git & golang book

Read golang book and work with git

golang book

AN INTRODUCTION TO PROGRAMMING IN GO

CALEB DOXSEY

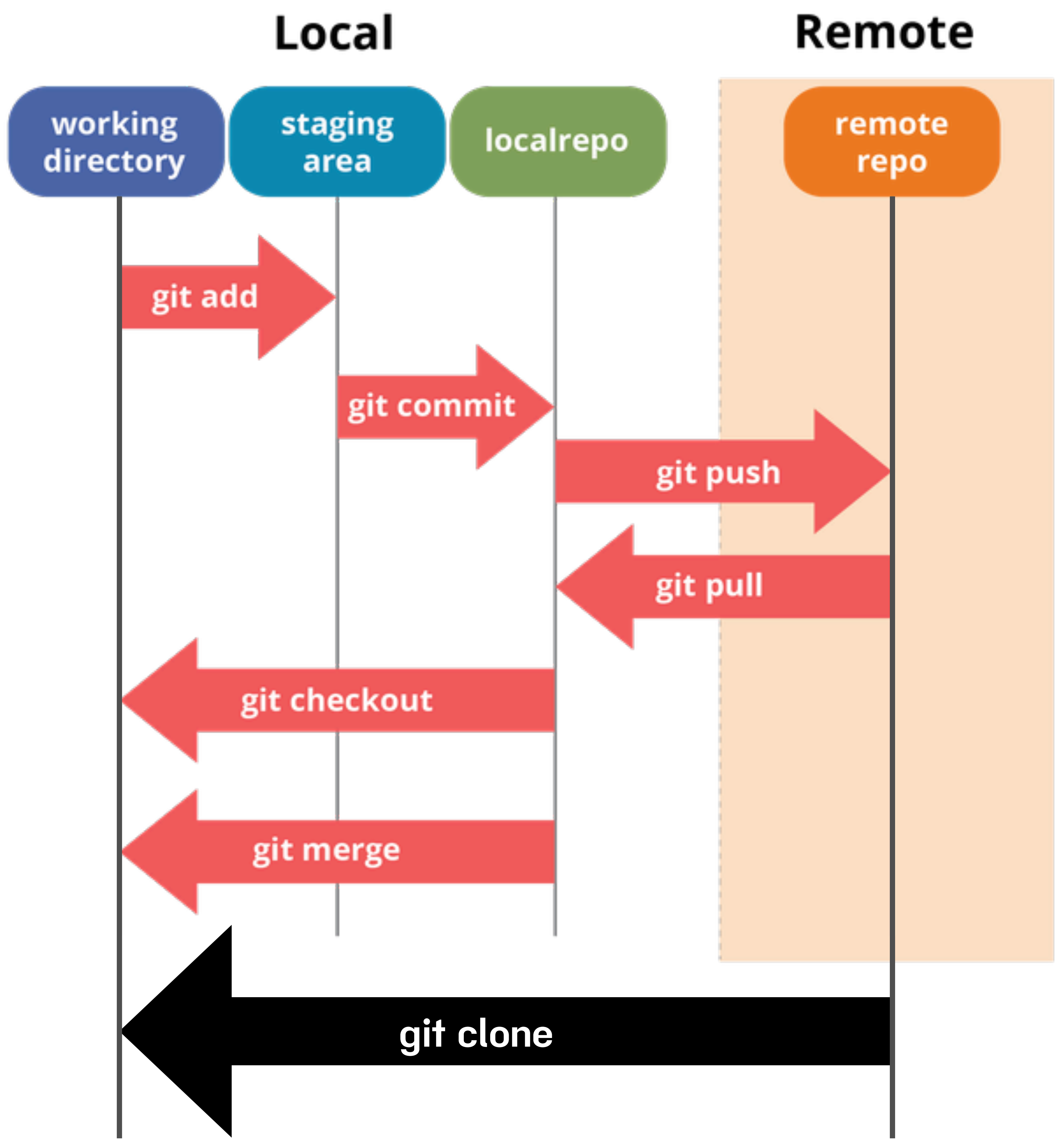
git

github account:

https://github.com/[yourname]

example:

https://github.com/boyone


Local
Remote
working directory
staging area
localrepo
remote repo
git add
git commit
git push
git pull
git checkout
git merge
git clone

Clone go-101

clone go-101 to your workspace:

```
>git clone https://github.com/boyone/go-101.git
```

golang book [1]

make working directory: [windows]

```
>md src\dojo\golang-book
```

make working directory: [linux/Mac]

```
>mkdir -p src/dojo/golang-book
```

golang book [2]

go to golang-book directory:

