

CS 220 - Fall 2023  
Instructors: Mike Doescher, Gurmail Singh, and Cole Nelson

Exam 1 — 10%

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

NetID (email): \_\_\_\_\_ @wisc.edu

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 01:20 PM (Gurmail)
  - 004 - MWF 03:30 PM (Gurmail)
  - 005 - MWF 08:50 AM (Cole)
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!**

---

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.

---

## General

1. Diablo wants to buy a jacket. They want a colorful and thick jacket or a plain and thin jacket. Please select the Boolean expression that reflects their preferences. You can assume that `colorful` and `thin` are correctly initialized variables with Boolean values.
  - A. `(colorful and thin) or (colorful and not thin)`
  - B. `(colorful and not thin) and (not colorful and thin)`
  - C. `(colorful and not thin) or (not colorful and thin)`
  - D. `(not colorful and not thin) or (colorful and thin)`
  - E. `(colorful and not thin) or (not colorful and not thin)`
2. Which of the following code snippets will produce this output:

```
220      is "awesome"
```

Please note that the spaces between “220” and “is” is equivalent to one tab.

- A. `print("220\tis \t\"awesome\"")`
- B. `print("220/nis /\"awesome/\"")`
- C. `print("220\nis 'awesome'")`
- D. `print("220/tis /\"awesome/\"")`

The following functions have been defined for you:

```
def is_div_seven_not_five(num):
    if num % 5 == 0:
        return False
    if num % 7 == 0:
        return True
    return False

def has_div_seven_not_five(start, end):
    found = False
    num = start
    while num <= end:
        if is_div_seven_not_five(num):
            found = True
            break
        num += 1
    print("num =", num)
    return found
```

---

3. Which of the following statements will be TRUE after the function call `has_div_seven_not_five(33, 43)`?

- A. `num = 35` will be printed
- B. `num = 42` will be printed
- C. `num = 43` will be printed
- D. This code will cause an infinite loop

Suppose that the function `has_div_seven_not_five` has been redefined as follows:

```
def has_div_seven_not_five(start, end):  
    found = False  
    num = start  
    while num <= end:  
        if is_div_seven_not_five(num):  
            found = True  
            continue  
        num += 1  
    print("num =", num)  
    return found
```

4. Which of the following statements will be TRUE after calling the redefined function as follows: `has_div_seven_not_five(33, 43)`?

- A. `num = 25` will be printed
- B. `num = 41` will be printed
- C. `num = 42` will be printed
- D. `num = 43` will be printed
- E. This code will cause an infinite loop

5. Which of the following snippets of Python code represents the correct way of checking if 3 squared is equal to 9 or 6?

- A. `3**2==9 or 6`
- B. `3^2==9 or 3^2==6`
- C. `3**2==9 or 3**2==6`
- D. `3**2=9 or 3**2=6`

---

6. What does the following expression evaluate to?

`False or not 7 + 8**2 / 4 > 20 and 5+3==7`

- A. True
- B. False
- C. None
- D. SyntaxError

7. What will be the output of the following Python code?

```
print(int(round(float("36.54719"),2)))
```

- A. 36
- B. 36.54
- C. 36.55
- D. 37
- E. None of the above

8. What will be printed after running the following Python code?

```
def printing(A, B, C = "5"):  
    A = A + B  
    print(A + B, end="")  
    return None  
    print(C, end="")
```

```
A = "5"  
B = "3"  
printing(A, B, "2")
```

- A. 532
- B. 53
- C. 5332
- D. 533
- E. The code will throw an error

---

9. What will be printed after running the following Python code?

```
def addition(A, B=3, C=5):  
    A = A + B  
    C = A - B  
    return C  
  
A = 5  
D = addition(A, C=2)  
print(D)
```

- A. 5
- B. 9
- C. 7
- D. 6
- E. 2

10. What will be printed after running the following Python code?

```
def concatenate_str(str1, str2 = "Mike"):  
    str1 = "Hello"  
    return str1 + str2  
  
def print_with_exclamation(str1):  
    print(str1 + "!")  
  
A = "How are you "  
B = "Nancy"  
C = concatenate_str(A, B)  
print_with_exclamation(C)
```

- A. How are you Nancy!
- B. Hello!
- C. How are you Mike!
- D. HelloNancy!
- E. Hello Mike!

