Let's get Go-ing

An introduction to Go
programming for COS 316

Today's Agenda

Just enough Go to get started on Assignment 1.

- What is Go?
- Variables, loops, and functions in Go
- Navigating the standard library documentation

Why learn Go?

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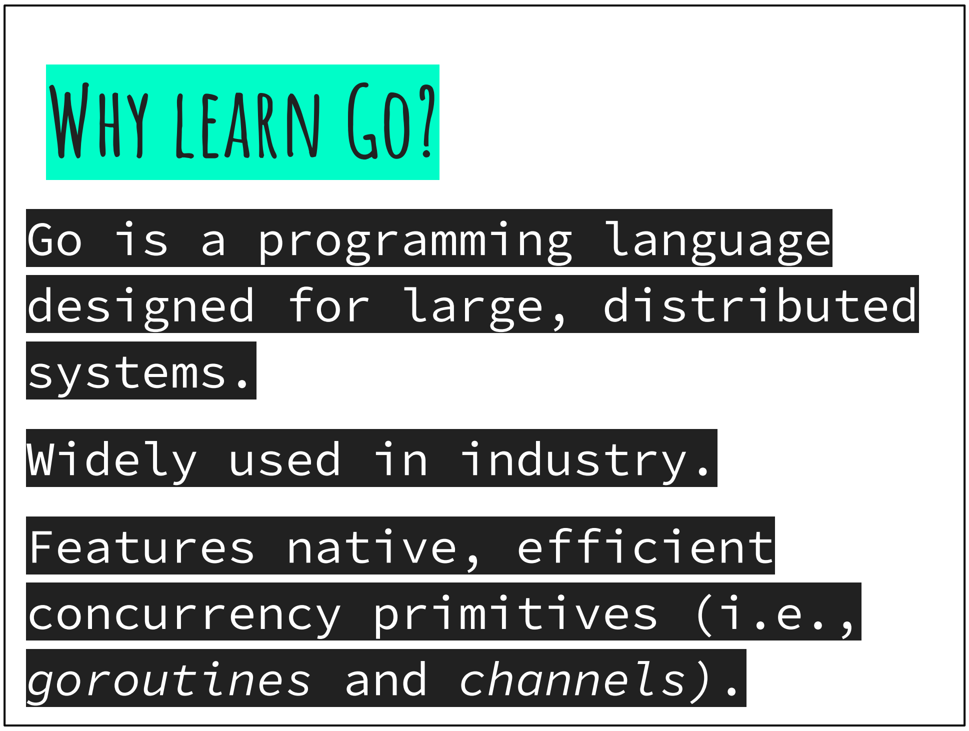
Widely used in industry.



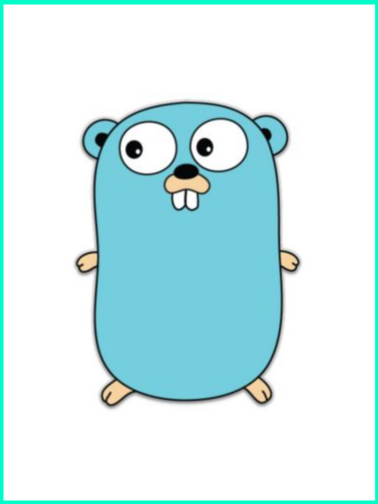
Why learn Go?

Go is a programming language designed for large, distributed systems.

Widely used in industry.

Features native, efficient concurrency primitives (i.e., *goroutines* and *channels*).

Worth mentioning Go is also used in COS 418.