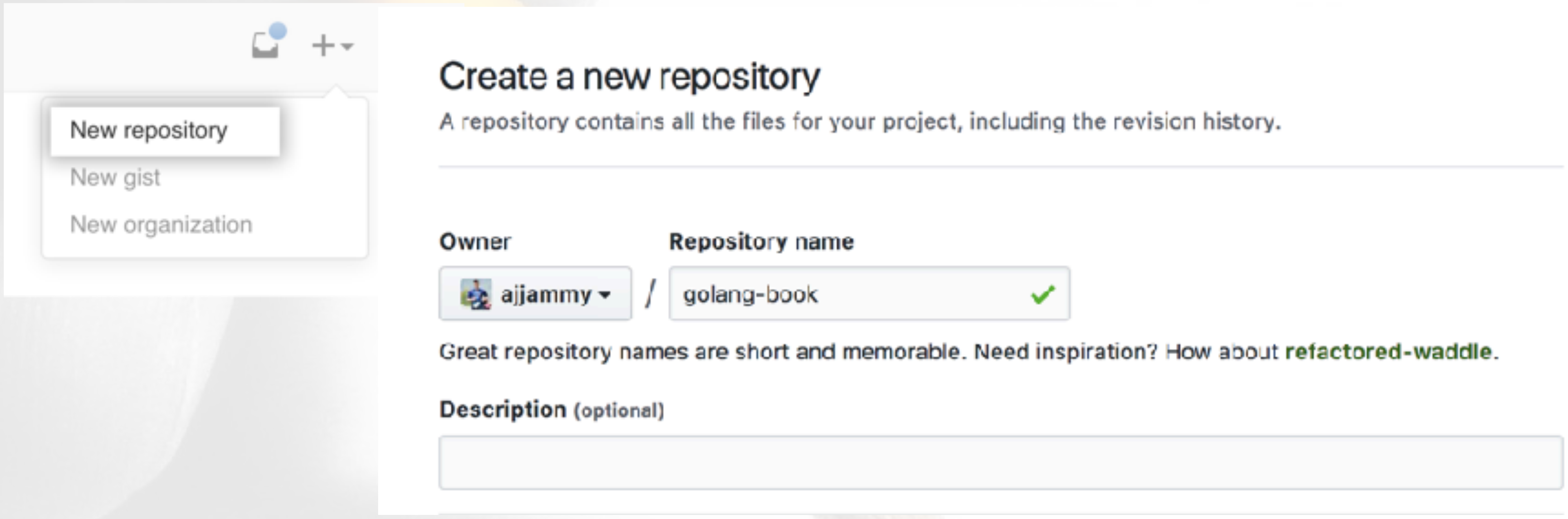
```
>cd src\dojo\golang-book
```

git init for golang-book directory:

```
>git init
```

golang book [3]

create github repository:



Create a new repository

A repository contains all the files for your project, including the revision history.

Owner: ajjammy / Repository name: golang-book ✓

Great repository names are short and memorable. Need inspiration? How about refactored-waddle.

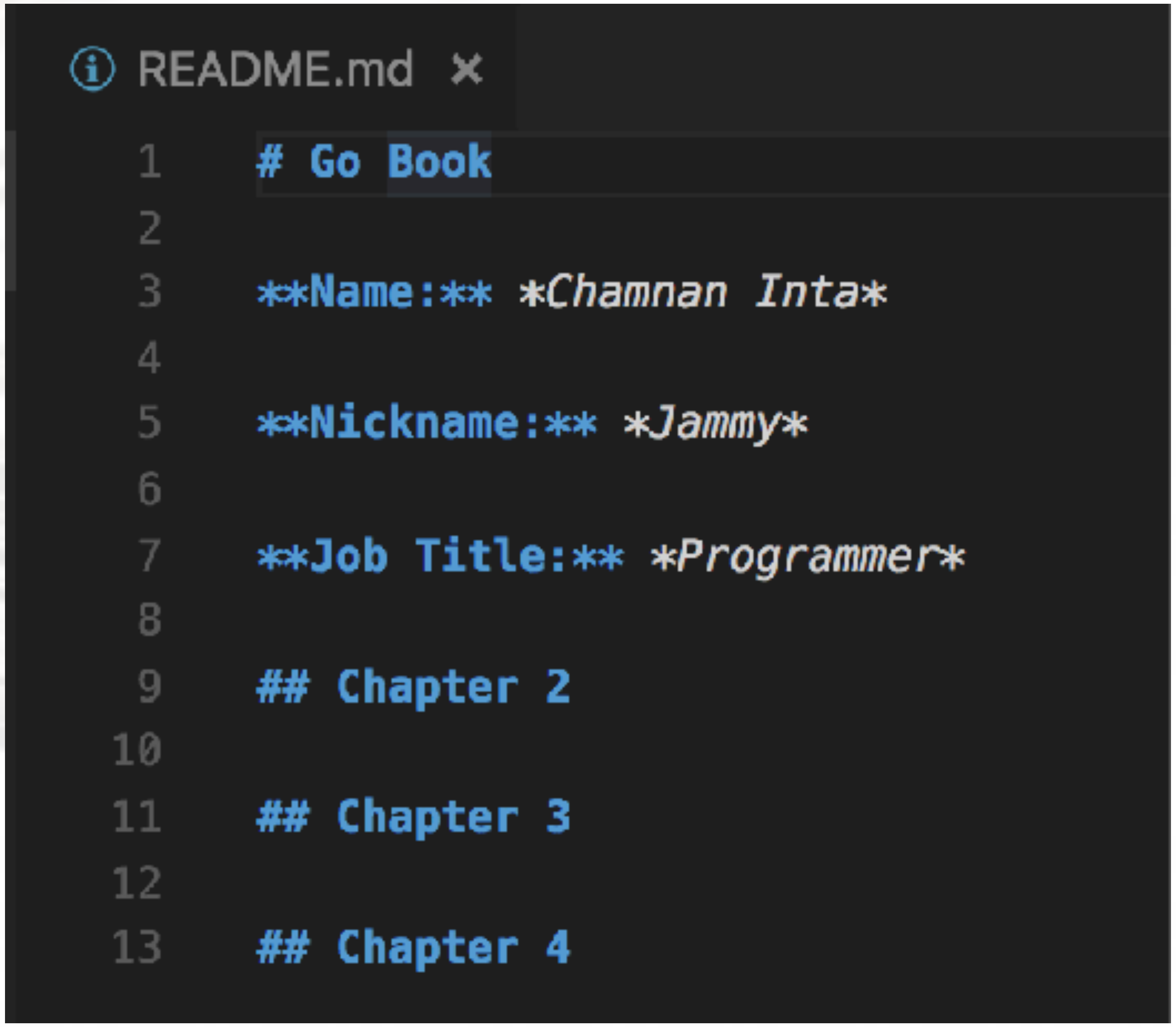
Description (optional)

add remote:

```
>git remote add origin https://github.com/<user>/golang-book.git
>git remote -v
```

golang book [4]

create README.md file:



```
# Go Book

**Name:** *Chamnan Inta*

**Nickname:** *Jammy*

**Job Title:** *Programmer*

## Chapter 2

## Chapter 3

## Chapter 4
```

golang book [5]

git add / git commit :

