CS 320 Exam 3 (16%) - Fall 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 2 hours 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 turn off and put away portable electronics now.

If multiple answers are correct, choose the best answer (for example, the most informative one when doing complexity analysis).

(Blank Page for You to Do Scratch Work)

Q1. The HEAD in git CANNOT do which of the following?

(A) point to a branch that points to a commit
(B) point directly to a commit
(C) point to a tag that points to a commit

Q2. Complexity analysis is most concerned with which of the following?

(A) measuring how long a step will take to run once
(B) relating the number of steps executed to an input size
(C) counting how many steps will execute for a specific input
(D) identifying ways to write functions with fewer lines of code

Q3. If a BST is constructed using the algorithm we learned in class, and the insert order is `[9, 12, 4, 7]`, where will `7` be?

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

Q4. If you're computing centroids in geopandas, you want a coordinate reference system in units of what?

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

Q5. Your zip file is 2 megabytes (MB) and has a 2x compression ratio. How large are the uncompressed contents?

(A) 0.5 MB (B) 1 MB (C) 2 MB (D) 4 MB

Q6. For what kind of recursive function is it most useful to draw a call graph?

(A) functions that DO something (B) functions that RETURN something

Q7. 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

Q8. A process's address space contains:

(A) only code (B) only data (C) both code and data

Q9. Which vector is NOT in the column space of the following matrix?

```
[[-1 1],
 [ 0 2],
 [ 0 3]]
```

(A) `[[-1], [-2], [-3]]` (B) `[[0], [0], [0]]` (C) `[[1], [2], [2]]` (D) `[[0], [2], [3]]`

Q10. How many oranges are classified as apples, according to the following confusion matrix?

	apples	oranges	bananas
apples	83	99	49
oranges	18	82	58
bananas	51	45	88

(A) 18 (B) 81 (C) 99 (D) 117

Q11. If M is a numpy matrix representing a color image, how can you slice it to get one corner of the image to display with `plt.imshow`?

(A) `M[:100,-100:]` (B) `M[:100,100:]` (C) `M[100:,100:,:]` (D) `M[:"up left"]`

Q12. True/False: all DAGs are connected in some way (either strongly or weakly)

(A) True (B) False

Q13. `df` has 13 columns and 179 rows. After running the following, how many columns will `p.components_` have?

```
p = PCA(5)
p.fit(df)
```

(A) 5 (B) 13 (C) 65 (D) 179

Q14. What is `matrix.argmax(axis=0)`, where `matrix` is the following numpy array?

```
array([[50, 58, 60, 54],
       [53, 59, 55, 57],
       [51, 56, 61, 52]])
```

(A) [1 1 2 1] (B) [2 1 2] (C) [50 56 55 52] (D) [53 59 61 57] (E) [60 59 61]

Q15. With K-Means clustering, what are we usually hoping for?

(A) low inertia, few clusters
(B) low inertia, many clusters
(C) high inertia, few clusters
(D) high inertia, many clusters

Q16. What is something firewalls do often?

(A) block ports (B) host robots.txt (C) return 429 (D) check passwords

Q17. What does a web browser check to determine what the file format is for a given resource?

(A) the extension (B) the status code (C) the content type

Q18. True/False: geopandas (the version used in class this semester) raises an exception when you plot GeoDataFrames with different coordinate reference systems in the same axes area.

(A) True (B) False

Q19. What will `re.findall` give us for the pattern r"([AB])([BC])" and the text "ABC"?

(A) 0 matches
(B) 1 group containing 2 matches
(C) 1 group containing 4 matches
(D) 1 match containing 2 groups
(E) 2 matches, each containing 2 groups

Q20. What is a special method that context managers implement?

(A) `__context__` (B) `__eq__` (C) `__exit__` (D) `__len__` (E) `__lt__`

Q21. What are the bounds on possible values for `s`?

```
lr = LinearRegression()
lr.fit(train[xcols], train[ycol])
s = lr.score(test[xcols], test[ycol])
```

(A) 0 to infinity (B) -1 to 1 (C) -infinity to 1 (D) -infinity to infinity (E) 0 to 1

Q22. Which search algorithm visits all the children, then all the grandchildren, and so on?

(A) BFS (B) BST (C) DFS (C) DST (D) CGG

Q23. True/False: if `p` is a sklearn `Pipeline`, then `p.predict(X)` will call `.predict` on every stage of the pipeline.

(A) True (B) False

Q24. Each _____ has one instruction pointer

(A) program (B) process (C) thread (D) stack (E) heap

Q25. If `A=np.array([[2, 3], [6, 1]])` and `b=np.array([[4, 5]])`, what is `A*b`?

(A) `[[18,27],[54,9]]` (B) `[[23],[29]]` (C) `[[8,12],[30,5]]` (D) `[[8,15],[24,5]]`

Q26. The shape of `A` is (7, 3), the shape of `B` is (3, 1), and the shape of `C` is (1, 9). What is the shape of `A@B@C`?

(A) (1, 9) (B) (3, 1) (C) (7, 3) (D) (7, 9)

Q27. After `obj.fit(df1)`, you successfully call `obj.predict(df2)`. What could the type of `obj` possibly be?

(A) LinearRegression (B) LogisticRegression (C) KMeans (D) AgglomerativeClustering

Q28. In A/B testing, "CTR" an example of a(n) _____.

(A) factor (B) metric (C) cookie (D) treatment

Q29. What is the precision for oranges, given the following confusion matrix?

	apples	oranges	bananas
apples	3	5	2
oranges	1	2	1
bananas	1	3	3

(A) 0.2 (B) 0.5 (C) 2 (D) 4

Q30. If shapely shapes X and Y overlap, which expression produces the shape that covers the most area? Assume X is larger than Y.

(A) `X.intersection(Y)` (B) `Y.difference(X)` (C) `X.union(Y)` (D) `X.difference(Y)`