Okay, let's write our first program

Variables

`https://go.dev/play`

Variables

```
package main

func main() {

}
```

Variables

```
package main

func main() {
  var a int = 3
}
```

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Variable types come *after* variable names

Variables

```
package main

func main() {
  var a int = 3
  var b = 2
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Variable types can be omitted and inferred

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package main

func main() {
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  c := 1
}
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func main() {
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A shorthand for 'var c =' is 'c :='

Variables

```
package main

func main() {
  var a int = 3
  var b = 2
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  var d int
}
```

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Can choose to accept default value (i.e., 0)

Variables

```
package main

func main() {
  var a int = 3
  var b = 2
  c := 1
  var d int
  var e, f int = -1, -2
}
```

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Can choose to accept default value (i.e., 0)

Can declare and init. multiple vars in 1 line

Variables

```
package main

func main() {
  var
  var
  c :=
  var
  var
}
```

Okay, looks good!
Let's run our code.

Variable types come *after* variable names

Variable types can be omitted and inferred

ccept
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```
Okay, looks good!
Let's run our code.

> go run main.go
```

Variables

```
package main
```

Variable types come *after* variable names

Variable types can be

default value (i.e., 0)

Can declare and init. multiple vars in 1 line

Compiler says nope!

X

```
./main.go:4:7: a declared and not used
./main.go:5:7: b declared and not used
./main.go:6:3: c declared and not used
./main.go:7:7: d declared and not used
./main.go:8:7: e declared and not used
./main.go:8:10: f declared and not used
```

Variables

```
package main

func main() {
  var
  var
  c :=
  var
  var
}
```

Go prevents you from compiling code with unused variables, so let's print them out

Variable types come *after* variable names

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Variables

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Variables

```
package main

import "fmt"

func main() {
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}
```

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package main

import "fmt"

func main() {
  var a int = 3
  var b = 2
  c := 1
  var d int
  var e, f int = -1, -2

  fmt.Println(a, b, c)
}
```

Variable types come *after* variable names

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  var a int = 3
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  fmt.Println(a, b, c)
  fmt.Println(d, e, f)
}
```

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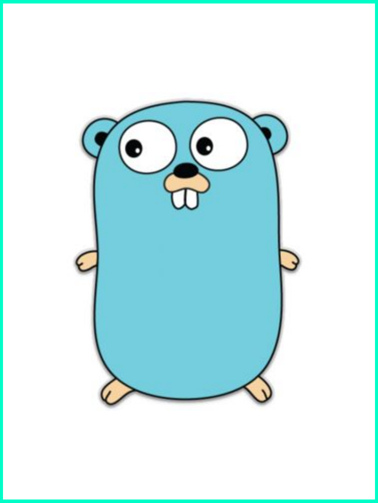

Let's see this in action!

Play time!

"Go" to go.dev/play and try out some variable declarations.

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Here are some ideas.

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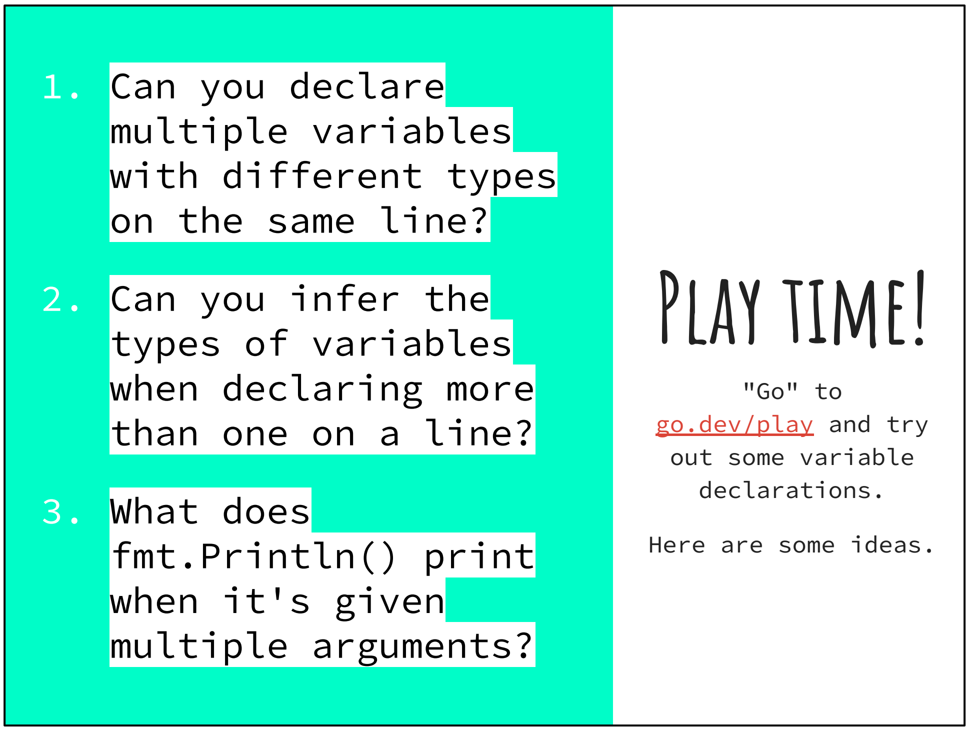

