1. By Hoang Do

									,		
	$A = \{13,$	19, 9, 5	5, 12, 8,	7, 21, 2,	6, 11}						
p, j	19	9	5	12	8	7	4	21	2	6	11
	:			12	0			21		0	
p 13	J 19	9	5	12	8	7	4	21	2	6	11
	12			12			<u>'</u>	21		U	
p 13	19	9	5	12	8	7	4	21	2	6	11
			:	12		<u> </u>	<u> </u>				
p 9	i 19	13	5	12	8	7	4	21	2	6	11
	i	13		:			,			Ü	
p 9	5	13	19	12	8	7	4	21	2	6	11
		- 10	1 1	12	:	,	<u> </u>				r
p 9	5	13	19	12	8	7	4	21	2	6	11
		i	1	1 12		:					r
р 9	5	8	19	12	13	7	4	21	2	6	11
				1	1 15	<u> </u>	:				
р 9	5	8	i 7	12	13	19	4	21	2	6	11
		•	1		all assessment	1	<u> </u>				
р 9	5	8	7	i 4	13	19	12	J 21	2	6	r 11
		U	1			17	1 12	21		1 0	
р 9	5	8	7	i 4	13	19	12	21	J 2	6	11
]]	0	1 /	T		13	12	1 21			
р 9	5	8	7	4	i 2	19	12	21	13	J	r
9)]	ð	1 1 .	4	L			21	1.3	6	11
р			Face 4			i		1 01		1 10	r
9	5	8	7	4	2	6	12	21	13	19	11
p			Town to the second	100000000000000000000000000000000000000		i					r
9	5	8	7	4	2	6	11	21	13	19	12

2. By Duyen Tran

the values of q that each partition returns is an alternation between the smallest value and the biggest value

Quicksort(A, P, Q-1)'s qualue is the first index of it's subarray

QuickSort(A, Ot1, r)'s o value is the last index of it's subarray

This is worst case because it's already in an order

3. By Bonnie Liu

QUICKSORT
$$(A, p, r)$$

1 if $p < r$

2 $q = PARTITION(A, p, r)$

3 QUICKSORT $(A, p, q - 1)$

4 QUICKSORT $(A, q + 1, r)$

$$T(n) = Cn + C(n - 1) + C(n - 2) + C(n - 2)$$

$$= C(n + (n - 1) + C(n - 2) + C(n - 2)$$

$$= C(n + (n - 1) + C(n - 2) + C(n - 2)$$

$$= C(n + (n - 1) + C(n - 2) + C(n - 2)$$

$$= C(n + (n - 1) + C(n - 2) + C(n - 2)$$

$$= C(n + (n - 1) + C(n - 2) + C(n - 2)$$

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$$= C(n + (n - 1) + C(n - 2) + C(n - 2)$$

$$= C(n + (n - 1) + C(n - 2) + C(n - 2)$$

$$= C(n + (n - 1) + C(n - 2) + C(n - 2)$$

4. By Dangnhi Ngo

By Danghhi Ngo

Ipper bound:
$$T(n) \leqslant T(n-1) + cn$$
 (c: positive constant)

Gruss: $T(n) = O(n^2)$

$$\leqslant dn^2$$
 (d: positive constant)

 $T(n-1) \leqslant d(n-1)^2$

$$T(n-1) \leqslant d(n^2-2n+1)$$

Substitution: $T(n) \leqslant dn^2-2dn+d+cn$

$$= dn^2 + (c-2d)n+d \leqslant 0$$

$$\Rightarrow c-2d \leqslant 0$$

$$\Rightarrow d \geqslant c/2$$

T(n) = $O(n^2)$ (1)

Lower bound: $T(n) \geqslant T(n-1) + cn$ (c: positive constant)

 $T(n-1) \geqslant d(n^2)$ (d: positive constant)

 $T(n-1) \geqslant d(n^2-2n+1)$

Substitution: $T(n) \geqslant d(n^2-2n+1)$

Substitution: $T(n) \geqslant d(n^2-2n+1)$

Substitution: $T(n) \geqslant d(n^2-2n+1)$
 $f(n-1) \geqslant d(n^2-2n+1)$

From (1) and (2),

 $f(n) = f(n^2)$

5. By David Baumann

$$T(n) = T(\frac{4n}{5}) + T(\frac{6}{5}) + \Theta(n)$$

$$C(n) = C(n)$$

$$T(\frac{4n}{5}) T(\frac{6}{5}) = C(n)$$

$$T(\frac{4n}{5}) T(\frac{6}{5}) = C(n)$$

$$T(\frac{4n}{5}) T(\frac{6n}{5}) T(\frac{6n}{5}) T(\frac{6n}{5}) C(\frac{6n}{5}) C(\frac{6n}{5}) T(\frac{6n}{5}) T(\frac{6n}{5})$$

$$C(n \log_{S} n) \leq T(n) \leq O(n \log_{S} n)$$

$$T(n) = O(n \log_{S} n)$$

6.By Karamel Quitayen

Minimum depth is repeatedly taking the smaller subproblem of the two, the branch that is proportional to α .

$$1 = \alpha^{k} n$$

$$k = \log_{a} \frac{1}{n}$$

$$k = -\frac{\lg n}{\lg \alpha}$$

Similarly, maximum depth is repeatedly taking the larger of the two subproblems, and this branch is proportional to $1-\alpha$.

$$1 = (1 - \alpha)^k n$$
$$k = \log_{(1-a)} \frac{1}{n}$$
$$k = -\frac{\lg n}{\lg(1 - \alpha)}$$