

Alexander Chatron-Michaud

Fall 2015

260611509

I worked alone on this assignment

2) a) $\frac{n+1}{2}, \frac{n+1}{4}, \frac{3(n+1)}{4}, \frac{n+1}{8}, \frac{3(n+1)}{8}, \frac{5(n+1)}{8}, \frac{7(n+1)}{8}, \dots$

gives minimal height $h = \log n$

b) For all three operations the worst case is
 $O(h) = O(\log n)$

c) 1, null, 2, null, 3, null, ..., null, n

gives max height $h = n$

(could be written as 1, 2, 3, ..., $n-1$, n but I wanted to indicate we only insert at the right child)

d) For all three, $O(h) = O(n)$

3) a) if (start == stop)
return A[start]

else

pivot \leftarrow partition(A, start, stop)

if (pivot == k)

return A[k]

else if (pivot > k)

return findKth(A, start, pivot-1, k)

else if (pivot < k)

return findKth(A, pivot+1, stop, k)

b) $T(n) = T(n/2) + a(n) + b$ when $n > 1$ $T(n) = c$ at $n = 1$

half size
array each
time
(recursive call)

partition,
where $a =$
 $(stop - start + 1)$

constant for
return statements,
conditionals, etc

$$T(n) = T(n/2) + an + b$$

$$= T(n/4) + \frac{1}{2}an + b + an + b$$

$$= T(n/8) + \frac{1}{4}an + b + \frac{1}{2}an + b + an + b$$

$$= T\left(\frac{n}{2^k}\right) + \left(\sum_{k=1}^k \left(\frac{1}{2}\right)^{k-1}\right)an + \sum_{k=1}^k b$$

$$= 1 + \underline{\hspace{2cm}} an + (\log n)b$$

$$2^k = n$$

$$k = \log n$$

largest term is the an term

hence the algorithm ~~is~~ is $\Theta(n)$

4)	a)	7	b)	9	c)	7	d)	7
		9		9		3		9
		7		8		9		9
		8		7		2		8
		9		6		6		7
		3		2		8		3
		6		1		9		6
		2		2		1		2
		2		3		2		2
		1		7		7		1

5) if (A=NULL and B=NULL)

return true

else if (A=NULL xor B=NULL)

return false

else if (A.getValue() != B.getValue())

return false

else if (isIsomorphic(A.getLeftChild(), B.getLeftChild()) and (isIsomorphic(A.getRightChild(), B.getRightChild())))

return true

else if (isIsomorphic(A.getLeftChild(), B.getRightChild()) and (isIsomorphic(A.getRightChild(), B.getLeftChild())))

return true

else

return false