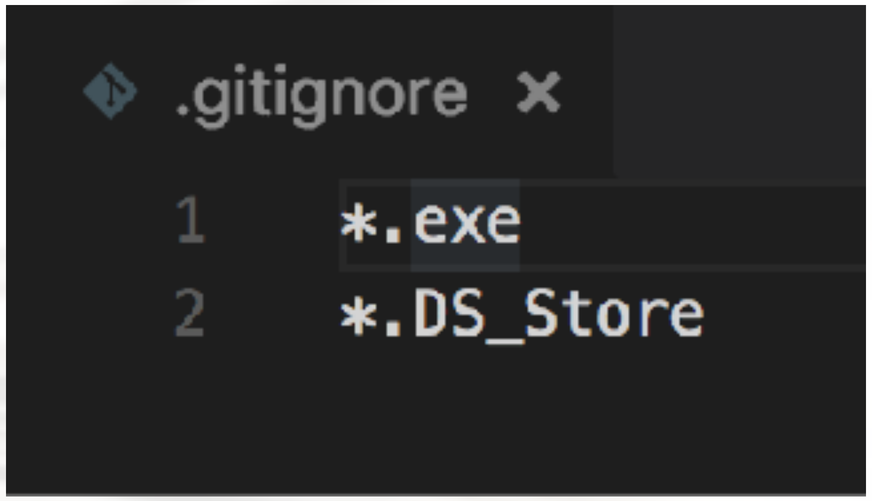
```
>git add README.md
>git commit -m “Add README.md file”
```

git push

```
>git push -u origin master
```

golang book [6]

create .gitignore file:



```
*.exe
*.DS_Store
```

golang book [7]

git add / git commit :

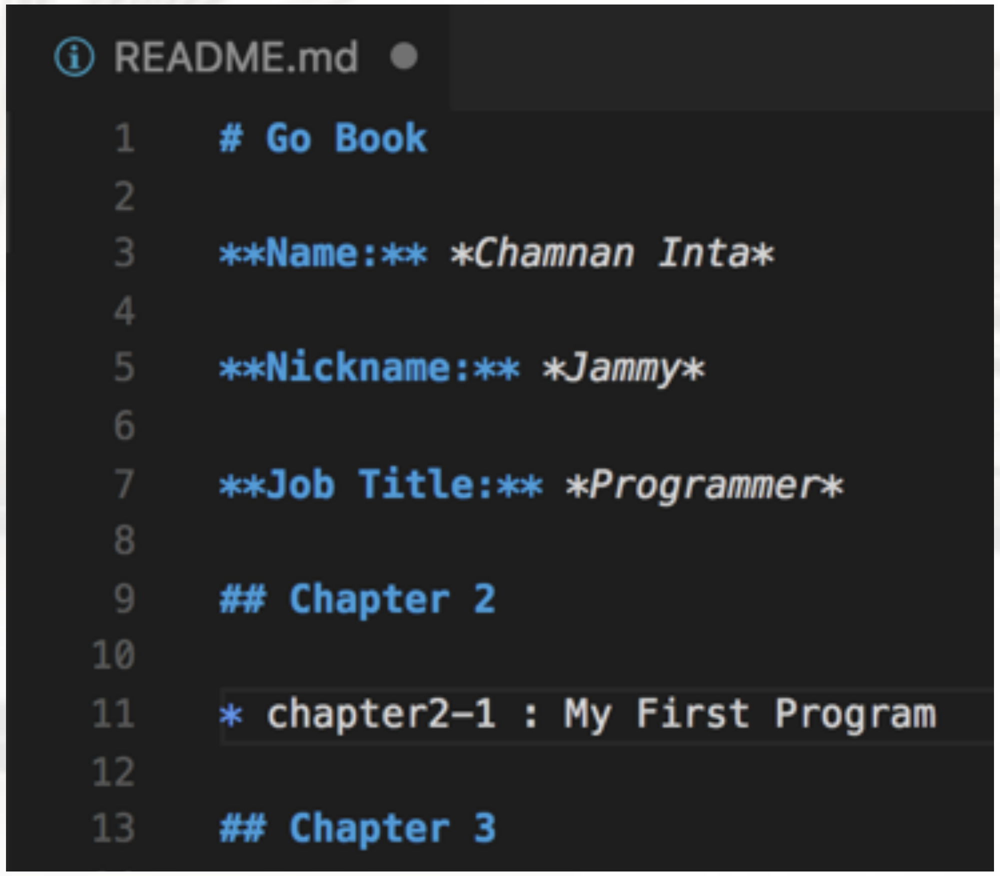
```
>git add .gitignore
>git commit -m “Add .gitignore file”
```

