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CS312 – Analysis of Algorithms
Homework Assignment #2
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1.1-4

- ✓ The shortest-path and traveling-salesman problems are similar in the sense that both of their solutions require looking at all possible outputs and their ideal solution is the shortest distance between any number of points. They are different in that the shortest-path problem has a solution that results in the best output possible, while the traveling-salesman problem is classified as a NP-Complete.

1.1-5

- ✓ A real-world problem in which only the best solution would do would be programming flight tracking service that provides real-time information about thousands of aircraft traveling around the world. The minimal calculation error could be potentially catastrophic and cause the lives of hundreds of passengers. A real-world problem in which an approximate solution would do would be finding the shortest distance traveled between two places, given that being a couple meters off won't matter as much.

1.2-2

- ✓ Insertion sort beats merge sort for all values of n between the values of 2 and 43.

1.2-3

- ✓ 15 is the smallest value of n that an algorithm with the running time 100n^2 runs faster than an algorithm whose running time is 2^n, on the same machine.

1-1 Comparison of running times

For each function f(n) and time t in the following table, determine the largest size n of a problem that can be solved in time t. Assuming that the algorithm to solve the problem takes f(n) milliseconds.

	1 Second = 1000 millisecond	1 Minute = 60000 milliseconds	1 Hour = 3.6e+6 milliseconds	1 Day = 8.64e+7 milliseconds
$\lg n$	2^{10^3}	2^{6*10^4}	$2^{3.6*10^6}$	$2^{8.64*10^7}$
$\sqrt{n}$	$(10^3)^2$	$(6*10^4)^2$	$(3.6*10^6)^2$	$(8.64*10^7)^2$
n	10^3	$6*10^4$	$3.6*10^6$	$8.64*10^7$
$n\ lg\ n$	$\frac{10^3}{\lg(10^3)}$	$\frac{(6*10^4)}{\lg\ (6*10^4)}$	$\frac{(3.6*10^6)}{lg(3.6*10^6)}$	$\frac{(8.64*10^7)}{lg(8.64*10^7)}$
n^2	$\sqrt{10^3}$	$\sqrt{6*10^4}$	$\sqrt{3.6*10^6}$	$\sqrt{8.64*10^7}$
n^3	$\sqrt[3]{10^3}$	$\sqrt[3]{6*10^4}$	$\sqrt[3]{3.6*10^6}$	$\sqrt[3]{8.64*10^7}$
2^n	$lg(10^3)$	$lg(6*10^4)$	$lg(3.6*10^6)$	$lg(8.64*10^7)$
$n!$	9	11	12	13

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Not too sure about this one.