

# Computer Science

What is a computer?

- A machine that does math
- Input  $\rightarrow$  Output
- Computes
- Artificially solves problems
- Code + electric signals

What is science?

- System of inquiry + investigation
- Specific field of study
- Study of nature + dynamics of \_\_\_\_\_
- Way of understanding natural world

Why study CS?

- Many applications - make money, contribute to human flourishing,
- Beautiful ideas, learn new ways of thinking.
- Being an engaged citizen

Start with a number  $n$ . — input

Repeat until  $n = 1$ : — math

{ If  $n$  is even, divide it by 2. — math

} Otherwise, multiply it by 3 and then add 1.

Output the number of repetitions needed to reach 1. — output.

Example

$n = 6, \rightarrow 3 \rightarrow 10 \rightarrow 5 \rightarrow 16 \rightarrow 8 \rightarrow 4 \rightarrow 2 \rightarrow 1$   
(8 reps.)

50 : 24

17 : 12

13 : 9

14 : 18

239 : ?

9 : 19

Algorithm = series of steps to accomplish a task.

5 aspects/components of algorithms:

- ① Input. — ie. taking information from outside world.
- ② Output — ie. putting information out into the world.
- ③ Math/Arithmetic
- ④ Conditionals — ie. deciding between multiple courses of action
- ⑤ Repetition — ability to repeat actions multiple times.

3 types of errors

- Syntax errors — ie. "grammar errors". Not even a valid program.
- runtime errors — valid program, but crashes.
- semantic errors. — valid program runs, but doesn't do what you intended.