

CSC148 Worksheet 16 Solution

Hyungmo Gu

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Question 1

a. The doctests for the base case is

```
1  """
2  >>> nested_list_contains(1,1)
3  True
4  >>> nested_list_contains(1,2)
5  False
6  """
7
```

Using this fact, we can write

```
1  from typing import Union, List
2
3  def nested_list_contains(obj: Union[int, List], item: int) $\\to$
bool:
4      """Return whether the given item appears in <obj>.
5      Note that if <obj> is an integer, this function checks whether
6      <item> is equal to <obj>.
7
8      >>> nested_list_contains(1,1)
9      True
10     >>> nested_list_contains(1,2)
11     False
12     """
13
14     if isinstance(self, int):
15         return obj == item
16
```

Listing 1: worksheet_16_q1a_solution

b. Consider the following doctest

```
1  """
2  >>> nested_list_contains([4,2,2,[6,5,7,[8]]],8)
3  True
4  """
5
```

Using the base case from question 1.a, and the basic recursive design recipe, we can conclude the algorithm will behave as follows

```
1) 4 → 4 == item? → False
2) 2 → 2 == item? → False
3) 2 → False
4) [6,5,7,[8]] → Recursion
    5) 6 → 6 == item? → False
    6) 5 → 5 == item? → False
    7) 7 → 7 == item? → False

    8) [8] → Recursion
        9) 8 → 8 == item? → True (function terminates)

11) Function Terminates until the end of recursion
```

Now, no new parameters other than *obj* and *item* are required, since

1. for the traversing and checking of elements, they are done using the two parameters.
2. for bringing the value 'True' to user, it is done by repeatedly ending the recursive function call early with the value
3. for bringing the value 'False' to user, it is done by returning False at the end.

```
C1  from typing import Union, List
2
3
4  def nested_list_contains(obj: Union[int, List], item: int) -> bool:
5      """Return whether the given item appears in <obj>.
6      Note that if <obj> is an integer, this function checks whether
7      <item> is equal to <obj>.
8
9      >>> nested_list_contains([4,2,2,[6,5,7,[8]]],8)
10     True
11     >>> nested_list_contains([4,2,2,[6,5,7,[8]]],9)
12     False
13     """
14
15     if isinstance(self, int):
16         return obj == item
17     else:
18         # ===== (Solution) =====
19         for sublist in obj:
20             result = nested_list_contains(sublist, item)
21
22         if result:
```

```
23         return result
24
25     return False
26     # =====
27
```

Listing 2: worksheet_16_q1c_solution

Question 2