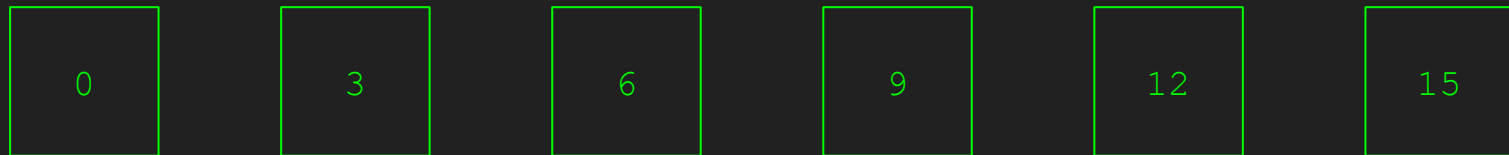# Code for Teachers

A practical approach to programming

Chapter 2-5:
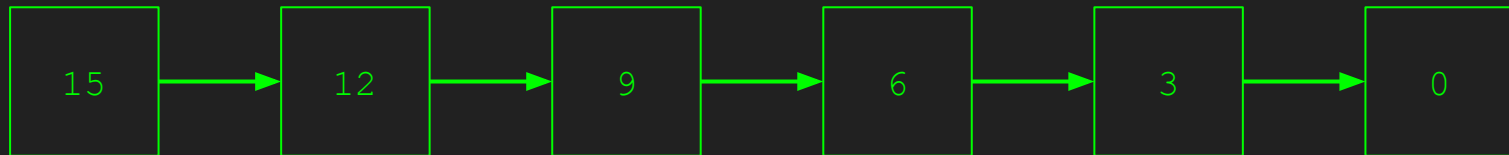# Division with a `while` Loop

Basic Concepts

- If multiplication is repeated addition…
  - Is division repeated *subtraction*?!
  - By exploring this idea computationally, we can deepen our conceptual understanding of division

```
5 * 3
```

| 0 | 3 | 6 | 9 | 12 | 15 |

Basic Concepts

`15 / 3`

```
┌──────┐      ┌──────┐      ┌──────┐      ┌──────┐      ┌──────┐      ┌──────┐
│  15  │ ───▶ │  12  │ ───▶ │  9   │ ───▶ │  6   │ ───▶ │  3   │ ───▶ │  0   │
└──────┘      └──────┘      └──────┘      └──────┘      └──────┘      └──────┘
```

- The quotient is a count of how many times we can subtract from our start toward zero without going past.

Program Design

- Take two numbers, `x` and `y`.
- Create a `quotient` variable, initialized to 0.
- While `x` is greater than 0, subtract `y` from `x`
  - Add 1 to `quotient` every time

Lesson Design

- Lots of opportunities here
- Our two programs have some built-in weaknesses (aka opportunities to explore further)
    - Getting input from the user
    - Negative numbers
    - Multiplication: More than two terms?
    - Division: Remainder?
    - Exponentiation: Repeated repeated addition?

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