CSE 361 HW-0

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September 10, 2016

1 1.2-1

Give an example of an application that requires algorithmic content at the application level, and discuss the function of the algorithms involved.

An application that manages students for a classroom might require algorithmic content at the application level. It could use a sorting algorithm to sort students alphabetically by name for attendance, or a random shuffling algorithm in order to assign random seats to the students in the class.

2 1.2-2

Suppose we are comparing implementations of insertion sort and merge sort on the same machine. For inputs of size n, insertion sort runs in $8n^2$ steps, while merge sort runs in $64n \lg n$ steps. For which values of n does insertion sort beat merge sort?

Insertion sort beats merge sort when $2 <= n <= 6$ (where n is an integer)

3 1.2-3

3 What is the smallest value of n such that an algorithm whose running time is $100n^2$ runs faster than an algorithm whose running time is 2^n on the same machine?

Assuming n can ony be an integer, the smallest value of n where $100n^2$ is faster than 2^n is 15.

4 Table of values

	1 second	1 minute	1 hour	1 day	1 month	1 year	1 century
lg(n)	e^{1e6}	e^{60e6}	$e^{3.6e9}$	$e^{86.4e9}$	$e^{2.59e12}$	e^{946e12}	$e^{94.6e15}$
sqrt(n)	1 (12)	3.6 (15)	12.0 (18)	7.46 (21)	6.72 (24)	895 (27)	8.95 (33)
n	1 (6)	60 (6)	3.60 (9)	86.4 (9)	2.59 (12)	946 (12)	94.6 (15)
n lg n	87.8 (3)	3.95 (6)	189 (6)	3.91 (9)	102 (9)	30.5 (12)	2.66 (15)
n^2	1000	7746	60 (3)	294 (3)	1.61 (6)	30.7 (6)	307 (6)
n^3	100	391	1532	4420	13700	98 (3)	455 (3)
2^n	19	25	31	36	41	49	56
n!	9	11	12	14	15	17	18