Definition (Monad in functional programming)
A monad

$$\langle return, join, fmap, bind, fish, lift \rangle$$

is a set of operations with the following signature:

$$\begin{aligned} return &: X \to MX \\ lift &: (X \to Y) \to (X \to MY) \\ fish &: (X \to MY) \to (Y \to MZ) \to (X \to MZ) \\ join &: MMX \to MX \\ fmap &: (X \to Y) \to (MX \to MY) \\ bind &: MX \to (X \to MY) \to MY \end{aligned}$$

These maps satisfy the equivalent axioms of unitality and associativity:

- *return* is a left identity for *bind*;
- *return* is a right identity for *bind*;
- *bind* is associative.