CS 320 Exam 1 (10%) - Spring 2022

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Fill in these fields (left to right) on the scantron form (use pencil):

1. LAST NAME (surname) and FIRST NAME (given name), fill in bubbles
2. IDENTIFICATION NUMBER is your Campus ID number, fill in bubbles
3. Under A of SPECIAL CODES, write your lecture number, fill in bubbles. 1=8:50am, 2=11am
4. Under B of SPECIAL CODES, tell us about the nearest person (if any) to your left. 0=no person to the left in your row, 1=somebody you do not know is there, 2=somebody you do know is there.
5. Under C of SPECIAL CODES, do the same as B, but for the person to your right
6. **Under D of SPECIAL CODES, write 8 and fill in bubble 8**. This is very important!

Make sure you fill all the special codes above accurately in order to get graded.
You have 40 minutes to take the exam. Use a #2 pencil to mark all answers. When you're done, please hand in these sheets in addition to your filled-in scantron. You may not sit adjacent to your friends or other people you know in the class (having only one empty seat is considered "adjacent"). You may only reference your notesheet. You may not use books, your neighbors, calculators, or other electronic devices on this exam. Please place your student ID face up on your desk. Turn off and put away portable electronics now.

(Blank Page for You to Do Scratch Work)

Q1. Which of the following is NOT a feature of git?

(A) it automatically creates commits when files change
(B) it allows multiple version of history in the same repo
(C) it allows programmers to document the changes they made
(D) it sometimes automatically resolves conflicts

Q2. What is `x`?

```
class Fruit:
    def __init__(self, vals):
        self.vals = vals

    def __len__(self):
        return 4

    def __getitem__(self, lookup):
        return 1

obj = Fruit([5, 2, 3])
x = len(obj.vals) # careful!
```

(A) 1 (B) 2 (C) 3 (D) 4 (E) 5

Q3. Where is a `deque` most useful in BFS code?

(A) to track which nodes have been visited
(B) to track nodes to be visited in the future
(C) to store the path from source to destination

Q4. What type does `check_output` return?

(A) int (B) bytes (C) bool (D) str (E) utf8

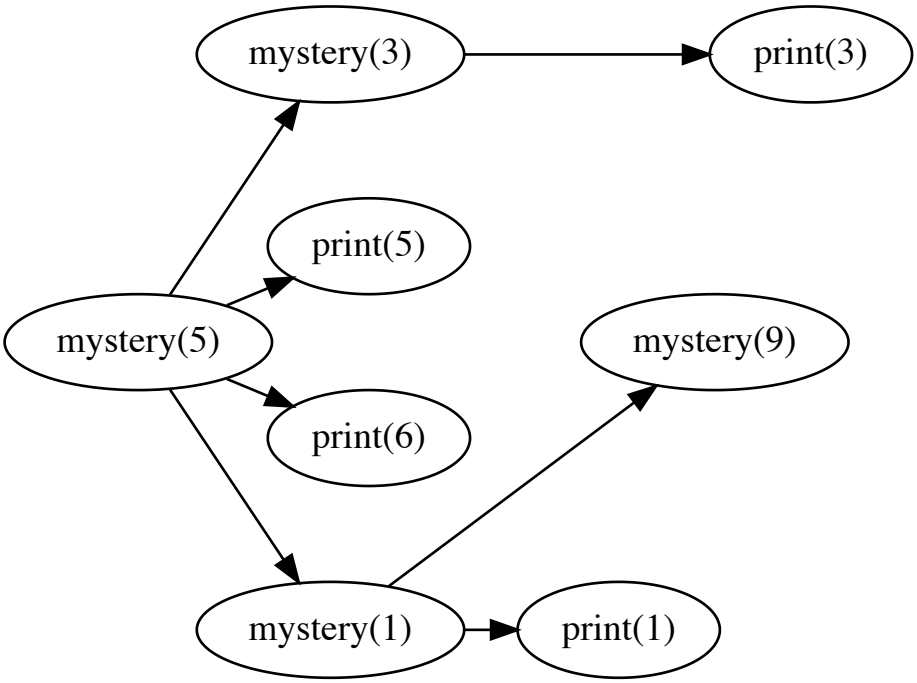
Q5. If a BST is constructed using the algorithm we learned in class, and the insert order is `[9, 14, 6, 3]`, where will `3` be?

(A) root.left.left (B) root.left.right (C) root.right.left (D) root.right.right

Q6. When trying to show that the function f(N) is inside the set O(g(N)), what are you NOT allowed to do when establishing an upper bound on f(N)?

