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15-112 Fall 2024 Quiz 2

Up to 25 minutes. No calculators, no notes, no books, no computers. Show your work!
Do not use loops, strings, lists, tuples, dictionaries, try/except, or recursion on this quiz.

1. **Code Tracing:** Indicate what the following two programs print. Place your answers (and nothing else) in the boxes below the code.

(a) (4 points) CT1

```
def f(x, y):  
    z = 3 + x * y  
    print(z)  
    x += y  
    y += z  
    x // 5  
    print(x, y)  
    return z / x
```

```
x = 5  
y = 6  
print(f(y, x))  
print(x, y)
```

(b) (5 points) CT2

```
def h(x, y, z, r):  
    print("A1", r, x + y + z)  
    return z == x + y  
  
def g(a, b, c):  
    res = 0  
    if a == b and h(a, b, c, res):  
        res += 2  
    elif h(c, b, a, res):  
        res += 7  
    if a == b or h(c, b, a, res):  
        res += 11  
    print(res)
```

```
g(5, 5, 10)  
print(g(3, 2, 1))
```

2. (5 points) **Free Response:** Similar Colors

For the purposes of this problem we will consider two colors as *similar* if, when their RGB values are represented in 3D space, the distance between the two colors is less than 20.

Consider the following:

- When we say “RGB values are represented in 3D space” what we mean is that the R value is mapped to the X-axis, the G value is mapped to the Y-axis, and the B value is mapped to the Z-axis.
- The formula for the distance between two points in 3D space is: $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2 + (z_2 - z_1)^2}$
- For the purposes of this problem, we will represent each color’s RGB values as a single integer. To do that, we’ll use the first 3 digits for red, the next 3 for green, the last 3 for blue, all in base 10 (decimal, as you are accustomed to). Hence, we’ll represent crimson as the integer 220020060, and mint as the integer 189252201.

Write the function `isSimilarColor(color1, color2)` that returns `True` if the two colors are similar, and `False` otherwise.

Consider the following testcases:

```
# The distance between (220,20,60) and (212,78,95) is 68.21, so they are not similar
assert isSimilarColor(220020060, 212078095) == False
# This distance between (12,105,210) and (20,115,211) is 12.85, so they are similar
assert isSimilarColor(12105210, 20115211) == True
```

3. (6 points) **Free Response:** Sort and Combine

Write the function `sortAndCombine(x, y, z)` which, given three, single-digit integers, returns a three-digit integer comprised of the original three digits in ascending order.

Consider the following testcases:

```
assert sortAndCombine(1, 2, 3) == 123
assert sortAndCombine(3, 2, 1) == 123
assert sortAndCombine(5, 2, 9) == 259
assert sortAndCombine(8, 6, 4) == 468
assert sortAndCombine(4, 6, 4) == 446
assert sortAndCombine(0, 0, 0) == 0
assert sortAndCombine(2, 0, 1) == 12
```

Hints and clarifications:

1. You can use `max(a,b,c)` to find the largest of three values, and `min(a,b,c)` to find the smallest.
2. You can assume that `x`, `y`, and `z` will be single-digit integers.