git push

```
>git push
```

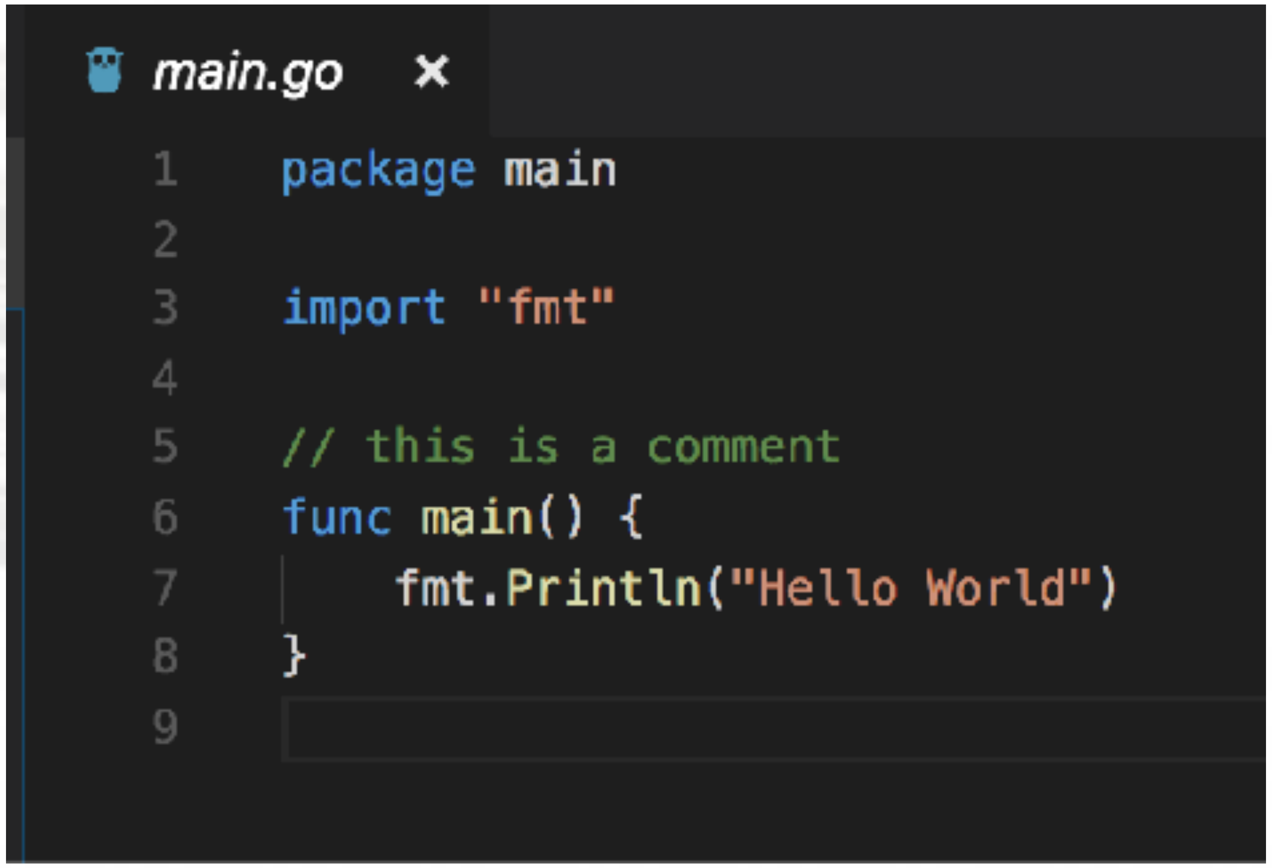
golang book [8]

1. Read book chapter 2
2. Update README.md
3. Create main.go file at directory golang-book/chapter2-1



README.md

```markdown
# Go Book

**Name:** *Chamnan Inta*

**Nickname:** *Jammy*

**Job Title:** *Programmer*

## Chapter 2

* chapter2-1 : My First Program

## Chapter 3
```



main.go

```go
package main

import "fmt"

// this is a comment
func main() {
	fmt.Println("Hello World")
}

```

golang book [9]

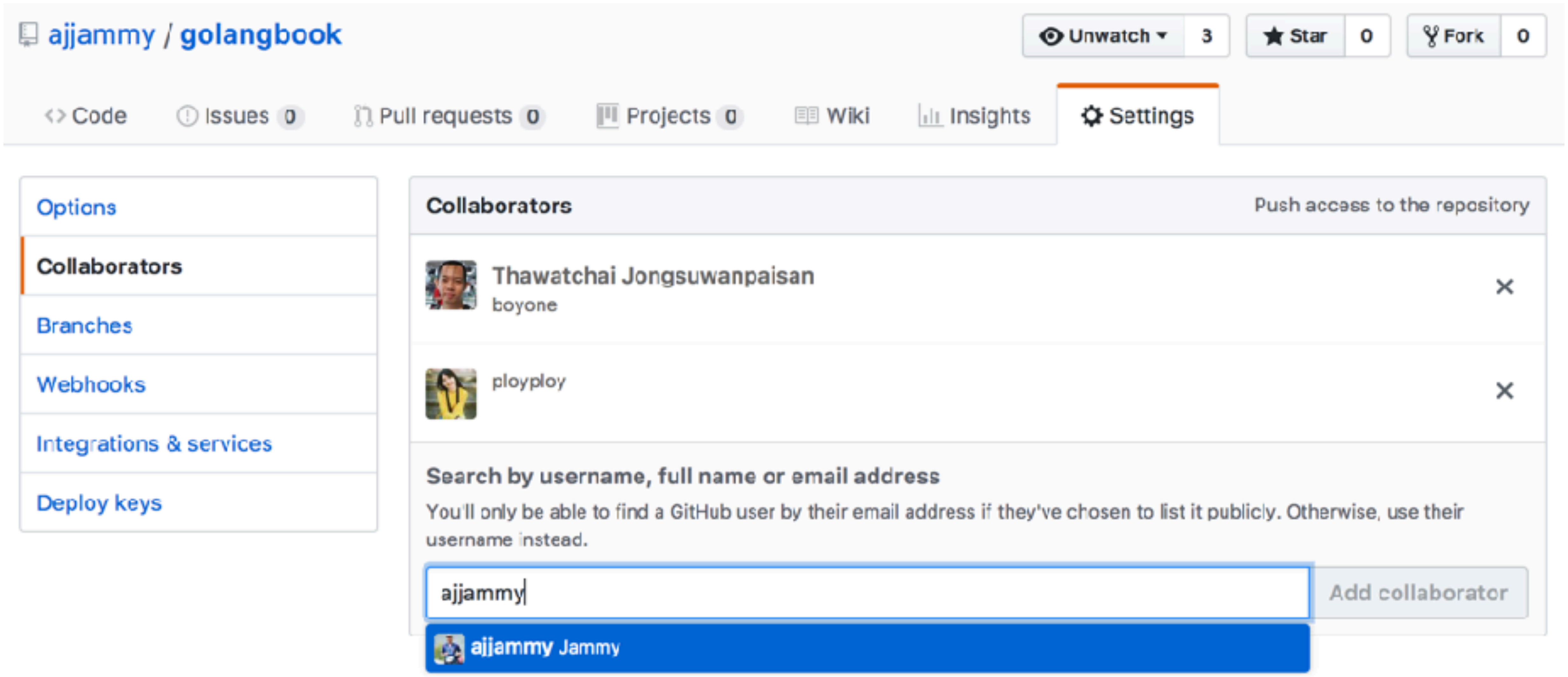
git add / git commit :

```
>git add .
>git commit -m “Add chapter2-1 My first program”
```

