

A semigroup + an identity element is **monoid**

```
class Semigroup a where  
  append :: a → a → a
```

```
class Semigroup m ≤ Monoid m where  
  mempty :: m
```

Semigroup



Identity

Monoid

Additionally, a monoid can be commutative

```
class Semigroup a where  
  append :: a → a → a
```

```
class Semigroup m ≤ Monoid m where  
  mempty :: m
```

```
class Monoid m ≤ CommutativeMonoid m
```

Semigroup



Identity

Monoid

Commutative or *abelian* monoid