CS 110 A – Creative Problem Solving in Computer Science

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Homework 10

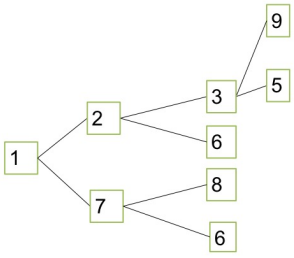
Instructor: Adriana Compagnoni

Due on Friday December 2, 2016 at 11:59PM

This homework is about trees and how to represent them in Python. The material for this homework appears in CFB chapter 9.

Exercises

1. (20 points) Write a Python representation of the following tree of numbers using tuples.



2. (20 points) Write a Python program `SumTree` that given a tree, returns the sum of all numbers in the tree.

   Test cases:

```
>>> SumTree((1,(5,
                  (7,(),()),
                  (62,(),())),
                (2,
                  (12,(),()),
                  (24,(),())))))
113

>>> SumTree((11, (), ()))
11
```

3. (20 points) Write a Python program `averageTree` that given a tree, returns the average of all numbers in the tree.

   Test cases:

```
>>> averageTree((5,(1,
                  (67,(),()),
                  (2,(),())),
                (3,
                  (10,(),()),
                  (26,(),()))))

16

>>> averageTree((6, (), ()))
6
```

4. (20 points) Write a Python program `mirrorTree` that given a tree, returns its mirror image.

   Test cases:

```
>>> mirrorTree(('ATG',
                  ('GGCT',
                      (7, (), ()),
                      (62, (), ())),
                  ('TTA',
                      (12, (), ()),
                      (24, (), ()))))
```

   returns

```
              ('ATG',
                  ('TTA',
                      (24, (), ()),
                       12, (), ())),
                  ('GGCT',
                      (62, (), ()),
                      (7, (), ())))
```

```
>>> mirrorTree((12, (), ()))
```

   returns `(12, (), ())`

5. (20 points) Write a Python function to draw number trees, so that the output prints leaves as well as internal nodes as in the following picture.