1. Can you declare multiple variables with different types on the same line?
2. Can you infer the types of variables when declaring more than one on a line?
3. What does fmt.Println() print when it's given multiple arguments?

Play time!

"Go" to go.dev/play and try out some variable declarations.

Here are some ideas.

1. Yes, if you instantiate the variables without the type
2. Yes
3. It gives space-separated values

Loops

Loops

```go
package main

func main() {

}
```

LOOPS

```go
package main

import "fmt"

func main() {
  for i := 1; i <= 3; i++ {
     fmt.Println(i)
  }
}
```

```
package main

import "fmt"

func main() {
  for i := 1; i <= 3; i++ {
     fmt.Println(i)
  }
}
```

Loops

'for' loops work like in Java/C, but don't require ()

Must use { }, even for 1-line loops

Loops

```go
package main

import "fmt"

func main() {
  for i := 1; i <= 3; i++ {
     fmt.Println(i)
  }
  i := 4
  for i <= 10 {
    fmt.Println(i)
    i++
  }
}
```

'for' loops work like in Java/C, but don't require ()

Must use { }, even for 1-line loops

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func main() {
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    fmt.Println(i)
    i++
  }
  for {
    fmt.Println("done!")
    break
  }
}
```

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Must use { }, even for 1-line loops

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package main

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  for i := 1; i <= 3; i++ {
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    i++
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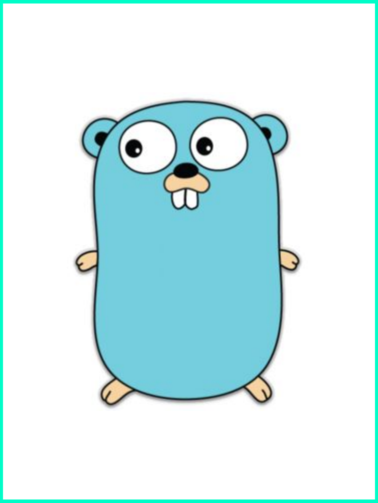
    break
  }
}
```

'for' loops work like in Java/C, but don't require ()

Must use { }, even for 1-line loops

No such thing as 'while' loops in Go

Can use 'break' and 'continue'



Let's try it ourselves

Let's Get Loopy

Navigate to go.dev/play and write a few Go loops.

1. Does the scoping of the index variable in a Go 'for' loop extend beyond the loop?

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1. Does the scoping of the index variable in a Go 'for' loop extend beyond the loop?
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LET'S GET LOOPY

