

John Spicer

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

11/12/15

CS385 HW 4

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1. When  $L_1$  is copied to  $L_2$ , do not reverse order.

2.  $72 \times 93$

72	93	
36	186	
18	372	
✓ 8	744	244
4	1488	
2	2976	
✓ 1	5952	5952
		6646

3. a. every input is less than the pivot

b.  $\Theta(n^2)$

4.  $22105 \times 11132 = 2,496,060$

$$c_2 = a_1 \times b_1 = 22 \times 11 = 242$$

$$c_0 = a_0 \times b_0 = 05 \times 32 = 160$$

$$c_1 = (a_1 + a_0) \times (b_1 + b_0) - (c_2 + c_0) = 27 \times 43 - 402 = 759$$

$$\begin{array}{r} a_1 a_0 \\ 212 \end{array} \times \begin{array}{r} b_1 b_0 \\ 111 \end{array}$$

$$c_2 = 2$$

$$c_0 = 2$$

$$c_1 = 4 \times 2 - 1 = 7$$

200
40
2
242

$$\begin{aligned}
 a_1 & 0/9 \times 3/2 \\
 c_2 & = 0 \\
 c_0 & = 10 \\
 c_1 & = 5 \times 5 - 10 = 15
 \end{aligned}$$

$$\begin{aligned}
 a_2 & a_0 \times b_1 b_0 \\
 217 & \times 413 \\
 c_2 & = 8 \\
 c_0 & = 21 \\
 c_1 & = 9 \times 7 - 29 = 34
 \end{aligned}$$

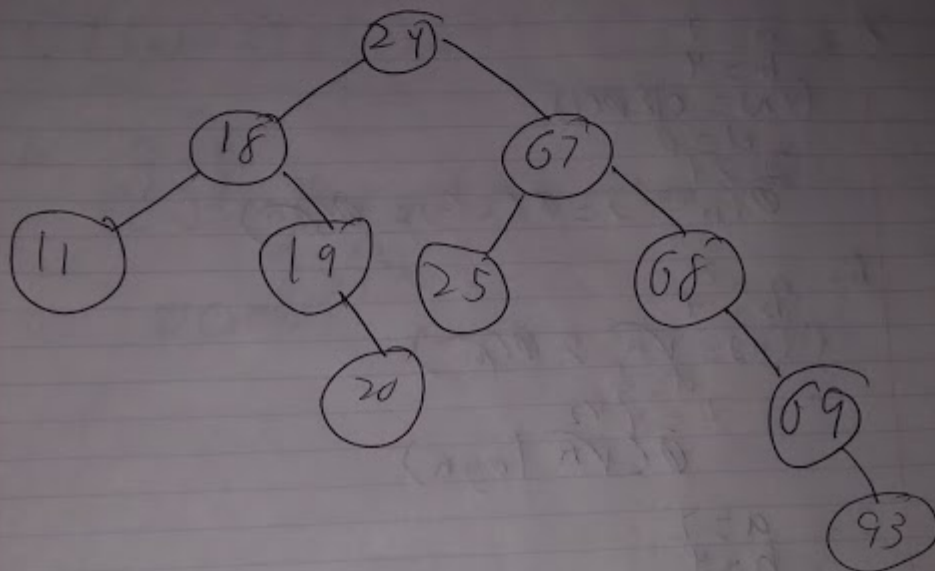


$$\begin{array}{r}
 000 \\
 150 \\
 10 \\
 \hline
 160
 \end{array}$$

$$\begin{array}{r}
 800 \\
 340 \\
 21 \\
 \hline
 1161 - 402 = 759
 \end{array}$$

$$\begin{aligned}
 n &= 4 \\
 c &= c_2 10^m + c_1 10^{\frac{n}{2}} + c_0 \\
 &= (242)10^4 + (759)10^2 + 160 = \\
 &\quad \underline{2,496,060}
 \end{aligned}$$

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. 4 is max width  
 g. 3 is height

$$\begin{aligned}
 &? \quad a=2 \\
 &\quad b=4 \\
 &\quad f(n) = c \in \Theta(1) \\
 &\quad d=0 \\
 &\quad 2 < 4 \\
 &\quad \Theta(n^{\log_2 2}) = \Theta(n^{1/2}) = \Theta(\sqrt{n})
 \end{aligned}$$

$$\begin{aligned}
 &b = a = 2 \\
 &\quad b=4 \\
 &\quad f(n) = \sqrt{n} \in \Theta(\sqrt{n}) \\
 &\quad d = \frac{1}{2} \\
 &\quad 2 < 4 \\
 &\quad \Theta(\sqrt{n} \log n)
 \end{aligned}$$

$$\begin{aligned}
 &c. \quad a=2 \\
 &\quad b=4 \\
 &\quad f(n) = n \in \Theta(n) \\
 &\quad d=1 \\
 &\quad 2 < 4 \\
 &\quad \Theta(n)
 \end{aligned}$$

$$\begin{aligned}
 &d. \quad a=2 \\
 &\quad b=4 \\
 &\quad f(n) = n^2 \in \Theta(n^2) \\
 &\quad d=2 \\
 &\quad 2 < 4 \\
 &\quad \Theta(n^2)
 \end{aligned}$$

$$\begin{aligned}
 &e. \quad a=2 \\
 &\quad b=4 \\
 &\quad f(n) = n^3 \in \Theta(n^3) \\
 &\quad d=3 \\
 &\quad 2 < 4 \\
 &\quad \Theta(n^3)
 \end{aligned}$$



8. a.  $T(n) = 6T\left(\frac{n}{3}\right) + n^{3/2}$

b.  $a = 6$

$b = 3$   
 $f(n) = n^{3/2} \in O(n^{3/2})$

$d = 3/2$

$O(n^{6/3})$