

CS 220 - Spring 2024  
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Exam 1 — 10%

(Last) Surname: \_\_\_\_\_ (First) Given name: \_\_\_\_\_

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Fill in these fields (left to right) on the scantron form (use #2 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 *ABC* of SPECIAL CODES, write your lecture number, fill in bubbles:  
001 - MWF 08:50 AM (Mike)  
002 - MWF 11:00 AM (Mike)  
003 - MWF 09:55 AM (Louis)  
004 - MWF 01:20 AM (Louis)
  4. Under **F** of SPECIAL CODES, write *A* and fill in bubble **6**
- 

**If you miss step 4 above (or do it wrong), the system may not grade you against the correct answer key, and your grade will be no better than if you were to randomly guess on each question. So don't forget!**

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You may only reference your note sheet. You cannot use books, your neighbors, calculators, or other electronic devices during this exam. Please place your student ID face up on your desk. Turn off and put away portable electronics (including smart watches) now.

Use a #2 pencil to mark all answers. When you're done, please hand in the exam, note sheet, and filled-in scantron form. The note sheet will not be returned.

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## General

1. Which of the following operators has the highest precedence?

- A. logical
- B. arithmetic
- C. relational
- D. They all have equal precedence

2. Consider the following variables and their values:

N=4

t=0

What will be the value of  $t$  after evaluating the following pseudocode?

1. If  $N$  is equal to 0 go to 5, otherwise continue to 2

2. Add  $N$  to the variable  $t$  and store the sum in  $t$

3. Subtract one from  $N$

4. Go to 1

5. Stop

A. 10

B. 0

C. 4

D. 9

3. What does the following expression evaluate to?

(3 > 1) and (not (4 != 4))

A. True

B. False

C. None

D. SyntaxError

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4. What will be the output of the following code snippet?

```
a = 0  
b = 5  
print(a / (b-5))
```

- A. 0
- B. ZeroDivisionError
- C. Infinity
- D. SyntaxError

5. What will the following expression evaluate to?

```
2 ** 4 ** 1/2
```

- A. 4.0
- B. 8.0
- C. 16.0
- D. 2.0

6. What will be the printed output of the following code?

```
seconds = 3845  
hours = seconds // 3600  
seconds = seconds % 3600  
minutes = seconds // 60  
seconds = seconds % 60  
print(hours, " ", minutes, " ", seconds)
```

- A. 1 60 0
- B. 1 64 5
- C. 1 4 5
- D. 245 1 0
- E. 1 5 4

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7. What will be the value stored in the variable `result` when the code below is executed?

```
def add3(x, y, z):
    print(x + y + z)
```

```
result = add3(1, 2, 3) ** 2
```

- A. 36
- B. 6
- C. 12
- D. None
- E. The code contains an error and will not run

8. What will be the printed output of the following code?

```
n = 8
while n >= 3:
    n -= 1
print(n)
```

- A. 2
- B. 8
- C. 3
- D. 4

9. What will be the printed output of the following code?

```
num = 19.74812
rounded1 = round(num, ndigits=2)
rounded2 = num * 100 // 1 / 100
print(rounded1 == rounded2)
```

- A. True
- B. False
- C. The code will not run due to a SyntaxError
- D. The code will not run due to a NameError

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10. What will be the printed output of the code below?

```
def customLoop(start, end, delta):
    current = start
    while current < end:
        current *= delta
    print(current)

customLoop(1, 3, 0.1)

A. 3.0
B. 0.3
C. 1.1
D. 1.0
E. This code will cause an infinite loop
```

11. What will be the printed output of the following code?

```
i = 1
result = 0
while i <= 4:
    j = 0
    while j < i:
        if j % 2 == 0:
            j += 1
            continue
        result += j
        j += 1
    i += 1
print(result)
```

- A. 0
- B. 2
- C. 4
- D. 6
- E. 10

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12. What will be the printed output of the following code?

```
print("$" * 3, "@" * 4, sep = "\t", end = "")
```

- A. \$\$\$\t@@@@\\"
- B. \$\$\$\t@@@@@"
- C. \$\$\$ @@@@\\"
- D. \$\$\$ @@@@@"
- E. The code contains an error and will not run

13. Which of the following answer choices best describes the return value of the following function?

```
def function(a, b, c):  
    x = a  
    if (x < b):  
        x = b  
    if (x < c):  
        x = c
```

- A. Returns the maximum number between a, b, and c
- B. Returns the minimum number between a, b, and c
- C. Returns the value of a
- D. Returns None