git push

```
>git push
```

add collaborators



Collaborators — Push access to the repository

Thawatchai Jongsuwanpaisan
boyone

ployploy

Search by username, full name or email address

You'll only be able to find a GitHub user by their email address if they've chosen to list it publicly. Otherwise, use their username instead.

ajjammy — Add collaborator

ajjammy Jammy

Exercise

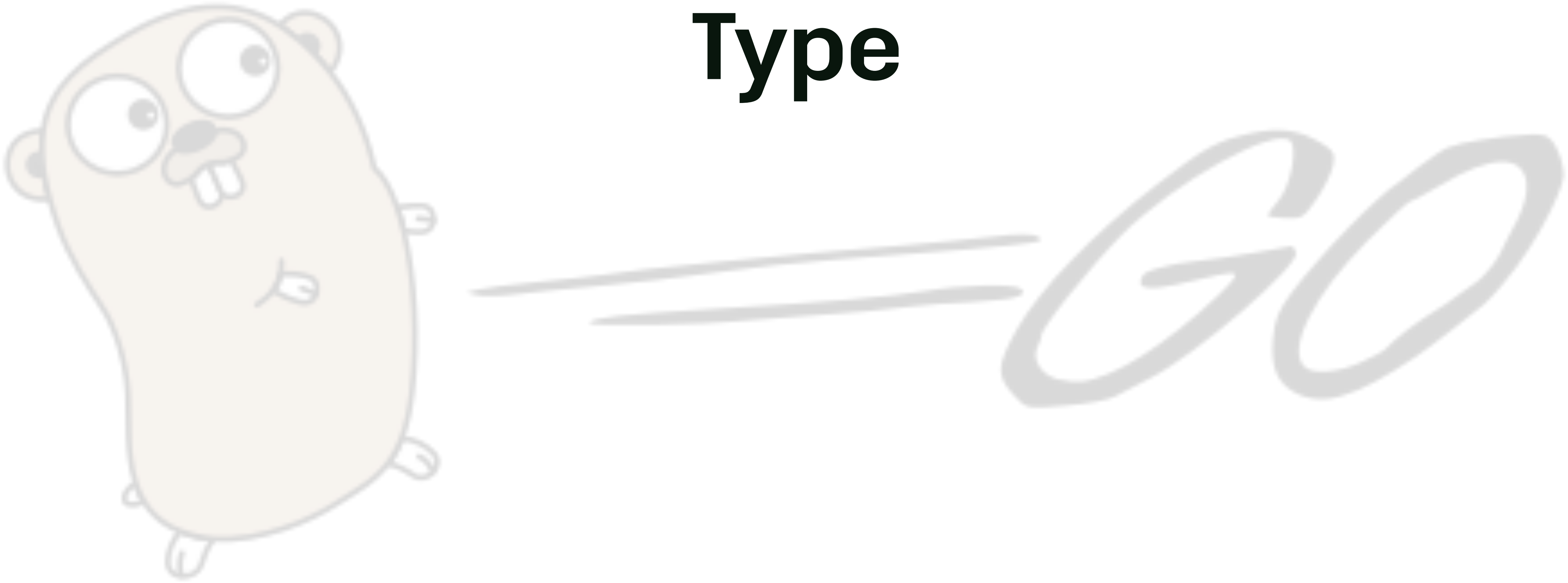
Read book

Chapter 1 to 4

```
Create folder chapter<...>-...
Create file main.go
Update README.md file
```

```
git add
git commit
git push
```

Type



golang : type Zero Value

```go
package main

import "fmt"

func main() {
    fmt.Println("=====Zero Value=====")
    var number int
    var str string
    var boolean bool
    fmt.Printf("number: %v\n", number)
    fmt.Printf("str: '%v'\n", str)
    fmt.Printf("boolean: %v\n", boolean)
}
```

golang : type Strings

```go
package main

import "fmt"

func main() {
    fmt.Println("=====String=====")
    backticks := `hello world!,
today's good day.`
    fmt.Println(backticks)

    doubleQuotes := "hello world!,\ntoday's good day."
    fmt.Println(doubleQuotes)
}
```

