

COS126 Exam1 Mini-Test Solutions

1. Short Answer

1. 3.0
2. $6.022e23$
3. True.
4. True.
5. False.
6. `java Recipe < cookbook.txt`
`java Recipe < cookbook.txt > meal.txt`
`java Recipe | java HungryThing`

2. Arrays, Functions, Analysis of Algorithms

- a) `mystery1(a, 5)` returns `true`.
- b) Fill in the trace table to show that `mystery2(a, 5)` returns the same thing.

target	low	high	mid	return value
5	0	6	3	
		2	1	true

- c) `mystery1(a, 20)` and `mystery2(a, 20)` both return `false` .
- d) These methods check whether `target` is an element in the array.
- e) `mystery1(a, 32)` makes 14 comparisons with the target. (two comparisons each pass through the `for` loop)
- f) `mystery2(a, 32)` makes 6 comparisons with the target. (two comparisons each pass through the `while` loop)
- g) `mystery2()`
- h) `mystery1()` does a sequential search through the array elements, so it has possibly N passes through the loop.
`mystery2()` halves the search area each pass, so worst case, it makes $\log N$ passes through the loop.

3. Recursion, Debugging (from Spring04, Exam 1, Question 4)

a.

$$\begin{array}{c} \text{func}(3) \\ | \\ 2*\text{func}(2) + 5*\text{func}(1) \\ | \\ 2*\text{func}(1) + 5*\text{func}(0) \\ | \\ 2*\text{func}(-1) + 5*\text{func}(-2) \end{array}$$

b. Change `if (j == 1) return 1;` to `if (j <= 1) return 1;`

4. Performance

X. Half a day.

Using the doubling hypothesis, the increase appears to be quadratic. So, when N increases by 10 (from 10,000 to 100,000) the time increases by 100 (from 8 to 800 minutes). 800 minutes is a little over 13 hours, so the best of the answers is half a day.