

Computer Science Mock Midterm

1. Consider the following document in the vim editor:

```
print("Hello, Wrld!")  
~  
~  
~  
~
```

... where **|** is your cursor location. Assuming vim is in INSERT MODE, what key sequence can a user efficiently use to navigate and correct the print error WITHOUT using the arrow keys:

- a) Esc, K, K, K, K, K, I, o
 - b) I, L, L, L, L, L, Esc, o
 - c) N, J, J, J, J, J, I, o
 - d) Esc, H, H, H, H, H, I, o
 - e) N, H, H, H, H, H, I, o
2. Consider the following program:

```
x = 16  
y = 8  
z = x / y  
print(type(z))
```

What will this program output in the console?

- a) class:int
 - b) <class 'int'>
 - c) class:float
 - d) <class 'float'>
 - e) 2
 - f) "2"
 - g) "x / y"
 - h) "16 / 8"
 - i) Nothing: the code contains an error
3. Consider the following program:

```
midterm_grades = [80, 70, 90]  
final_exam_grades = [60, 90, 90]  
  
print(midterm_grades[1:2] + final_exam_grades[1:2])
```

What will this program output in the console?

- a) 80, 70
- b) [80, 70]
- c) 160
- d) [160]
- e) 70, 90
- f) [70, 90]
- g) Nothing: the code contains an error.

4. Which of the following statements is NOT true?
- a) Python is a programming language that is computed & executed line by line
 - b) The “else:” code block will be skipped if the “if :” condition is True
 - c) To upload a change in a file using git, we can use the “git push –force” command
 - d) To display the contents of a file in the terminal, we can use the “cat” command
 - e) To save and quit a document after editing it with vim, we use the function “:sq”
 - f) None of the above
5. Trace the following expression:

```
x = "SF1"
y = "Dawson"
z = x + y

a = len(x) != len(y) and x != z and bool(y and not True)
```

6. Trace the following expression:

```
t = 3
u = 0.8

a = int(t / u) == t and u != t
```

7. Trace the following expression:

```
h = "Hello"
w = "World!"
c = ", "
def salutation(x: str, y: str) -> str:
    return x + y

a = salutation(h, c) + w
```

8. Write a function that calculates the amount of money that a company must pay a freelancer for their work each month. Assume there are 8 hours a day and 22 working days in a month, and a discount may be applied.

Inputs: a float of hourly wage and a float discount (in form of 25.0).

Output: the amount to be paid by the company.

9. Complete the function to determine whether you should upgrade the model of your phone. The phone costs \$1500.

You should only upgrade if:

- Your remaining bank balance will be greater than \$2000
- Your phone is more than 4 years old
- You have a job

```
def should_upgrade(bank_balance: float, age: float, have_job: bool) -> bool:
```

10. Complete the function to calculate the resultant vector of 3 vectors. Each vector starts at the end of the last vector and the first vector begins at the origin.

Each vector will be a list of size two in the following format: [x_comp, y_comp]

Ex: vec1 is [1, 5], vec2 is [-3, 2] and vec3 is [4, -8]

The resultant vector is calculated by adding the x-component of each vector and adding the y-component of each vector together so that the final form is another vector.

Your solution must make use of a function that will accept an index as an argument and return the sum of each vector's component at that index.

```
def calc_resultant(vec1: list[int], vec2: list[int], vec3: list[int]) -> list[int]:
```

Bonus 1. Calculate the magnitude of the resultant vector from the previous question.

$$\text{Magnitude} = \sqrt{x^2 + y^2}$$

where x is `x_comp` and y is `y_comp`. You can use the `sqrt` function through the `math.sqrt(x: float)` function in Python.

```
def calc_magnitude(resultant: list[int]) -> float:
```

Bonus 2. Calculate the angle of the resultant vector from the previous question.

$$\theta = \arctan\left(\frac{|y|}{|x|}\right)$$

where x is `x_comp` and y is `y_comp`. You can use the `arctan` function through the `math.degrees(math.atan(x: float))` function in Python.

Then adjust the angle according to the following cases:

- $x \geq 0$ and $y \geq 0$: do nothing
- $x < 0$ and $y \geq 0$: $180 - \theta$
- $x < 0$ and $y < 0$: $180 + \theta$
- $x \geq 0$ and $y < 0$: $360 - \theta$

```
import math
```

```
def calc_angle(resultant: list[int]) -> float:
```

Bonus 3. What Linux distro do programmers use to flex on other programmers?