CSCI 150: Exam 1 Practice

September 16, 2019

Read all questions carefully before beginning. You will have 50 minutes to complete this exam. You are not allowed to use your notes, textbook, phone, or computer. You may use a calculator. Show all your work for full credit.

1. The color Cornflower Blue is defined as the hexadecimal number #6495ED. Find the amount of blue in this color, written as a base ten number between 0 and 255. (Recall that the components of a color are listed in the order Red, Green, Blue.)

2. September 13th is World Programmers Day, because it is the 256th day of the year. What is the binary representation of 92 (the 92nd day of the year is April 1st)?

3. You are given the following Python definitions:

```
a = 2
b = 3
c = 23.8
d = True
e = False
```

Evaluate the truth value of each Python expression below:

- `e or c > a`

- `(d and e) or (not d and not e)`

- `(a / b) > 0 and d`

- `((a * b) - 12) == 9`

4. Two trains a and b are on a collision course heading down the same track. If you know the speed of the two trains and how far apart they are, you can calculate when they will collide by the following formula:

$$collision = \frac{distance}{speed_a + speed_b}.$$

Write a Python function that has three parameters, one each for the speed of the two trains and one for their distance. This function should calculate how long before the trains collide using the above formula, and return the result.

5. Hal wants to write a function that will tell him when to set his alarm clock. This function has two parameters, an integer variable for `day` according to 0=Sun, 1=Mon, 2=Tue, ..., 6=Sat, and a boolean variable `vacation` indicating if he is on vacation.

The function should return a string of the form `7:00` indicating when the alarm clock should ring. Normally, on weekdays (Monday through Friday) the alarm should return `7:00` and on the weekend (Saturday or Sunday) it should return `10:00`. Unless he is on vacation—then on weekdays it should return `10:00` and weekends it should return `off`.

Below is shown Hal's first attempt; it is not correct.

   (a) Show **two specific examples** of values for `day` and `vacation` that cause the function to produce incorrect output.

   (b) Exhibit a correct version of the function, either by clearly indicating changes that should be made to Hal's code, or by writing your own version from scratch.

```
def alarm(day: int, vacation: bool) -> str:
    if vacation and day > 5:
        return "off"
    else:
        if day > 0 or day < 6:
            return "7:00"
        else:
            return "10:00"
```

6. Trace the execution of the following Python code, using the template provided on the next page.

Showing your work (*e.g.* evaluation of expressions) is not required, but makes it much easier to give partial credit if you make a mistake.

```
i = 3
animal = 'cat'

if i < 1 or (animal == 'cat' and i > 1):
    i = i + 1
    animal = 'dog'
    first = 'yay'
elif animal == 'dog' and i > 1:
    i = i + 1
    animal = 'pig'
    first = 'boo'
if i > 5:
    i = i * 3
    second = animal
else:
    i = i - 2
    second = 'no'
```

Scratch   **Variables**

Extra practice

Distance between two points

The shortest distance between two points is usually a straight line. However, the shortest distance between two locations on Earth is calculated with the great circle distance. Given two locations, this distance in kilometers is

$$6371.01\,\mathrm{acos}(\sin(\phi_s)\sin(\phi_f) + \cos(\phi_s)\cos(\phi_f)\cos(\lambda_s - \lambda_f)),$$

where

- ϕ_s is the latitude of the starting point,

- λ_s is the longitude of the starting point,

- ϕ_f is the latitude of the final point, and

- λ_f is the longitude of the final point.

Write a function that takes as parameters the latitude and longitude of two locations in decimal form, calculates the distance between them using the above formula, and returns the result.

Shoe sizes

European and American shoe sizes differ by a standard amount. You can approximate the European shoe size by using the following formulas.

For men:
$$euroSize = \frac{9}{7}americanSize + 30.5$$

For women:
$$euroSize = \frac{9}{7}americanSize + 29$$

Write a function that takes two parameters representing the American shoe size and gender, calculates the European shoe size using the above formula, and returns the result.