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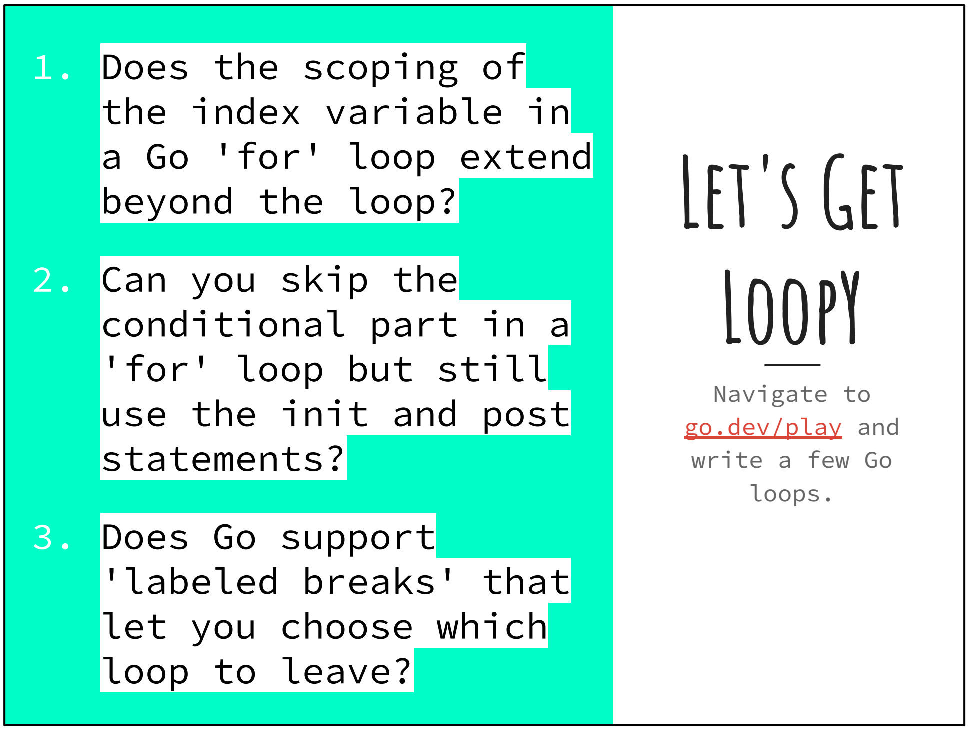

1. Does the scoping of the index variable in a Go 'for' loop extend beyond the loop?
2. Can you skip the conditional part in a 'for' loop but still use the init and post statements?
3. Does Go support 'labeled breaks' that let you choose which loop to leave?

LET'S GET LOOPY

Navigate to go.dev/play and write a few Go loops.

1. If the variable is declared as part of the loop invocation, then its scope doesn't extend beyond the loop.
2. Yes
3. Yes

Functions

Functions

```
func f(a int, b int) int {
  return a + b
}
```

FUNCTIONS

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func g(a, b int) int {
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If args are same type, can specify type once at end

Functions

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func f(a int, b int) int {
  return a + b
}

func g(a, b int) int {
  return a * b
}

func h(a, b int) (int,int) {
  return f(a, b), g(a, b)
}
```

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FUNCTIONS

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func f(a int, b int) int {
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func h(a, b int) (int,int) {
  return f(a, b), g(a, b)
}

func main() {
  a, b := h(1, 2)
  _, c := h(3, 4)
}
```

