# Basic syntax

```go
// All files start with a package declaration
package main

// Import statements, one package on each line
import (
    "errors"
    "fmt"
)

// Main method will be called when the Go executable is run
func main() {
    fmt.Println("Hello world!")
    basic()
    add(1, 2)
    divide(3, 4)
    loops()
    slices()
    maps()
    sharks()
}

// Function declaration
func basic() {
    // Declare x as a variable, initialized to 0
    var x int
    // Declare y as a variable, initialized to 2
    var y int = 2
    // Declare z as a variable, initialized to 4
    // This syntax can only be used in a function
    z := 4

    // Assign values to variables
    x = 1
    y = 2
    z = x + 2 * y + 3

    // Print the variables; just use %v for most types
    fmt.Printf("x = %v, y = %v, z = %v\n", x, y, z)
}

// Function declaration; takes in 2 ints and outputs an int
func add(x, y int) int {
    return x + y
}
```

```go
// Function that returns two things; error is nil if successful
func divide(x, y int) (float64, error) {
    if y == 0 {
        return 0.0, errors.New("Divide by zero")
    }
    // Cast x and y to float64 before dividing
    return float64(x) / float64(y), nil
}

func loops() {
    // For loop
    for i := 0; i < 10; i++ {
        fmt.Print(".")
    }
    // While loop
    sum := 1
    for sum < 1000 {
        sum *= 2
    }
    fmt.Printf("The sum is %v\n", sum)
}

func slices() {
    slice := []int{1, 2, 3, 4, 5, 6, 7, 8}
    fmt.Println(slice)
    fmt.Println(slice[2:5]) // 3, 4, 5
    fmt.Println(slice[5:]) // 6, 7, 8
    fmt.Println(slice[:3]) // 1, 2, 3
    slice2 := make([]string, 3)
    slice2[0] = "tic"
    slice2[1] = "tac"
    slice2[2] = "toe"
    fmt.Println(slice2)
    slice2 = append(slice2, "tom")
    slice2 = append(slice2, "radar")
    fmt.Println(slice2)
    for index, value := range slice2 {
        fmt.Printf("%v: %v\n", index, value)
    }
    fmt.Printf("Slice length = %v\n", len(slice2))
}

func maps() {
    myMap := make(map[string]int)
    myMap["yellow"] = 1
    myMap["magic"] = 2
    myMap["amsterdam"] = 3
    fmt.Println(myMap)
    myMap["magic"] = 100
    delete(myMap, "amsterdam")
    fmt.Println(myMap)
    fmt.Printf("Map size = %v\n", len(myMap))
}
```

# Basic syntax

```go
// Object oriented programming
// Convention: capitalize first letter of public fields
type Shark struct {
    Name string
    Age int
}


// Declare a public method
// This is called a receiver method
func (s *Shark) Bite() {
    fmt.Printf("%v says CHOMP!\n", s.Name)
}


// Because functions in Go are pass by value
// (as opposed to pass by reference), receiver
// methods generally take in pointers to the
// object instead of the object itself.
func (s *Shark) ChangeName(newName string) {
    s.Name = newName
}


// Receiver methods can take in other objects as well
func (s *Shark) Greet(s2 *Shark) {
    if (s.Age < s2.Age) {
        fmt.Printf("%v says your majesty\n", s.Name)
    } else {
        fmt.Printf("%v says yo what's up %v\n",
            s.Name, s2.Name)
    }
}


func sharks() {
    shark1 := Shark{"Bruce", 32}
    shark2 := Shark{"Sharkira", 40}
    shark1.Bite()
    shark1.ChangeName("Lee")
    shark1.Greet(&shark2) // pass in pointer
    shark2.Greet(&shark1)
}
```

```go
// Launch n goroutines, each printing a number
// Note how the numbers are not printed in order
func goroutines() {
    for i := 0; i < 10; i++ {
        // Print the number asynchronously
        go fmt.Printf("Printing %v in a goroutine\n", i)
    }
    // At this point the numbers may not have been printed yet
    fmt.Println("Launched the goroutines")
}


// Channels are a way to pass messages across goroutines
func channels() {
    ch := make(chan int)
    // Launch a goroutine using an anonymous function
    go func() {
        i := 1
        for {
            // This line blocks until someone
            // consumes from the channel
            ch <- i * i
            i++
        }
    }()
    // Extract first 10 squared numbers from the channel
    for i := 0; i < 10; i++ {
        // This line blocks until someone sends into the channel
        fmt.Printf("The next squared number is %v\n", <-ch)
    }
}


// Buffered channels are like channels except:
//   1. Sending only blocks when the channel is full
//   2. Receiving only blocks when the channel is empty
func bufferedChannels() {
    ch := make(chan int, 3)
    ch <- 1
    ch <- 2
    ch <- 3
    // Buffer is now full; sending any new messages will block
    // Instead let's just consume from the channel
    for i := 0; i < 3; i++ {
        fmt.Printf("Consuming %v from channel\n", <-ch)
    }
    // Buffer is now empty; consuming from channel will block
}
```