GO

บริษัท สยามชำนาญกิจ จำกัด และเพื่อนพ้องน้องพี่

golang : type Floating point [1]

```go
package main

import "fmt"

func main() {
	fmt.Println("=====Floating point=====")
	third := 1.0 / 3.0
	fmt.Printf("third = %v\n", third)
	fmt.Printf("third + third + third = %v\n", third+third+third)
}
```

GO

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golang : type Floating point [2]

```go
package main

import "fmt"

func main() {
    fmt.Println("=====Comparing floating point=====")
    fmt.Println("0.1 + 0.2 == 0.3 is", 0.1+0.2 == 0.3)
    num := 0.1
    num += 0.2
    fmt.Println("num == 0.3 is", num == 0.3)
    fmt.Println("num is", num)
}
```

Variables

golang : Variables [1]

create main.go in folder chapter4-1 :

```go
package main

import "fmt"

func main() {




}
```

run -> no error -> push to your git repository

golang : Variables [2]

create main.go in folder chapter4-2 :

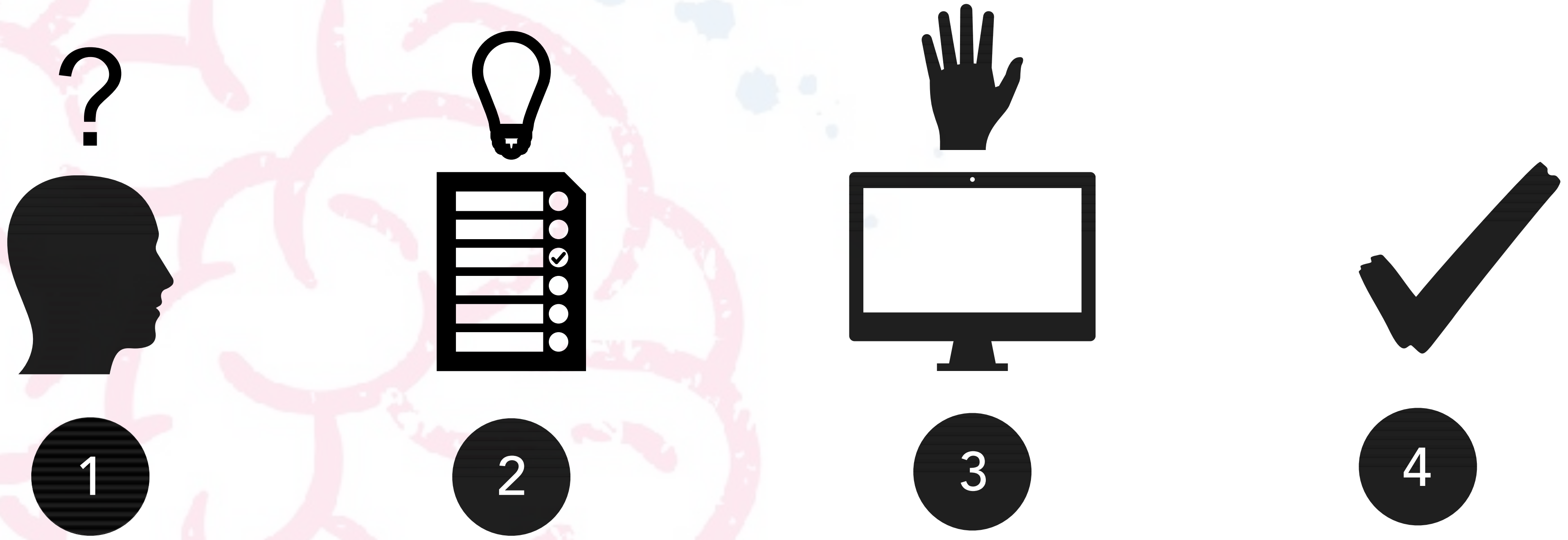
```go
package main

import "fmt"

func main() {
    fmt.Print("Enter a number: ")
    var input float64
    fmt.Scanf("%f", &input)
    output := input * 2
    fmt.Println(output)
}
```

run -> no error -> push to your git repository

Exercise

Modify main.go in folder chapter4-2 for solve

Problem No.5 of Chapter 4 :