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}
```

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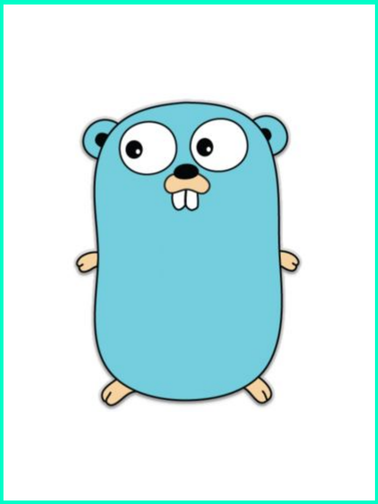
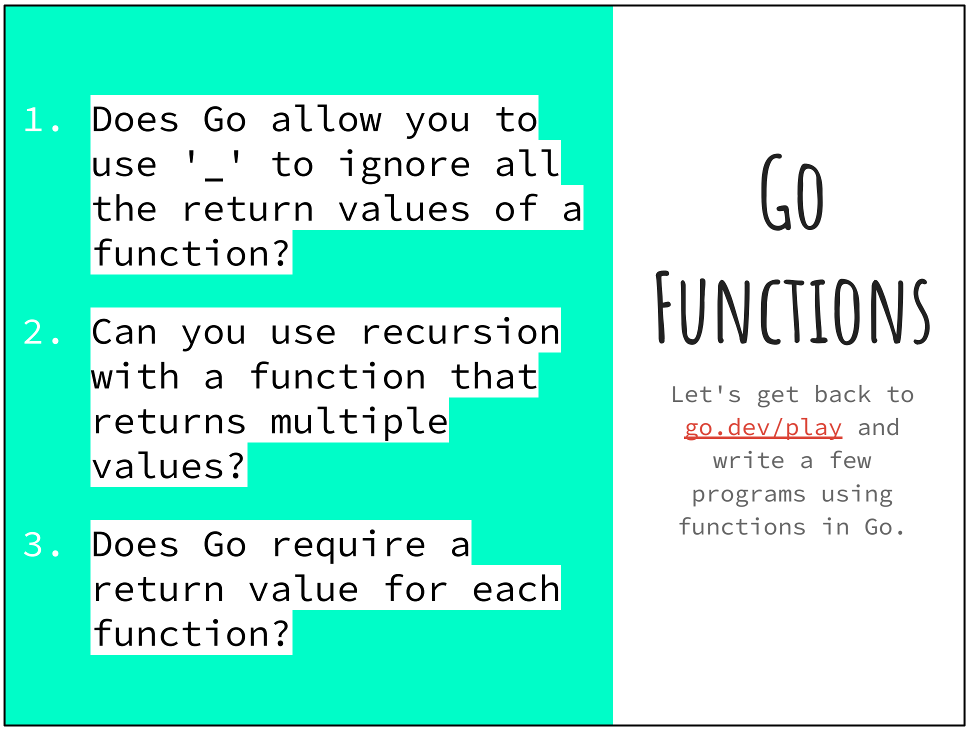
Functions can return more than one result

'_' throws away a return value



Last programming exercise!



1. Does Go allow you to use '_' to ignore all the return values of a function?
2. Can you use recursion with a function that returns multiple values?
3. Does Go require a return value for each function?

Go Functions

Let's get back to go.dev/play and write a few programs using functions in Go.

1. No
2. Yes
3. No

Go Standard Library

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All Go programs have access to to a massive standard library of packages. (See pkg.go.dev/std)

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This collection of officially supported packages is one of the reasons Go is a useful language for systems programmers.

Reading The Documentation

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There's a lot of it and you'll be learning about the language as you read it.

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Expect to spend some time pouring over it.

External Sources

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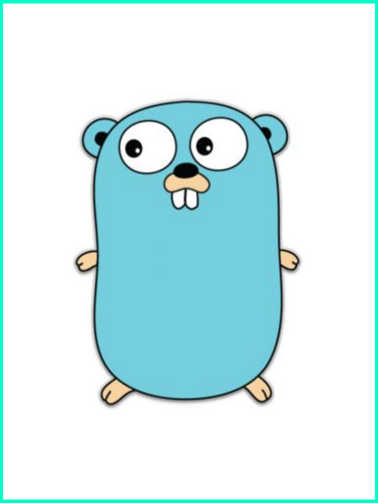
Search for “golang” instead.



Let's see the docs

Doc Hunt

1. Find some "interesting" packages
2. Can you experiment using the provided examples?

Navigate to
pkg.go.dev

Use
go.dev/play

Questions?

Please don't hesitate to ask!

Additional Resources

- Go.dev
- Go Tutorial
- go.dev/play
- gobyexample.com
- "Learn Go Programming" (7 hour YouTube tutorial)