L9 PROBLEM 1 (5/5 points)

Here is some code from lecture:

```
def linearSearch(L, x):
    for e in L:
        if e == x:
            return True
    return False
```

Choose which of the following inputs to `linearSearch` would give the best case, average case, or worst case run time.

1. Best Case Run Time

- ○ `linearSearch([14, 15, 6, 27, 13, 16, 25, 11, 7], 15)`
- ○ `linearSearch([21, 1, 25, 22, 30, 13, 7, 24, 12], 24)`
- ◉ `linearSearch([20, 10, 1, 7, 4, 22, 25, 12, 31], 20)` ✔
- ○ `linearSearch([9, 3, 12, 24, 7, 8, 23, 11, 19], 8)`
- ○ `linearSearch([4, 12, 20, 17, 9, 14, 7, 24, 6], 7)`
- ○ `linearSearch([13, 9, 22, 3, 10, 17, 11, 2, 12], 26)`

2. Worst Case Run Time

- ○ `linearSearch([14, 15, 6, 27, 13, 16, 25, 11, 7], 15)`
- ○ `linearSearch([21, 1, 25, 22, 30, 13, 7, 24, 12], 24)`
- ○ `linearSearch([20, 10, 1, 7, 4, 22, 25, 12, 31], 20)`
- ○ `linearSearch([9, 3, 12, 24, 7, 8, 23, 11, 19], 8)`
- ○ `linearSearch([4, 12, 20, 17, 9, 14, 7, 24, 6], 7)`
- ◉ `linearSearch([13, 9, 22, 3, 10, 17, 11, 2, 12], 26)` ✔

3. Average Case Run Time

- ○ `linearSearch([14, 15, 6, 27, 13, 16, 25, 11, 7], 15)`
- ○ `linearSearch([21, 1, 25, 22, 30, 13, 7, 24, 12], 24)`
- ○ `linearSearch([20, 10, 1, 7, 4, 22, 25, 12, 31], 20)`
- ◉ `linearSearch([9, 3, 12, 24, 7, 8, 23, 11, 19], 8)` ✔
- ○ `linearSearch([4, 12, 20, 17, 9, 14, 7, 24, 6], 7)`
- ○ `linearSearch([13, 9, 22, 3, 10, 17, 11, 2, 12], 26)`

4. What is the number of steps it will take to run `linearSearch` in the best case? Express your answer in terms of *n*, the number of elements in the list `L`.

   Indicate addition and multiplication explicitly, with `+` and `*` symbols. Indicate exponentiation with the caret (`^`) symbol.

1

1

Answer: 1

EXPLANATION:

In the best case scenario, `L` is an empty list. Thus one step is taken: `return False`.

5. What is the number of steps it will take to run `linearSearch` in the worst case? Express your answer in terms of *n*, the number of elements in the list `L`.

   Indicate addition and multiplication explicitly, with `+` and `*` symbols. Indicate exponentiation with the caret (`^`) symbol.

   2*n+1

   $2 \cdot n + 1$

   Answer: 2*n + 1

   EXPLANATION:

   In the worst case scenario, `x` is not present in `L`. Thus we go through the for loop *n* times. This means we execute assignment of `e` to each element of `L` (this takes place in the line `for e in L`) to enter the `for` loop, and also execute the check

   ```
       if e == x:
   ```

   once each for every element. So this is 2*n steps. Finally at the end of the `for` loop, we execute the return statement one time.

Help

Reminder: You do not lose points for trying a problem multiple times, nor do you lose points if you hit "Show Answer". If this problem has you stumped after you've tried it a few times, feel free to reveal the solution.

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