

## CSCI423/501 Programming Assignment 2

The Collatz conjecture concerns what happens when we take any positive integer  $n$  and apply the following algorithm:

$$n = \begin{cases} n / 2, & \text{if } n \text{ is even} \\ 3 \times n + 1, & \text{if } n \text{ is odd} \end{cases}$$

The conjecture states that when this algorithm is continually applied, all positive integers will eventually reach 1. For example, if  $n=35$ , the sequence is

35, 106, 53, 160, 80, 40, 20, 10, 5, 16, 8, 4, 2, 1

Write a C program using the `fork()` system call that generates this sequence in the child process. The starting number will be provided from the command line. For example, if 8 is passed as a parameter on the command line, the child process will output 8, 4, 2, 1. Have the parent invoke the `wait()` call to wait for the child process to complete before exiting the program. Perform necessary error checking to ensure that a positive integer is passed on the command line. Following are some running examples, assuming the compiled program named `b.out`:

Example 1:

```
./b.out 3
3, 10, 5, 16, 8, 4, 2, 1
```

Example 2:

```
./b.out -3
<starting value> should be a positive integer
```

Example 3:

```
./b.out
Usage: ./b.out <starting value>
```

Example 4:

```
./b.out 3 10
Usage: ./b.out <starting value>
```