(A) multiply g(N) by a constant factor
(B) only consider N values larger than some threshold
(C) only consider N values smaller than some threshold

Q7. Consider the below call graph drawn as somebody is tracing through a recursive function call, using the same technique demonstrated in the lecture. What is the LAST number printed?



(A) 1 (B) 3 (C) 5 (D) 6 (E) 9

Q8. What does `nums` contain after the following runs?

```
nums = []
def count(z):
    nums.append(z)
    if z < 7:
        count(z+1)
count(4)
print(nums)
```

(A) `[6, 5, 4]` (B) `[]` (C) `[7, 6, 5, 4]` (D) `[4, 5, 6]` (E) `[4, 5, 6, 7]`

Q9. What is printed?

```
vals = []
for item in [-1, 3, 1.5, 0, -5]:
    heapq.heappush(vals, item)
print(heapq.heappop(vals))
```

(A) `0` (B) `1.5` (C) `-1` (D) `-5`

Q10. Assume obj is an instance of some class and `obj.robo("R", 2)` succeeds. What might the definition line of `robo` look like?

(A) `def robo(self):`
(B) `def robo(self, x):`
(C) `def robo(x, y):`
(D) `def robo(x, y, z):`

Q11. Let N be the length of nums. The following code is O(N2). What optimization would make it be O(N)?**

```
nums = ... # hidden

def avg(values):
    return sum(values) / len(values)

big_nums = []
total = sum(nums)   # line 1
count = len(nums)   # line 2
for x in nums:
    if x > sum(nums) / len(nums):   # line 3
        big_nums.append(x)   # line 4
```

(A) delete lines 1 and 2
(B) line 3: replace "sum(nums)" with "total"
(C) line 3: replace "len(nums)" with "count"
(D) line 3: replace "sum(nums) / len(nums)" with "avg(nums)"
(E) line 4: replace the line with "print(x)"

Q12. What is the complexity of the following code, if N is the length of the list `L`? Choose the best answer.

```
for num in L: # TYPO ON EXAM (QUESTION THROWN OUT)
    threshold = min(L)
    if val <= 3 * threshold:
        print("oops!")
```

(A) $O(1)$ (B) $O(N)$ (C) $O(N^2)$ (D) $O(N^2+1)$ (E) $O(N^3)$

Q13. Code implementing the DFS algorithm typically keeps track of visited nodes. For what kind of graph could this tracking safely be removed?

(A) DAG
(B) weakly connected graph
(C) strongly connected graph

Q14. What does a Python interpreter do?

(A) translate from the instructions of one CPU architecture to instructions of a different CPU architecture
(B) translate Python code to CPU instructions
(C) translate CPU instructions to Python code

Q15. Suppose `b` is a Selenium WebDriver and that the following code runs without error. What can we guarantee about `y` and `z`?

```
w = "????" # an unknown string
x = b.find_element(by="id", value="some_element")
y = len(b.find_elements(by="tag name", value=w))
z = len(x.find_elements(by="tag name", value=w))
```

(A) y < z (B) y <= z (C) y == z (D) y >= z (E) y > z

Q16. When writing a class to be used like a Python `dict`, what special method is necessary?

(A) `__in__` (B) `__find__` (C) `__getitem__` (D) `__contains__` (E) `__subscript__`

Q17. For Selenium, "headless" means:

(A) the HEAD is not on a branch
(B) the elements do not have id's
(C) the web driver doesn't have a visible browser window
(D) `selenium` was installed with `pip`, but Chrome is not installed

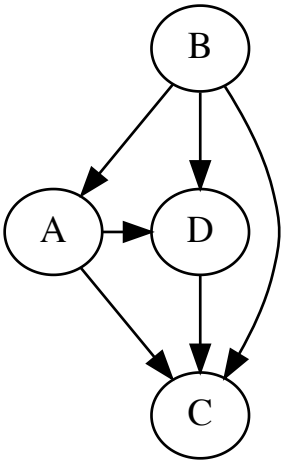
Q18. If HEAD is pointing to branch A and you run "git merge B", which branch(es) will point to the newly created commit? Assume that prior to the command, neither A nor B is an ascestor of the other.

(A) A only (B) B only (C) both A and B (D) none of the above

Q19. In order to use Python's built-in sorting capabilities, you must implement the `__gt__` special method.

(A) True (B) False

Q20. What can be said about the following graph?



(A) it is not acyclic and not strongly connected
(B) it is strongly connected but not acyclic
(C) it is acyclic but not strongly connected
(D) it is both strongly connected and acyclic