Activity 1. Stack Overflow Exception

The complexity of the classes Subtraction1 is O(n) and Subtraction2 is O(n^2)

Subtraction1 and Subtraction2 stop giving values after n = 16384 and n = 32768 respectively as they are adding values to the stack faster that it can process them throwing a stack overflow error when there is no more space in the stack.

Activity 2. Subtraction3 approximation for n = 80

Taking into account the complexity of the Subtraction 3, O(2^n), we can approximate the time it would take to execute for n = 80 as 2^80 = 1.209\*10^24 ms.

(1,208,925,819,614,629,174,706,176)

Activity 3. Subtraction4 and Subtraction5 tables

|  |  |
| --- | --- |
| n | Substraction4 times(ms) |
| 100 | 1 |
| 200 | 1 |
| 400 | 3 |
| 800 | 33 |
| 1600 | 214 |
| 3200 | 1483 |
| 6400 | 10829 |
| 12800 | 10829 |
| 25600 | OoT |

|  |  |
| --- | --- |
| n | Substraction5 times(ms) |
| 30 | 27 |
| 32 | 83 |
| 34 | 134 |
| 36 | 697 |
| 38 | 1188 |
| 40 | 6292 |
| 42 | 10753 |
| 44 | 56782 |
| 46 | OoT |

To compute the time it would take for Substraction5 to execute for n=80 we can calculate by doing 3 ^ (80/2) = 3^40 1.216 \* 10 ^ 19 ms. (12,157,665,459,056,928,801)

Activity 4. Divide and Conquer with division

For Division1 and Division3 their complexities are O(n) and for Division2 the complexity is n\*log(n) this is accurate as the times for Division1 and Division3 are almost identical and for Division2 we can see it’s slightly worse.

Activity 5. Divide and Conquer with division

Activity 6. Divide and Conquer with division