---

The following function will be used for the next 2 questions:

```
def is_divisible(x,y):
    if y == 0:
        return "division by zero not allowed"
    elif x % y == 0:
        return True
    else:
        print("not divisible")
    return False
```

11. What will be the return value of `is_divisible(10,4)`?

- A. True
- B. False
- C. None
- D. division by zero not allowed
- E. not divisible

12. What will be the return value of `is_divisible(0,0)`?

- A. True
- B. False
- C. None
- D. division by zero not allowed
- E. not divisible

The following function will be used for the next 2 questions:

```
def check_conditions(a,b,c,d):
    if a:
        if not b and not c:
            return True
        else:
            return False
    elif b or c:
        if not a and not b:
            return True
    else:
        print("default")
    return b
```

---

13. What will be the return value of `check_conditions(True,True,False,False)`?

- A. default
- B. None
- C. True
- D. False

14. What will be the return value of `check_conditions(False,True,True,False)`?

- A. default
- B. None
- C. True
- D. False

15. How many times will `Hello!` be printed after running the following code?

```
i=-4
while i<0:
    print("Hello!")
    if i<-2:
        i+=1
    else:
        i+=2
```

- A. 2
- B. 3
- C. 4
- D. 5
- E. 6

---

## Madison City Budget

Consider the following dataset, helper functions, and the function `interpolate` when answering the following questions. The implementation of `get_year_budget(agency_id, year_str)` is not given, but it will return the a float from the below table associated with the int `agency_id` and string `year_str` passed to it. For example, `get_year_budget(27, "2019")` evaluates to 14.21.

| id | 2019  | 2020  | 2021  | 2022  | 2023  |
|----|-------|-------|-------|-------|-------|
| 25 | 14.23 | 14.73 | 15.58 | 15.53 | 16.00 |
| 27 | 14.21 | 8.55  | 8.50  | 9.12  | 2.00  |

```
def get_year_budget(agency_id, year_str):
    ...

def get_id(agency):
    """Gets the id of an agency, given a string with its name."""
    if agency == "Parks":
        return 25
    else:
        return 27

def interpolate(agency, target_year_str, start_year_str="2020",
                end_year_str="2022"):
    start_year = int(start_year_str)
    target_year = int(target_year_str)
    end_year = int(end_year_str)
    agency_id = get_id(agency)
    starting_budget = get_year_budget(agency_id, start_year_str)
    final_budget = get_year_budget(agency_id, end_year_str)

    change_per_year = (final_budget - starting_budget) / (end_year - start_year)

    if target_year < start_year:
        return starting_budget
    elif target_year > end_year:
        return final_budget
    return starting_budget + change_per_year * (target_year - start_year)
```



- 
16. In Python, what will `type(get_year_budget(get_id("Parks"), "2020"))` evaluate to?
- A. `int`
  - B. `bool`
  - C. `float`
  - D. `str`
17. Which of the following function calls has a different return value from the others?
- A. `interpolate("Metro Transit", "2021", start_year_str="2020", end_year_str="2022")`
  - B. `interpolate("Metro Transit", "2021", end_year_str="2022")`
  - C. `interpolate("Metro Transit", "2021", start_year_str="2020")`
  - D. `interpolate("Metro Transit", "2021")`
  - E. `interpolate("Metro Transit", "2020", end_year_str="2022")`
18. What will be returned by `interpolate("Parks", "2019", start_year_str= "2020", end_year_str = "2022")`?
- A. 14.23
  - B. 14.21
  - C. 15.58
  - D. 14.73
  - E. None of the above
19. What will be returned by `interpolate("Metro Transit", "2022", start_year_str="2021", end_year_str="2023")`?
- A. 9.12
  - B. 1.68
  - C. 5.25
  - D. 10.36

