Discussion 14: Final Review

Binary

1. YouTube now uses 64 instead of 32 bits to count views. How many more is that? \(2^{32}\) times more

Drawing/Movement in Snap

Question 1: Mr. Robot 2

We tried to rewrite our midterm maze script to visit all the letters A-H in the maze. Here are our four attempts, let us know the letters they each visit.

<table>
<thead>
<tr>
<th>move forward</th>
<th>rotate left</th>
<th>rotate right</th>
<th>can move left?</th>
<th>can move forward?</th>
<th>can move right?</th>
<th>dead end</th>
</tr>
</thead>
<tbody>
<tr>
<td>The robot moves <strong>INPUT squares</strong> forward in the direction it's facing.</td>
<td>The robot turns, in-place. {left = counterclockwise, right = clockwise, around = u-turn}</td>
<td>Reports <strong>true</strong> if the robot has a free square to its {left, front, right}; otherwise reports <strong>false</strong>. The last one reports <strong>true</strong> if can't move left, forward and right.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Question 2: Magical Mystery Tour

Consider the following two blocks and setup code:

Mystery length # with n # helper levels

if n = 0
move length steps
else
Mystery \(\frac{length}{2}\) with \(n - 1\) helper levels
Helper length \(\frac{length}{2}\) with \(n - 1\) helper levels
Mystery \(\frac{length}{2}\) with \(n - 1\) helper levels

when clicked
clear pen down
Mystery 16 with LEVELS helper levels pen up

Helper length #

turn -90 degrees
move length steps
move 0 - length steps
turn 90 degrees
a. Now, given that the sprite starts out in the bottom left corner facing right, and that the pen is in the middle of the sprite, shade in the pixels that will be colored after calls to Mystery with levels set to 1 and levels set to 3. You may use the top left grid for scratch work. Levels = 0 has been given to you.

![Diagram of sprite and pen positions]

b. Runtime

We're told that it actually costs a dollar to fill in all the pixels drawn by helper. Which expression best captures the cost (in dollars) for this call? (select ONE)

- L
- \( \frac{1}{2} L \)
- N
- \( \frac{1}{2} N \)
- L+N
- \( \frac{1}{2} L+N \)
- L^2
- \( \frac{1}{2} L^2 \)
- N^2
- \( \frac{1}{2} N^2 \)
- None of these

Recursion

Question 1: Ready, Set, Go!

In this problem, we have created three different blocks to see if a given list is a set, that is, it has no duplicates. For each of the blocks below, select one of the following answer choices:

- A = it works fine.
- B = it will cause an error or run forever.
- C = it always returns true.
- D = it always returns false.
- E = if it's the empty list, true, otherwise it always returns false
- F = if it's the empty list, false, otherwise it always returns true
- G = if it's the empty list, true, otherwise it only returns whether the first element is in the list multiple times
- H = if it's the empty list, true, otherwise it only returns whether the last element is in the list multiple times
a. For this subpart, note that the or and and blocks don’t even look at their right input if the left one is true or false, respectively. For example,

```
true or Infinite loop
```

```
false and Infinite loop
```

b. 

```
set? data : ... ... ...
if empty? data
  report true
else
  if all but first of data contains item 1 of data
    report false
  else
    report true
report set? all but first of data
```

c. 

```
set? data : ... ...
for each A of data
  for each B of data
    if A = B
      report true
    else
      report false
```

```
```

```
```

```
```

```
Question 2: Constructing the set block
How could we construct the set block using the following occurrences of block? Note that you may only choose one option from each section A-C.

Script variables A B C

A
- Set A to 0
- Set A to 1
- Set A to 2
- Set A to length of (data)

B
- Set B to occurrences of 1 in data = A
- Set B to occurrences of data in B = A
- Set B to occurrences of (data in B) = A
- Set B to occurrences of (not B = A) in data

C
- Set C to empty? keep items such that B from data
- Set C to not empty? keep items such that B from data

What is the running time of this set? block?
- Constant
- Logarithmic
- Linear
- Quadratic
- Exponential

(select ONE)
Python

Question 1: Syntax
Write the output of the following lines of code.
```python
>>> ['cal', 'berkeley', 'stanford'][1][2]
'r'
>>> [x*10 for x in range(3) if x != 1]
[0, 20]
```

Question 2: Reversing a Dictionary
We want to write a dictionary reverser that takes in a dictionary and returns a new dictionary with the original values as the new keys and the original keys as a list of values.
```python
>>> dictionary_reverser({1:3, 2:3, 8:9})
{3: [1, 2], 9: [8]}
```
Write this function by filling in the blanks in the skeleton code below.
```python
def dictionary_reverser(dict):
    r = {}
    for k in dict:
        if dict[k] in r:
            r[dict[k]].append(k)
        else:
            r[dict[k]] = [k]
    return r
```