14. In the code snippet below, what kind of arguments are passed to each of the respective parameters in the function call on Line 4?

```
def foo(a,b,c=0): # LINE 1  
    return a+b+c # LINE 2  
                # LINE 3 (empty)  
foo(1, b=2, c=3) # LINE 4
```

- A. positional, positional, positional
- B. positional, positional, keyword
- C. keyword, keyword, default
- D. default, positional, default
- E. None of the above

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15. What will be the printed output of the code snippet below?

```
def foo(b,c):
    a = d+b
    c = 5

a=1
b=2
d=1

foo(a,b)
print(a, " ", b)
```

- A. 1 2
- B. 2 2
- C. 2 5
- D. 3 5
- E. This code will not run

16. Which of the following answer choices when used to replace the ??? in the code below will make the code print 0?

```
x = 7

if ???:
    print(1)
else:
    print(0)
```

- A.  $x < 9$
- B.  $x \% 2 == 0$
- C.  $x + 1 == 6$
- D. Both B and C
- E. None of the above

---

17. The following function has been provided:

```
def my_conditional(b1, b2):  
    if b1:  
        if not b2:  
            return True  
        else:  
            return False  
    else:  
        return True
```

Which of the following answer choices when used to replace the ??? in the function below will make the function `refactored` work the same as `my_conditional`?

```
def refactored(b1, b2):  
    return ???
```

- A. `(not b1) or b1 or not b2`
- B. `not b1 or (b1 and not b2)`
- C. `b2 or (not b1 and not b2)`
- D. `b1 and b2`
- E. A, B, and C

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## Madison City Budget

For the following questions, you can assume that all member functions of the project module are correctly defined and will behave exactly as they did in P3.

18. Which of the following answer choices when used to replace the ??? in the code below will make the function return the average budget for a given agency from 2020 through 2022?

```
def agency_average(agency):
    agency_id = project.get_id(agency)
    budget_2020 = project.get_budget(agency_id, 2020)
    budget_2021 = project.get_budget(agency_id, 2021)
    budget_2022 = project.get_budget(agency_id, 2022)
    return ???
```

- A.  $\max(\text{budget\_2020}, \text{budget\_2021}, \text{budget\_2022}) - \min(\text{budget\_2020}, \text{budget\_2021}, \text{budget\_2022})$
  - B.  $\text{mean}(\text{budget\_2020}, \text{budget\_2021}, \text{budget\_2022})$
  - C.  $\text{sum}(\text{budget\_2020}, \text{budget\_2021}, \text{budget\_2022}) / 3$
  - D.  $(\text{budget\_2020} + \text{budget\_2021} + \text{budget\_2022}) / 3$
  - E. All of the above
19. Assume the average budget for Public Health between years 2020 and 2024 is stored in the variable avg\_public\_health and the budget for Public Health for 2023 is stored in the variable public\_health\_2023. How would you calculate the percentage difference of 2023's budget from the average?
- A.  $(\text{avg\_public\_health} - \text{public\_health\_2023}) / \text{public\_health\_2023} * 100$
  - B.  $\text{public\_health\_2023} - \text{avg\_public\_health}$
  - C.  $\text{diff}(\text{public\_health\_2023}, \text{avg\_public\_health})$
  - D.  $(\text{public\_health\_2023} - \text{avg\_public\_health}) / \text{avg\_public\_health} * 100$
  - E. Both A and D

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20. Assume that the function `year_min(year)` has been defined and will return the lowest budget of any agency in a given year. Which of the following code snippets will return the lowest budget of any agency for the years from 2020 through 2022?

- A. `min(project.get_budget(year_min(2020)), project.get_budget(year_min(2021)), project.get_budget(year_min(2022)))`
- B. `min(2020, 2021, 2022)`
- C. `min(year_min(2020), year_min(2021), year_min(2022))`
- D. `min(project.get_budget(2020), project.get_budget(2021), project.get_budget(2022))`

21. Consider the code below:

```
def change_per_year(agency, start_year=2020, end_year=2024):  
    agency_id = project.get_id(agency)  
    budget_start_year = project.get_budget(agency_id, start_year)  
    budget_end_year = project.get_budget(agency_id, end_year)  
    budget_difference = budget_end_year - budget_start_year  
    average_change = budget_difference / (end_year - start_year)  
    return average_change  
  
x = change_per_year('Fire', 2021, 2023)  
y = change_per_year('Fire', 2023, 2021)
```

Which of the following will evaluate to True?