---

## Pokemon

20. Please select the function body that, when used to replace the ... correctly implements the `num_hits` function shown below. Keep in mind that a Pokémon faints when its HP reaches zero. For instance, if the defending Pokémon has 50 HP and the attacking Pokémon does 20 effective damage each turn, it will take 3 turns before the defender faints. Assume `get_hp` and `effective_damage` work correctly.

```
def num_hits(attacker, defender):
```

```
    ...
```

- A. `return project.get_hp(attacker) / effective_damage(attacker, defender)`
- B. `return math.floor(project.get_hp(attacker) / effective_damage(attacker, defender))`
- C. `return math.ceil(project.get_hp(defender) // effective_damage(attacker, defender))`
- D. `return project.get_hp(defender) % effective_damage(attacker, defender)`
- E. `return math.ceil(project.get_hp(defender) / effective_damage(attacker, defender))`

---

Below are function definitions for `get_stat_total` and `friendship_score`:

```
def get_stat_total(pkmn):
    stat_total = project.get_attack(pkmn) + project.get_defense(pkmn)
    stat_total += project.get_sp_atk(pkmn) + project.get_sp_def(pkmn)
    stat_total += project.get_hp(pkmn) + project.get_speed(pkmn)
    return stat_total

def friendship_score(pkmn1, pkmn2):
    friendship = 0
    pkmn1_region = project.get_region(pkmn1)
    pkmn2_region = project.get_region(pkmn2)

    if pkmn1_region == pkmn2_region:
        friendship += 1

    if project.get_speed(pkmn1) == project.get_speed(pkmn2):
        friendship += 1

    if abs(get_stat_total(pkmn1) - get_stat_total(pkmn2)) <= 100:
        friendship += 1

    pkmn1_type1 = project.get_type1(pkmn1)
    pkmn1_type2 = project.get_type2(pkmn1)
    pkmn2_type1 = project.get_type1(pkmn2)
    pkmn2_type2 = project.get_type2(pkmn2)

    if pkmn1_type1 == pkmn2_type1:
        if pkmn1_type2 != "DNE" and pkmn1_type2 == pkmn2_type2:
            friendship += 3
        else:
            friendship += 1
    elif pkmn1_type2 != "DNE" and pkmn1_type2 == pkmn2_type2:
        friendship += 1

    return friendship
```

- 
21. What is the output of `friendship_score("Voltorb", "Zapdos")`? The stats of both Pokemon are shown below:

| Voltorb         | Zapdos          |
|-----------------|-----------------|
| HP: 40          | HP: 90          |
| Attack: 30      | Attack: 90      |
| Defense: 50     | Defense: 85     |
| Sp. Atk: 55     | Sp. Atk: 125    |
| Sp. Def: 55     | Sp. Def: 90     |
| Speed: 100      | Speed: 100      |
| Type1: Electric | Type1: Electric |
| Type2: DNE      | Type2: Flying   |
| Region: Kanto   | Region: Kanto   |

- A. 0
- B. 1
- C. 2
- D. 3
- E. 4

Here is an incomplete function that compares the speed of two Pokemon and tries to determine which is faster:

```
def compare_speed(pkmn1, pkmn2):  
    if project.get_speed(pkmn1) ... project.get_speed(pkmn2):  
        return pkmn1  
    elif project.get_speed(pkmn2) ... project.get_speed(pkmn1):  
        return pkmn2  
    elif project.get_speed(pkmn1) ... project.get_speed(pkmn2):  
        return "Draw"  
    else:  
        print("Can't compare speeds")  
        return None
```

22. Which of the following combinations of operators correctly fill in the areas with ... so that the function will return the name of the faster Pokemon or "Draw" if they have the same speed stat?