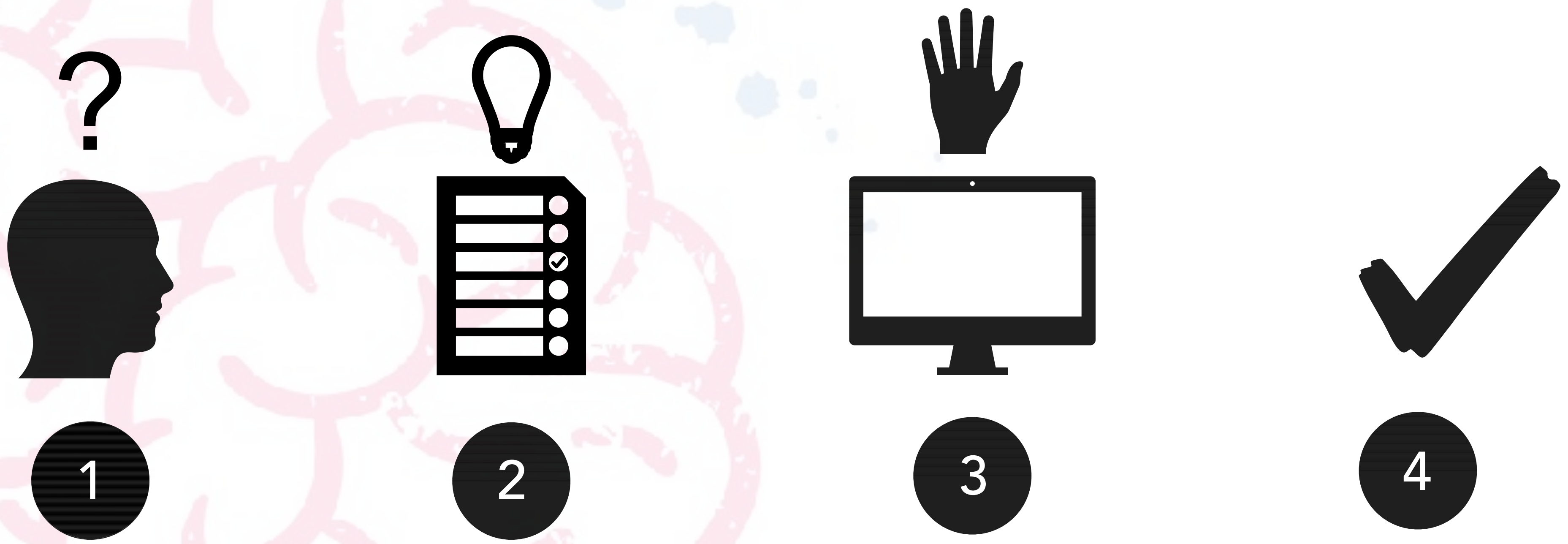


run -> no error -> push to your git repository

Exercise

Create main.go in folder chapter4-3 for solve

Problem No.6 of Chapter 4 :



run -> no error -> push to your git repository

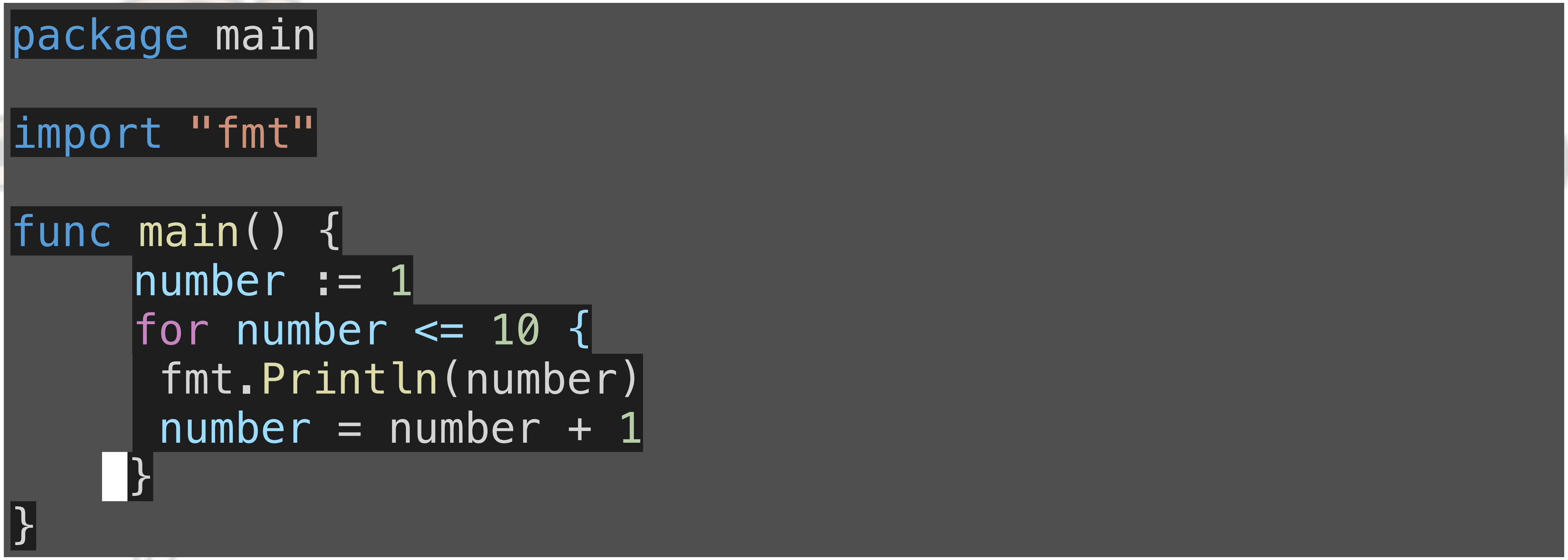
Conditions

golang : Conditions

create main.go in folder chapter5-1 :

```
package main

import "fmt"

func main() {
      fmt.Println(“1”)
      fmt.Println(“2”)
      fmt.Println(“3”)
      fmt.Println(“4”)
      fmt.Println(“5”)
      fmt.Println(“6”)
      fmt.Println(“7”)
      fmt.Println(“8”)
      fmt.Println(“9”)
      fmt.Println(“10”)

}
```

golang : Conditions [for]



```go
package main

import "fmt"

func main() {
     number := 1
     for number <= 10 {
      fmt.Println(number)
      number = number + 1
    }
}
```

golang : Conditions [if]

create main.go in folder chapter5-2 :

```
package main

import "fmt"

func main() {
  for number := 1; number <= 100; number++ {
      if number%15 == 0 {
        fmt.Println(number, "FizzBuzz")
      } else if number%3 == 0 {
        fmt.Println(number, "Fizz")
      } else if number%5 == 0 {
        fmt.Println(number, "Buzz")
      } else {
        fmt.Println(number)
      }
    }
}
```

golang : Conditions [switch case]

create main.go in folder chapter5-3 :

```
package main

import "fmt"

func main() {
    switch i := 5 {
        case 0:
          fmt.Println("Zero")
        case 1:
          fmt.Println("One")
        case 2:
          fmt.Println("Two")
        case 3:
          fmt.Println("Three")
        case 4:
          fmt.Println("Four")
        case 5:
          fmt.Println("Five")
        default:
          fmt.Println("Unknown Number")
       }
}
```

