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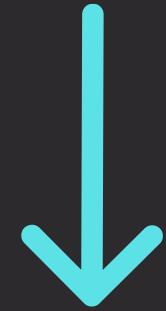


# Generics

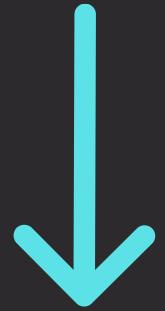
- | Allow one function to handle multiple types of data
- | Reduces code duplication
  - | Less code = less bugs chances
- | Generics are defined using interfaces (called **constraints**)
  - | Function parameters / return types are constrained to a specific set of interfaces

# Syntax

Generic type name



"or"



```
func name[T constraint, U constraintA | constraintB](a T, b U) T {  
    // ...  
}
```



Constraint / Interface

# Example

```
func IsEqual[T comparable](a, b T) bool {  
    return a == b  
}  
  
IsEqual(2, 2)  
IsEqual("foo", "bar")  
IsEqual('a', 'b')  
IsEqual[uint8](4, 4)
```

# Creating a Constraint

```
type Integers32 interface {
    int32 | uint32
}

func SumNumbers[T Integers32](arr []T) T {
    var sum T
    for i := 0; i < len(arr); i++ {
        sum += arr[i]
    }
    return sum
}

nums := []int32{1, 2, 3}
nums2 := []uint32{1, 2, 3}
total := SumNumbers(nums)
total2 := SumNumbers(nums2)
```

# Constraints and Type Aliases

```
type Integers32 interface {
    int32 | uint32
}

func SumNumbers[T Integers32](arr []T) T {
    var sum T
    for i := 0; i < len(arr); i++ {
        sum += arr[i]
    }
    return sum
}

type MyInt int32
nums := []MyInt{MyInt(1), MyInt(2), MyInt(3)}
```

Error: MyInt does not implement Integers32

# Approximation

```
type Integers32 interface {
    ~int32 | ~uint32
}

func SumNumbers[T Integers32](arr []T) T {
    var sum T
    for i := 0; i < len(arr); i++ {
        sum += arr[i]
    }
    return sum
}

type MyInt int32
nums := []MyInt{MyInt(1), MyInt(2), MyInt(3)}
```

# Builtin Constraints

**constraints**

**Package**



<b>Constraint</b>	<b>Description</b>
any	Any type
comparable	Anything that can be compared for equality
Unsigned	All unsigned integers
Signed	All signed integers
Ordered	Sortable types (numbers, strings)
Integer	All integers
Float	All floating point numbers
Complex	All complex numbers

# Generic Structure

```
import "constraints"
type MyArray[T constraints.Ordered] struct {
    inner []T
}
func (m *MyArray[T]) Max() T {
    max := m.inner[0]
    for i := 0; i < len(m.inner); i++ {
        if m.inner[i] > max {
            max = m.inner[i]
        }
    }
    return max
}
arr := MyArray[int]{inner: []int{6, 4, 8, 9, 4, 0}}
fmt.Println(arr.Max())
```

# Recap

- | Generic functions reduce code duplication
- | Generic constraints are interfaces which specify allowable types
- | Use tilde (~) to allow approximate types
  - | Approximation permits checking underlying types
- | The **constraints** package has commonly used constraints
- | The **comparable** constraint is always available