- A. >,<==
- B. ==,>,<
- C. >,>==
- D. <,>==
- E. <,<==

---

Below are the inputs and outputs of the battle function:

| pkmn1     | pkmn2     | Winner    |
|-----------|-----------|-----------|
| Bulbasaur | Charizard | Charizard |
| Bulbasaur | Squirtle  | Bulbasaur |
| Charizard | Squirtle  | Charizard |
| Charizard | Wartortle | Charizard |
| Wartortle | Bulbasaur | Wartortle |
| Wartortle | Squirtle  | Wartortle |

In addition, the following functions have been defined for you:

```
def is_surprise_winner(pkmn):
    if(pkmn=="Charizard"):
        return False
    return True

def pokemon_fight (pkmn1, pkmn2="Charizard", pkmn3="Squirtle"):
    winner_battle_1 = battle(pkmn1, pkmn2)
    winner_battle_2 = battle(pkmn2, pkmn3)
    if winner_battle_1 == winner_battle_2:
        print(winner_battle_1 + " wins both!")
        return winner_battle_1

    absolute_winner = battle(winner_battle_1, winner_battle_2)
    if is_surprise_winner(absolute_winner):
        print(absolute_winner + " is the surprise winner.")
    else:
        print(absolute_winner + " is the absolute winner.")
    return absolute_winner
```

23. What will be printed when calling `pokemon_fight()`?
- A. Charizard wins both!
  - B. Squirtle wins both!
  - C. Charizard is the absolute winner.
  - D. An error will be thrown
  - E. Squirtle is the surprise winner.

---

24. What will be printed when calling `pokemon_fight("Wartortle", "Bulbasaur")`?

- A. Squirtle is the absolute winner.
- B. Wartortle is the surprise winner.
- C. Bulbasaur wins both!
- D. Bulbasaur is the surprise winner.
- E. Charizard wins both!

---

# Snake

The following function has been defined for you:

```
def draw(X, Y, rows = 5):  
    for i in range(rows):  
        if X == i:  
            j = 0  
            while j < 5:  
                if Y == j:  
                    print("M", end = "")  
                elif i%4 == 0 or i%4 == 2:  
                    print("S", end = "")  
                elif i%4==1 and j==0:  
                    print("S", end="")  
                elif i%4==3 and j==4:  
                    print("S", end = "")  
                else:  
                    print(".", end = "")  
                j = j + 1  
            elif i % 2 == 0:  
                print("SSSSS", end="")  
            elif i % 4 == 1 :  
                print("S....", end="")  
            elif i % 4 == 3:  
                print("....S", end="")  
            elif i % 2 != 0:  
                print(".....", end="")  
            print()  
#Line 1  
#Line 2  
#Line 3  
#Line 4  
#Line 5 (print the M)  
#Line 6  
#Line 7 (full row)  
#Line 8  
#Line 9 (left S)  
#Line 10  
#Line 11 (right S)  
#Line 12  
#Line 13 (otherwise)  
#Line 14  
#Line 15  
#Line 16  
#Line 17 (full snake)  
#Line 18  
#Line 19 (left S)  
#Line 20  
#Line 21 (right S)  
#Line 22  
#Line 23 (empty row)  
#Line 24
```

25. What function call will create the following grid?

```
SSSSS  
S....  
SSSSS  
....S  
SSSSS  
S..M.
```

- A. draw(3, 5)
- B. draw(5, 3, rows=6)
- C. draw(5, rows=6)
- D. draw(4, 2)

---

26. What function call should we use to get the following grid?

```
SSSSS
S....
SSSSS
```

- A. `draw(0, 1, rows=3)`
- B. `draw("0", "1")`
- C. `draw("0", "1", rows=3)`
- D. None of the above

27. Which of the following function calls will throw an error?

- A. `draw(2, -1, rows=2)`
- B. `draw("0", "B")`
- C. `draw(0, 1, rows=0)`
- D. `draw(0, 1, "3")`

28. Where would the function call `draw(5,5,5)` print the "M"?

- A. The fourth character of the third row.
- B. The third character of the fourth row.
- C. The fifth character of the fifth row.
- D. "M" will not be printed out.

29. What datatype does the following code snippet evaluate to?

```
i%4==3 and j==0
```

- A. `int`
- B. `bool`
- C. `float`
- D. `str`



---

30. How many times will the print function be called during the function call `draw(3,4,5)`?

- A. 12
- B. 13
- C. 14
- D. 15

---

**Blank Page: this page is intentionally blank**