CS 320 Exam 2 (12%) - Spring 2022

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

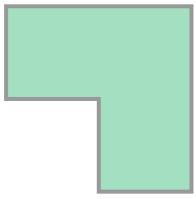
1. LAST NAME (surname) and FIRST NAME (given name), fill in bubbles
2. IDENTIFICATION NUMBER is your Campus ID number, fill in bubbles
3. Under A of SPECIAL CODES, write your lecture number, fill in bubbles. 1=8:50am, 2=11am
4. Under B of SPECIAL CODES, tell us about the nearest person (if any) to your 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 3 and fill in bubble 3**. 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. Turn off and put away portable electronics now. If multiple answers to a question are correct, choose the best answer.

(Blank Page for You to Do Scratch Work)

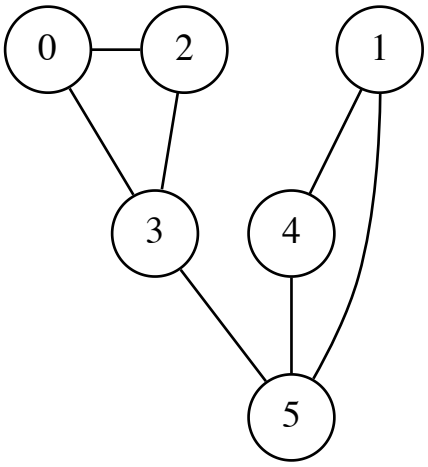
Q1. What could be added to the following code to produce the below shape?

```
from shapely.geometry import box, Point
x = box(0, 0, 2, 2)
y = box(1, 1, 3, 3)
```



(A) `x.union(y)` (B) `x.intersection(y)` (C) `x.difference(y)` (D) `y.difference(x)`

Q2. What is the order in which the nodes of the undirected graph are visited in a BFS starting from node 0? When you have the choice of two or more nodes, break ties by choosing the node with smaller value.

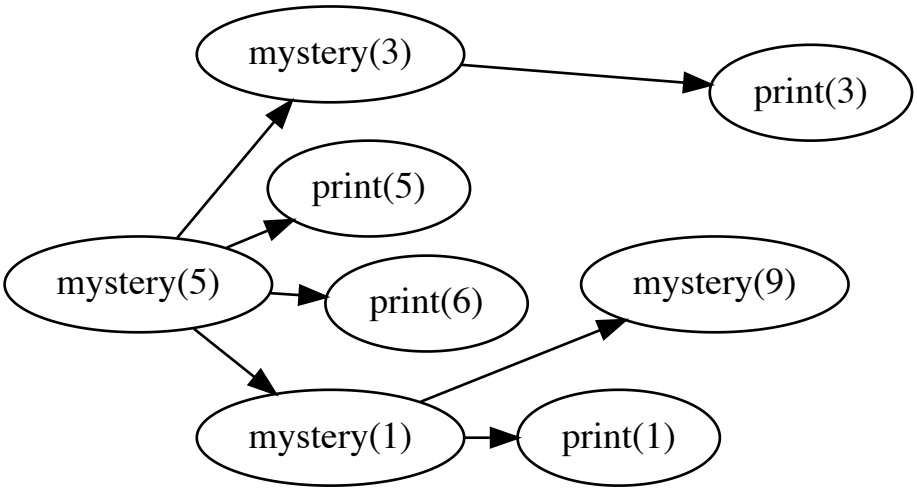


(A) [0, 2, 3, 5, 1, 4] (B) [0, 3, 2, 5, 1, 4] (C) [0, 3, 2, 5, 4, 1] (D) [0, 2, 0, 3, 5, 1, 4]

Q3. What components in matplotlib serve a function most similar to a coordinate reference system in geopandas?

(A) figures (B) patches (C) transformers (D) SpineBounds (E) AxesSubplots

Q4. 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 third number printed?



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

Q5. To get a copy of a GitHub repo on your VM, what git command do you need to use?

(A) cp (B) clone (C) create (D) curl (E) checkout

Q6. `fire` and `water` are GeoDataFrames with meter-based coordinate reference systems. You want to find the fire stations within 1 km of some water. What should replace the `????` parts, respectively?

```
fire[fire.????.intersects(water.????)]
```

(A) `unary_union`, `unary_union` (B) `buffer(1000)`, `unary_union`
(C) `unary_union`, `buffer(1000)` (D) `union`, `buffer(1000)`

Q7. Assume `robo` is an instance of some class and `robo.run("now")` succeeds. What might the definition line of `run` look like?

(A) `def run():` (B) `def run(x, y):` (C) `def run(x, y, z):` (D) `def run(this):`

Q8. Is the center of the text created by the following code within the region bounded by the ax subplot?

```
ax.text(-1, 0.5, "hi", transform=ax.transAxes, size=20, color="red",
        verticalalignment="center", horizontalalignment="center")
```

(A) definitely not (B) definitely (C) it depends on the xlim and ylim of the ax region

Q9. In complexity analysis, which statement about steps is true?

(A) a step may contain multiple lines of code
(B) all steps must take the same amount of time to execute
(C) a step's execution time never depends in any way on the input
(D) a piece of code containing a loop always consists of multiple steps

Q10. If a Flask app has the following handlers, what does it print when a user visits the home page in a browser?

```
@app.route("/")
def home():
    print("X")
    return '<html><body><img src="g"></body></html>'
@app.route("/example.svg")
def handler1():
    print("Y")
    return "TODO"
@app.route("/out.svg")
def g():
    print("Z")
    return "TODO"
```

(A) X only (B) X and Y (C) X and Z (D) X, Y, and Z

Q11. You want to create a model to predict a category. What kind of machine learning task is this?

(A) regression (B) classification (C) clustering (D) decomposition

Q12. In regular expressions, `^` is sometimes an anchor to the beginning of the string. When does it mean *NOT* instead? When it is ...

(A) escaped (B) inside `(` and `)` (C) at the end of a string (D) inside a character class

Q13. The DOM is a graph of elements on a page. What kind of graph is this? If multiple answers are correct, choose the most specific option that is true.

(A) DAG (B) Binary Tree (C) BST (D) Directed Graph

Q14. What URL should be visited to get back a page containing the letter "Z"? Careful!

```
@my320app.route("/W")
def X():
    return 'Y'

@my320app.route("/X")
def W():
    return 'Z'
```

(A) http://127.0.0.1:5000/W (B) http://127.0.0.1:5000/X
(C) http://127.0.0.1:5000/Y (D) http://127.0.0.1:5000/Z

Q15. What does a web browser check to determine what the file format is for a given resource?

(A) the page extension (B) the status code (C) the query string (D) the response header

Q16. If you're computing centroids of geographic regions in geopandas, you want a coordinate reference system in units of what?

(A) dots (B) meters (C) pixels (D) radians (E) degrees

Q17. Every non-leaf node in a binary search tree has exactly two children.

(A) True (B) False

Q18. Does the regular expression `r"a.+?\d"` match anything in the string `"dbc1Ba."`?

(A) yes (B) no

Q19. In the following code analyzing a contingency table from an A/B test, pvalue is 0.22. The threshold for significance is 0.2. Do we have statistically significant evidence that B has a different click-through-rate than A?

```
from scipy import stats

df = pd.DataFrame({
    "click":    {"A": ????, "B": ????},
    "no-click": {"A": ????, "B": ????},
})
_, pvalue = stats.fisher_exact(df)
```

(A) yes (B) no

Q20. Which of the following evaluates to `True`?

(A) `"\\" == r"\\"` (B) `"\\" == r"\\\\"` (C) `"\\\\" == r"\\"`