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### 15-112 Fall 2021 Quiz 3

Up to 20 minutes. No calculators, no notes, no books, no computers. Show your work!  
Do not use string indexing, loops, lists, 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 next to the code.

(a) (4 points) CT1

```
def h(x, y):
    if (x > y):
        if (x > 2 * y):
            return 3
        print("Cat")
    elif (x < 2 * y):
        return 5
    else:
        print("Dog")
        return 7
    return 9

def ct1():
    w = h(4, 8)
    x = h(8, 4)
    y = h(8, 3)
    z = w + 10 * x + 100 * y
    print(z)

print(ct1())
```

(b) (4 points) CT2

```
def f(x):
    print('f', x)
    x += 1
    return (x**2) // 10

def g(y):
    print('g', y)
    z = 7 * y % 5
    return f(z // 10 + 3)

def ct2(x):
    y = g(f(x))
    print(y)
    return x+y

ct2(-9)
```

2. (4 points) **Reasoning Over Code:** Find an argument, `n`, for the following function to cause it to return `True`. Place your answer (and nothing else) in the box below the code.

```
import math

def rc1(n):
    if ((not isinstance(n, int)) or (n < 100) or (n > 999)):
        return False
    a = n % 10
    b = n // 10
    return (math.isclose(b**0.5, a) and (a + b == 42))
```

3. (8 points) **Free Response:** Write the function `timeInterval(t1, t2)` which, given two non-negative integers `t1`, `t2`, that encode two 24-hour times in the format `hhmm`, returns the time interval, in minutes, between those two times. If `t2 < t1`, you should assume that `t2` refers to a next day time.

You can assume that  $0 \leq \text{hh} < 24$  is the hour, and  $0 \leq \text{mm} < 60$  are the minutes. If `hh > 0`, then `mm` is always a two-digit number. If `hh == 0`, then `mm` can be either a one or a two-digit number, depending on its value.

- `1503` is 15 hours, 3 minutes, or 3:03pm.
- `849` is 8 hours, 49 minutes, or 8:49am.
- `0` is 0 hours, 0 minutes, or 12:00am midnight.
- `59` is 0 hours, 59 minutes, or 12:59am.
- `101` is 1 hour, 1 minute, or 1:01am.

For example...

- `timeInterval(1400, 1545)` returns the time interval between 14 o'clock and 15:45 (same day) which is 105 minutes.
- `timeInterval(2359, 31)` returns the time interval between 23:59 and 00:31 (next day), which is 32 minutes.
- `timeInterval(31, 2359)` returns the time interval between 00:31 and 23:59 (same day), which is 1408 minutes.
- `timeInterval(1200, 0)` returns the time interval between noon and midnight (next day), which is 720 minutes.

Hint: There are 1440 minutes in a day.