Exercise 2

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Finger Exercises due Oct 27, 2022 07:30 +08 Completed

Exercise 2

6/6 points (graded)

ESTIMATED TIME TO COMPLETE: 12 minutes

For the following programs, fill in the best-case and the worst-case number of steps it will take to run each program.

For these questions, you'll be asked to write a mathematical expression. Use +, -, / signs to indicate addition, subtraction, and division. Explicitly indicate multiplication with a * (ie say "6*n" rather than "6n"). Indicate exponentiation with a caret (^) (ie "n^4" for n^4). Indicate base-2 logarithms with the word log2 followed by parenthesis (ie "log2(n)").

1. Program 1:

```
def program1(x):
    total = 0
    for i in range(1000):
        total += i

    while x > 0:
        x -= 1
        total += x

    return total
```

What is the number of steps it will take to run Program 1 in the best case? Express your answer in terms of *n*, the size of the input `x`.

3003 ✔

3003

What is the number of steps it will take to run Program 1 in the worst case? Express your answer in terms of *n*, the size of the input `x`.

5*n + 3003 ✔

$5 \cdot n + 3003$

2. Program 2:

```
def program2(x):
    total = 0
    for i in range(1000):
        total = i

    while x > 0:
        x = x//2
        total += x

    return total
```

What is the number of steps it will take to run Program 2 in the best case? Express your answer in terms of *n*, the size of the input `x`.

2003 ✔

2003

What is the number of steps it will take to run Program 2 in the worst case? Express your answer in terms of *n*, the size of the input `x`.

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5*log2(n) + 2008

$5 \cdot \log_2(n) + 2008$

3. Program 3:

```
def program3(L):
    totalSum = 0
    highestFound = None
    for x in L:
        totalSum += x

    for x in L:
        if highestFound == None:
            highestFound = x
        elif x > highestFound:
            highestFound = x

    return (totalSum, highestFound)
```

What is the number of steps it will take to run Program 3 in the best case? Express your answer in terms of *n*, the number of elements in the list `L`.

3

3

What is the number of steps it will take to run Program 3 in the worst case? Express your answer in terms of *n*, the number of elements in the list `L`.

7*n + 2

$7 \cdot n + 2$

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.

Click the "Reset" button to clear your answers.

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- n - 1 in Q3 — 2
  please how does n -1 come in?
- why log 2? — 5
  why is the worst case in part 2 a log2(n)? why don't we assume log10(n)? does this have to do with the division by 2?
- Unsure about how to count steps — 3
  I am having trouble understanding how to count steps. For question 1, I thought it would take 2000 steps to go through the for loop -...
- Empty list in example 3 — 4
  For example 3, doesn't the program have to use a step to recognize that the list is empty and that it doesn't need to enter the loop?
- don't understand answer to problem 3 (first part)

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the part i can't figure out is why python wouldn't evaluate the "for" statements when L = []. when i put this code into Python Tutor, th...

understanding what counts and what doesn't

for all these problems, why are we counting steps that don't have any dependency on n? like in part 1, for in range(1000) doesn't inv... 4

The questions are ambigiously

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