

Algorithms Assignment 3

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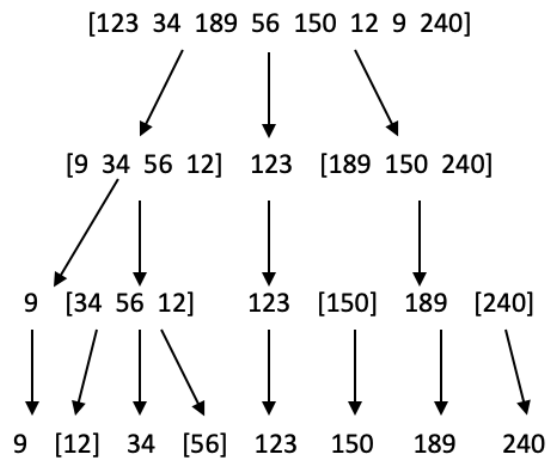
16. By Divide and Conquer Master Theorem:

$$T(n) = 10T(n/3) + n^2$$

$$T(n) \in \Theta(n^{\log_3 10}) \text{ because } 10 > 3^2$$

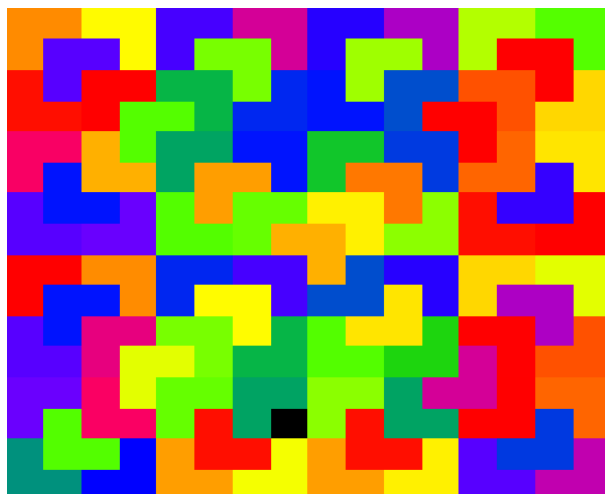
19. Quicksort to sort: [123, 34, 189, 56, 150, 12, 9, 240]

(Uses farthest left pivot point)



42. assign3.py contains implementation

Example visual output: 16x16 grid with (2,7) forbidden square

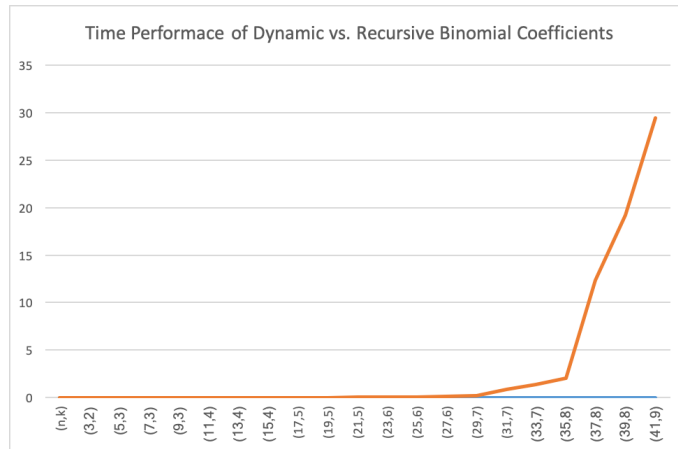


3. assign3.py contains implementation

Performance Study: Basic Operation: Dynamic -> comparison Recursive -> comparison

$\binom{3}{2}$ Dynamic = 9 basic op., Recursive = 5 basic op. $\binom{5}{4}$ D = 20, R = 9 $\binom{11}{4}$ D = 50, R = 659

(n,k)	Dynamic (s)	Recursive (s)
(3,2)	0.000019	0.000003
(5,3)	0.000021	0.000004
(7,3)	0.000029	0.000012
(9,3)	0.000037	0.000027
(11,4)	0.000043	0.000052
(13,4)	0.00006	0.000232
(15,4)	0.000071	0.000439
(17,5)	0.000082	0.000737
(19,5)	0.000109	0.003605
(21,5)	0.00014	0.006894
(23,6)	0.000389	0.012307
(25,6)	0.000194	0.061799
(27,6)	0.000192	0.095378
(29,7)	0.000211	0.151966
(31,7)	0.000264	0.815324
(33,7)	0.000286	1.33623
(35,8)	0.000311	2.058191
(37,8)	0.000339	12.352334
(39,8)	0.000343	19.176394
(41,9)	0.000648	29.451292
(43,9)	0.000431	178.783591



4. assign3.py contains implementation