Sharon A Glendale

Assignment 3

Z23285379

Insertion Sort

n	Theoretical RT = $\Theta(n^2)$	Simulated RT (ms)	Hidden Constant
1000	$1x10^5$	411	4.11×10^{-4}
2000	$4x10^5$	1730	4.33×10^{-4}
3000	$9x10^5$	3746	4.16×10^{-4}
4000	$16 x10^5$	6718	4.2×10^{-4}
5000	$25 x10^5$	10374	4.15×10^{-4}
6000	$36 x10^5$	15130	4.2×10^{-4}
7000	$49 x10^5$	20361	4.16×10^{-4}
8000	$64 x10^5$	26652	4.16×10^{-4}
9000	$81 x10^5$	34084	4.21×10^{-4}
10000	$1x10^7$	42119	4.21×10^{-4}
11000	$12.1 x10^7$	50747	4.19×10^{-5}
12000	$14.4 x10^7$	60868	4.23×10^{-5}
13000	$16.9 x10^7$	74153	4.39×10^{-5}
14000	$19.6 x10^7$	86803	4.43×10^{-5}
15000	$22.5 x10^7$	97052	4.31×10^{-5}
16000	$25.6 x10^7$	108977	4.26×10^{-5}
17000	$28.9 x10^7$	127369	4.41×10^{-5}
18000	$32.4 x10^7$	135876	4.2×10^{-5}
19000	$36.1 x10^7$	154822	4.29×10^{-5}
20000	$40 x10^7$	171850	4.3×10^{-5}

$C_1 = \frac{411}{10^5} = 4.11 \times 10^{-4}$

$C_2 = \frac{1730}{4 \times 10^5} = 4.33 \times 10^{-4}$

$C_3 = \frac{3746}{9 \times 10^5} = 4.16 \times 10^{-4}$

$C_4 = \frac{6718}{16 \times 10^5} = 4.2 \times 10^{-4}$

$C_5 = \frac{10374}{25 \times 10^5} = 4.15 \times 10^{-4}$

$C_6 = \frac{15130}{36 \times 10^5} = 4.2 \times 10^{-4}$

$C_7 = \frac{20361}{49 \times 10^5} = 4.16 \times 10^{-4}$

$C_8 = \frac{26652}{64 \times 10^5} = 4.16 \times 10^{-4}$

$C_9 = \frac{34084}{81 \times 10^5} = 4.21 \times 10^{-4}$

$C_{10} = \frac{42119}{10^7} = 4.21 \times 10^{-4}$

$C_{11} = \frac{50747}{12.1 \times 10^7} = 4.19 \times 10^{-5}$

$C_{12} = \frac{60868}{14.4 \times 10^7} = 4.23 \times 10^{-5}$

$C_{13} = \frac{74135}{16.9 \times 10^7} = 4.39 \times 10^{-5}$

$C_{14} = \frac{86803}{19.6 \times 10^7} = 4.43 \times 10^{-5}$

$C_{15} = \frac{97052}{22.5 \times 10^7} = 4.31 \times 10^{-5}$

$C_{16} = \frac{108977}{25.6 \times 10^7} = 4.26 \times 10^{-5}$

$C_{17} = \frac{127369}{28.9 \times 10^7} = 4.41 \times 10^{-5}$

$C_{18} = \frac{135876}{32.4 \times 10^7} = 4.2 \times 10^{-5}$

$C_{19} = \frac{154822}{36.1 \times 10^7} = 4.29 \times 10^{-5}$

$C_{20} = \frac{171850}{40 \times 10^7} = 4.3 \times 10^{-5}$

$C_{max} = C_9$ or C_{10}

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Heap Sort

n	Theoretical RT = Onlgn	Simulated RT (ms)	Hidden Constant
1000	99657.8	58	[redacted]
2000	[redacted]21931400	113	[redacted]
3000	[redacted]34652100	174	[redacted]
4000	[redacted]47862800	247	[redacted]
5000	[redacted]61438500	54	[redacted]
6000	[redacted]75304200	413	[redacted]
7000	[redacted]89411760	506	[redacted]
8000	[redacted]103725600	608	[redacted]
9000	[redacted]118221300	727	[redacted]
10000	[redacted]132877000	849	[redacted]
11000	[redacted]147677200	905	[redacted]
12000	[redacted]162608400	997	[redacted]
13000	[redacted]177660600	1123	[redacted]
14000	[redacted]192823400	1234	[redacted]
15000	[redacted]208089000	1448	[redacted]
16000	[redacted]223451200	1479	[redacted]
17000	[redacted]238904400	1606	[redacted]
18000	[redacted]254442600	1828	[redacted]
19000	[redacted]270060300	1883	[redacted]
20000	[redacted]285754000	2021	[redacted]

$C_1 = \frac{58}{99657.8} = 0.00058$ $C_6 = \frac{413}{75304200} = 0.0054844$ $C_{11} = \frac{905}{147677200} = 0.0612852$ $C_{16} = \frac{1479}{223451200} = 0.0068189$

$C_2 = \frac{113}{21931400} = 5.125\,E^{-6}$ $C_7 = \frac{506}{89411760} = 0.05659$ $C_{12} = \frac{997}{162608400} = 0.0061313$ $C_{17} = \frac{1606}{238904400} = 0.006722$

$C_3 = \frac{174}{34652100} = 5.021\,E^{-6}$ $C_8 = \frac{608}{103725600} = 0.0058616$ $C_{13} = \frac{1123}{177660600} = 0.006322$ $C_{18} = \frac{1828}{254442600} = 0.00718$

$C_4 = \frac{247}{47862800} = 5.1605\,E^{-6}$ $C_9 = \frac{727}{118221300} = 0.006149$ $C_{14} = \frac{1234}{192823400} = 0.006399$ $C_{19} = \frac{1883}{270060300} = 0.006752$

$C_5 = \frac{54}{61438500} = 8.7892\,E^{-7}$ $C_{10} = \frac{849}{132877000} = 0.006389$ $C_{15} = \frac{1448}{208089000} = 0.006956$ $C_{20} = \frac{2021}{285754000} = 0.007057$

$C_{max} = C_{20}$

	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
Insert_Sort	411	1730	3746	6718	10374	15130	20361	26652	34084	42119	50747	60868
Heap_Sort	58	113	174	247	54	413	506	608	727	849	905	997