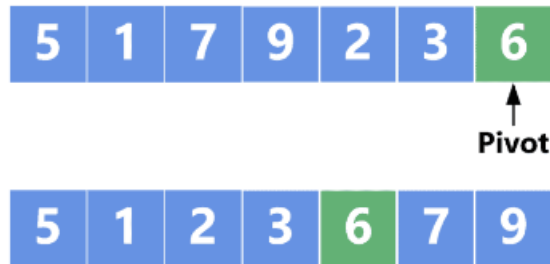# CS211 Lab 9

QUICKSORT

The Collatz sequence for a number n is produced as follows:

if n is even, divide by 2
otherwise multiply by 3 and add 1

BigInteger

The Collatz length of a number is the number of steps it follows before reaching 1. For example, the Collatz length of 9 is 20, because there are 20 terms in the sequence that starts with 9:

9, 28, 14, 7, 22, 11, 34, 17, 52, 26, 13, 40, 20, 10, 5, 16, 8, 4, 2, 1

The goal is to sort numbers by their Collatz length. For example, the Collatz lengths of the numbers from 1 to 10 is:

1	2	3	4	5	6	7	8	9	10
1	2	8	3	6	9	17	4	20	7

Which means that when the numbers from 1 to 10 are sorted by their Collatz lengths, they end up in this order:

[1, 2, 4, 8, 5, 10, 3, 6, 7, 9]

Imagine **all** the numbers that exist are sorted by their Collatz length.
Write a program that takes in an int *n* and outputs the number in *n*th place.

Find the highest position in this ordering that you can.

PEN AND PAPER EXERCISE

Show how the following numbers would be sorted by quicksort, identifying the swaps and pivots involved:

91 60 25 95 69 15 97 41