COMP 250 Assignment #1

Alex Hale

4) a) all times in nanoseconds

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Digits | iterativeAddition | standardMultiplication | recursiveMultiplication | recursiveFastMultiplication |
| 2 | 25607 | 12168 | 2641 | 6343 |
| 4 | 1123810 | 18085 | 3840 | 11505 |
| 8 | 22255274667 | 71755 | 24398 | 34669 |
| 16 | too slow | 178501 | 53373 | 99326 |
| 32 | too slow | 594616 | 200413 | 225357 |
| 64 | too slow | 1936504 | 813360 | 713286 |
| 128 | too slow | 7563881 | 2912893 | 2053967 |
| 256 | too slow | 30971324 | 11031940 | 6093984 |
| 512 | too slow | 122604025 | 45693739 | 18158892 |
| 1024 | too slow | 508340027 | 184399704 | 55414889 |
| 2048 | too slow | 2064707268 | 743952790 | 218404874 |
| 4096 | too slow | 8991897380 | 3787743571 | 609691302 |

Patterns

iterativeAddition: too hard to tell given the small numbers of x

standardMultiplication: increases by roughly a factor of 4 over the last five trials

recursiveMultiplication: increases by roughly a factor of 4 over three of the last four trials, then increases by a roughly a factor of 5 between the second-last and last trial

recursiveFastMultiplication: increases by roughly a factor of 3 between 512 digits and 1024 digits, and roughly a factor of 4 over the last two trials

b) Used functions in part c) to predict T(x = 8192)

iterativeAddition: ns years times the age of the universe

standardMultiplication : ns 37.02 s

recursiveMultiplication : ns 16.28 s

recusiveFastMultiplication : 2 069 589 666 ns 2.07 s

c) Used Excel linear regression

iterativeAddition:

* Note: measured running time of x = 1, 2, …, 9 to get a more accurate function

standardMultiplication :

recursiveMultiplication :

recursiveFastMultiplication :

d) compared values in chart

faster than iterativeAddition: n = 2

faster than standardMultiplication: n = 2

faster than recursiveMultiplication: n = 64