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I pledge my honor that I have abided by the Stevens Honor System

1. To generate the binary numbers instead of the binary gray codes, when the algorithm copies L1 to L2, we have to copy the list exactly instead of in reverse order. This way, we can get the binary numbers for a given length n. For example, using the numbers of length 2, it would copy [0,1] to L2, and get L1 = [00,01] and L2 = [10,11], which appended together gives [00,01,10,11], the binary numbers of length 2.

2.

|  |  |  |
| --- | --- | --- |
| X | Y | Add |
| 72 | 93 |  |
| 36 | 186 |  |
| 18 | 372 |  |
| 9 | 744 | 744 |
| 4 | 1488 |  |
| 2 | 2976 |  |
| 1 | 5952 | 5952 |
| Sum |  | 6696 |

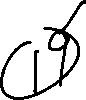
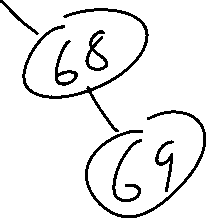
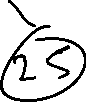
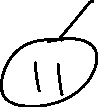
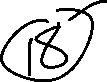
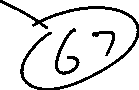
3a. Quicksort will perform in the worst case running time when it is partitioned with no elements on one side of the pivot and all the elements on the other. This happens when the pivots are always the largest element, which is when the array is reverse sorted, or when the pivots are always the smallest element, when the array is sorted.

3b. This runtime is θ(n2)

4.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Operation | 2205x1132 | 22\*11 | 05 \* 32 | 27\*43 |
| C2 | *22\*11* = 242 | 2\*1 = 2 | 0\*3 = 0 | 2\*4 = 8 |
| C0 | *05\*32* = 160 | 2\*1 = 2 | 5\*2 = 10 | 7\*3 = 21 |
| C1 | (22+05) \* (11+32) – (242+160) = *27\*43* – 402 = 1161 – 402 = 759 | (2+2) \* (1+1) – (2+2) = 4\*2-4 = 4 | (0+5) \* (3+2) – (10+0) = 5\*5-10 = 15 | (2+7) \* (4+3) – (8+21) = 9\*7-29 = 34 |
| Result | *242 \* 104* + *759 \* 102* + 160 = 2420000 + 75900 + 160 = 2496060 | 2\*102 + 4 \* 10 + 2  = 242 | 0\*102 + 15\*10 + 10 = 150 + 10 = 160 | 8\*102 + 34\*10 + 21 = 800 + 340 + 21 = 1161 |

5.



6.



a. 10, 8, 5, 3, 5, 2, 1, 7, 1, 6

b. 3, 5, 5, 8, 1, 2, 10, 1, 7, 6

c. 3,5,5,1,2,8,1,6,7,10

d. 5 internal nodes

e. 5 leaves

f. max width = 4

g. height = 3

h. diameter = 5 edges, 6 nodes

7a. a=2, b=4, d = 0, a>bd, θ(nlog­4­2) = θ(n1/2)

7b. a=2, b=4, d=1/2, a=bd, θ(n1/2 \* log4 n)

7c. a=2, b=4, d=1, a<bd, θ(n)

7d. a=2, b=4, d=2, a<bd, θ(n2)

7e. a=2, b=4, d=3, a<bd, θ(n3)

8.

a. T(n) = 6 T(n/3) + θ(n3/2)

b. a=6, b=3, d=3/2, a>bd, θ(nlog36) = θ(n1.63)