- A. `x == y`
- B. `x > y`
- C. `x < y`
- D. `x == -y`
- E. Both B and D

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## Pokemon

22. What is the output of the following code?

```
def damage(phys_atk, spec_atk, phys_def, spec_def):  
    phys_dmg = 10 * (phys_atk - phys_def)  
    spec_dmg = 11 * (spec_atk / spec_def)  
    return max(phys_dmg, spec_dmg)  
  
dmg = damage(5, 4, spec_def=2, phys_def=1)  
print(dmg)
```

- A. 40
- B. 22
- C. 30
- D. 55
- E. None of the above

23. What is the output of the following code?

```
def type_bonus(atk_vs_def_1, atk_vs_def_2=None):  
    bonus = atk_vs_def_1  
    if atk_vs_def_2 == None:  
        return bonus  
    return bonus * atk_vs_def_2  
  
bonus = type_bonus(atk_vs_def_2=0.5, atk_vs_def_1=2)  
print(bonus)
```

- A. 0.5
- B. 1.0
- C. 2.0
- D. The code has error and will not run
- E. None of the above

---

24. What is the output of the following code?

```
def battle_ratio(hp1, effective_dmg1, speed1, hp2, effective_dmg2, speed2):
    dps1 = effective_dmg1 * speed1
    dps2 = effective_dmg2 * speed2
    if dps1 == 0 and dps2 == None:
        return None
    elif dps1 == None:
        return 0
    elif dps2 == 0:
        return 999
    ratio = (hp1/dps2) / (hp2/dps1)
    return ratio

ratio = battle_ratio(10, 2, 2, 8, 5, 1)
print(ratio)
```

- A. None
  - B. 0.0
  - C. 999.0
  - D. 1.0
  - E. 1.5625
25. What is the output of the below code?

```
def friendship(same_region, stat_diff, first_type1, first_type2,
               second_type1, second_type2):
    return (abs(stat_diff)<20) + same_region + (first_type1==second_type1) +
           (first_type2==second_type2 and second_type2!="DNE")

friend_score = friendship(same_region=True, -10, "DNE", "Fire", "DNE", "DNE")
print(friend_score)
```

- A. 1
- B. 2
- C. 3
- D. 4
- E. The code has error(s) and will not run

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## Snake

Reference the following code for the next 5 questions. The draw function **attempts** to print a Snake and Mouse game ('S' represents positions occupied by the snake, 'M' represents the position of the mouse, and '.' represents empty space).

```
def draw(x, y, rows=5, cols=6):          # Line 1
    for i in range(rows):                 # Line 2
        for j in range(cols):             # Line 3
            if i == x and j == y:         # Line 4   print M
                print("M", end="")
            elif i % 5 == 0 or i % 5 == 3: # Line 6   full row of S
                print("S", end="")
            elif i % 5 == 2 and j == 0:    # Line 8   left S
                print("S", end="")
            elif i % 5 == 4 and j == cols-1: # Line 10  right S
                print("S", end="")
            else:                         # Line 12  print .
                print(".", end="")
    print()                                # Line 14
```

draw(1,1,9,9) produces the following output:

```
SSSSSSSSS
.M.....
S.....
SSSSSSSSS
.....S
SSSSSSSSS
.....
S.....
SSSSSSSSS
```

26. Which of the following calls will produce a 5x5 grid with the mouse at the third line and the third column?
- A. draw(2, 2, 6, 6)
  - B. draw(2, 2, 5, 5)
  - C. draw(3, 3, 6, 6)
  - D. draw(3, 3, 5, 5)

- 
27. Which of the following function calls will print a grid that does not have a row with a \*\*single\*\* 'S' at the right end of a line? Note that single 'S' means that there is only one 'S' in that line. For example: '..M..S'
- A. draw(2, 2, 4, 6)
  - B. draw(1, 1, 5, 4)
  - C. draw(2, 3, 6, 4)
  - D. draw(5, 4, 6, 6)
28. What is the purpose of the condition on Line 10?
- A. To print "S" in the rightmost column of every fifth row.
  - B. To print "S" in the rightmost column of the last row.
  - C. To print "M" in the rightmost column of every fifth row.
  - D. To print "S" in the rightmost column of the second-to-last row.
29. How many times is Line 12 evaluated when draw(1,3,4,4) is called?
- A. 1
  - B. 2
  - C. 4
  - D. 6
  - E. 8
30. Which of the following is NOT a valid function call?
- A. draw(x=1,y=1)
  - B. draw(x=20,y=25)
  - C. draw(x=1,y=1,4,4)
  - D. draw(x=1,y=5,rows=4,cols=4)
  - E. draw(1,1,cols=2)

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