="radio"/>	

b) **A is equal to both B and C** is supposed to return **true**, and *does* return **true**.

			This is impossible to achieve!
A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
B	<input type="radio"/>	<input type="radio"/>	
C	<input type="radio"/>	<input type="radio"/>	

c) **A is equal to both B and C** is supposed to return **false**, but returns **true**.

			This is impossible to achieve!
A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
B	<input type="radio"/>	<input type="radio"/>	
C	<input type="radio"/>	<input type="radio"/>	

d) **A is equal to both B and C** is supposed to return **true**, but returns **false**.

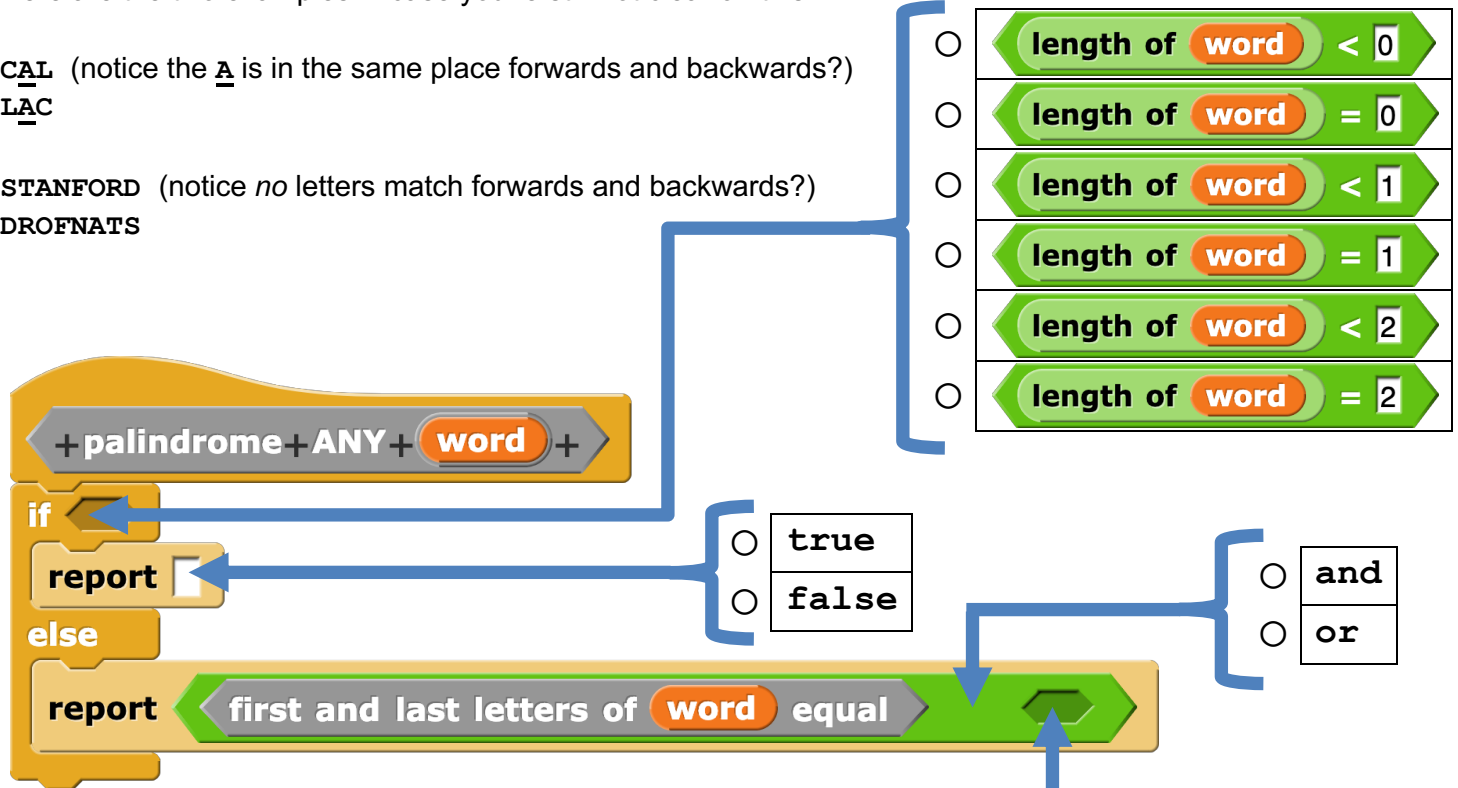
			This is impossible to achieve!
A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
B	<input type="radio"/>	<input type="radio"/>	
C	<input type="radio"/>	<input type="radio"/>	

Question 12: Why isn't the word *palindrome* a *palindrome*? Awww! (12 pts)

Palindromes are words which read the same backward as forward, e.g., OTTO, I and ANA. A better name for these words would be *PalindromeALL*, because ALL letters have to match backward and forward. We're interested in *PalindromeANY* words, in which ANY letters can match, e.g., OTTO, I, ANA, CAL (note the A in the middle matches both forwards and backwards) and REAR. You guessed it, STANFORD is not a *PalindromeANY* word, since no letters match forward and backwards. Fill in the 4 sets of "select ONE" options to write it. Here are the two examples in case you're still not clear on this:

CAL (notice the A is in the same place forwards and backwards?)
LAC

STANFORD (notice no letters match forwards and backwards?)
DROFNATS



- all but first letter of **palindrome ANY word**
- all but last letter of **palindrome ANY word**
- all but last letter of **all but first letter of palindrome ANY word**
- palindrome ANY** all but first letter of **word**
- palindrome ANY** all but last letter of **word**
- palindrome ANY** all but last letter of **all but first letter of word**

