

CIS 1152 - Lab #2 PHP Logic and Loops
S. Ruegsegger
Modified by Peter Chapin (with permission)

Objective

To explore the use of PHP logic (Boolean) conditionals and loops.

Task 1: Multiplication table

Student skill: *nested loops*

Use a nested loop to build a multiplication table in HTML of size $n \times n$; where a single PHP variable $\$n$ determines the (square) size. For example, here are two tables.

This is a **5 x 5** multiplication table.

x	1	2	3	4	5
1	1	2	3	4	5
2	2	4	6	8	10
3	3	6	9	12	15
4	4	8	12	16	20
5	5	10	15	20	25

This is a **10 x 10** multiplication table.

x	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10
2	2	4	6	8	10	12	14	16	18	20
3	3	6	9	12	15	18	21	24	27	30
4	4	8	12	16	20	24	28	32	36	40
5	5	10	15	20	25	30	35	40	45	50
6	6	12	18	24	30	36	42	48	54	60
7	7	14	21	28	35	42	49	56	63	70
8	8	16	24	32	40	48	56	64	72	80
9	9	18	27	36	45	54	63	72	81	90
10	10	20	30	40	50	60	70	80	90	100

You may be creative with CSS or other formatting. Here are 4 requirements:

- There is a first column of *row-headers* and a first row of *column-headers*
- Row and column headers have a different color background.
- Row and column header text is **bold**.
- Color the row=column diagonal cells with a different, highlighting background color.

Task 2: Collatz Sequence

Student skill: *while* loops (unknown sequence ending) with if-then-else logic.

What is the Collatz Sequence? Read this: https://en.wikipedia.org/wiki/Collatz_conjecture

This is an algorithm which can start with *any* (very large) integer and it always, and eventually (and rather quickly), ends at the number “1”. I find that amazing! I love it.

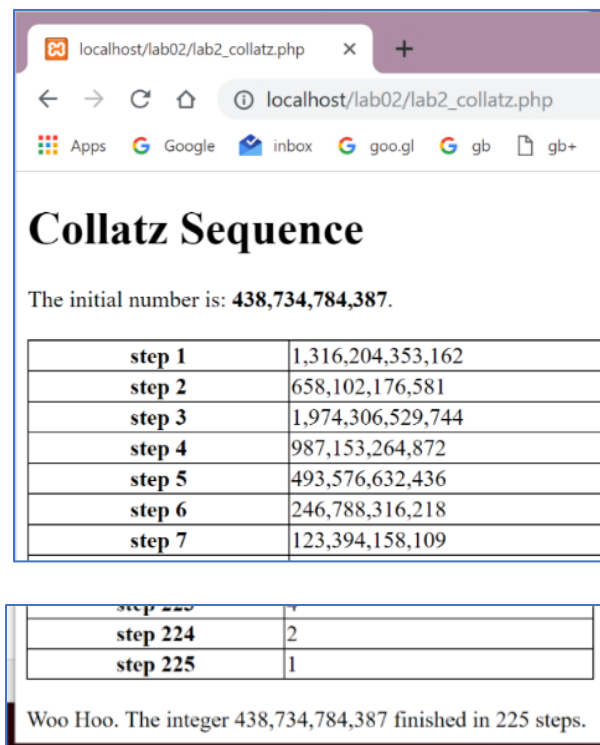
Here is the algorithm:

- If the number is even, divide it by 2
- If the number is odd, then return $(3 * \text{number} + 1)$
- Keep doing this loop until the number is 1.

Notice that evens get smaller, but odds get bigger!

Requirements:

- Print out the initial, **very large** number – which is at least **12 digits** long.
- Print all numbers in a readable “comma” format.
- Make a two-column table where the first column is the step number and the second column is the resultant sequential number of the algorithm.
- Finally, after the table is ended, print out the number of steps.



The screenshot shows a web browser window with the URL localhost/lab02/lab2_collatz.php. The page title is "Collatz Sequence". Below the title, it says "The initial number is: 438,734,784,387." There are two tables. The first table shows the first 7 steps of the sequence, with the numbers decreasing as the steps progress. The second table shows the final steps, step 224 with the number 2, and step 225 with the number 1. Below the tables, a message reads: "Woo Hoo. The integer 438,734,784,387 finished in 225 steps."

step 1	1,316,204,353,162
step 2	658,102,176,581
step 3	1,974,306,529,744
step 4	987,153,264,872
step 5	493,576,632,436
step 6	246,788,316,218
step 7	123,394,158,109

step 224	2
step 225	1

Woo Hoo. The integer 438,734,784,387 finished in 225 steps.