Exercise

create exercise.go in folder chapter5-4 :

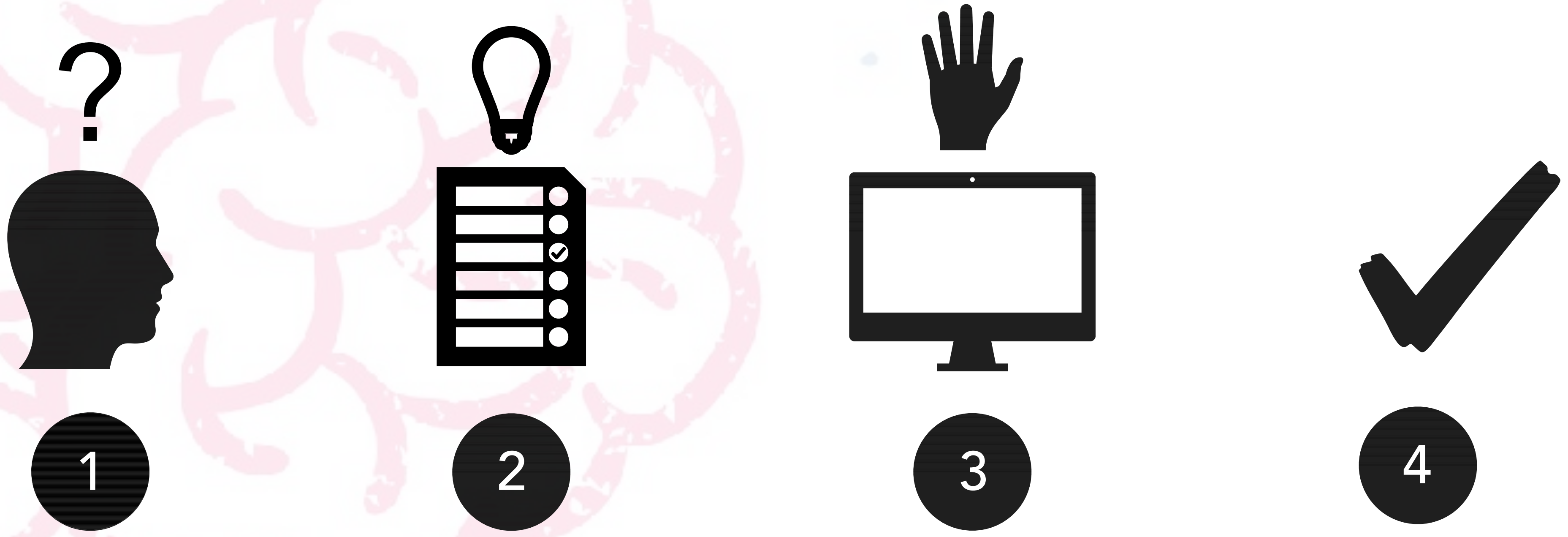
โปรแกรมจะให้ใส่ตัวเลขได้ไม่เกิน 5 ครั้ง

ถ้าเจอตัวเลขที่สุ่มมาจะแสดงคำว่า เจอแล้ว และจบการทำงาน

ถ้าเลขที่ใส่มากกว่าจะแสดงคำว่า มากไป

ถ้าเลขที่ใส่น้อยกว่าจะแสดงคำว่า น้อยไป

ถ้าใส่เกิน 5 ครั้งจะแสดงคำว่า เกินพอ และจบการทำงาน



run -> no error -> push to your git repository

function

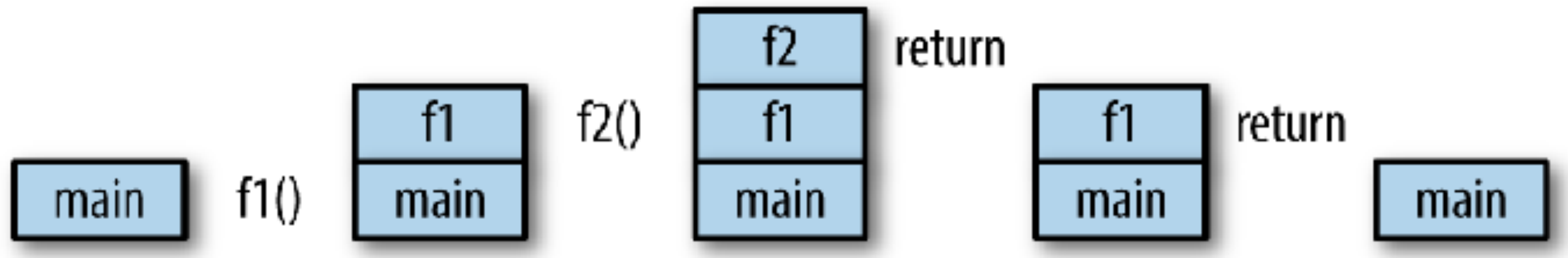
golang : function

```go
package main

func main() {
}

func f() {
}

func fWithReturn(i int) int {
	return i
}

func fWithMultipleReturn(i int, s string) (int, error) {
	return i, nil
}
```

golang : function

create main.go in folder chapter6-1 :

```
package main

import "fmt"

func main() {
    fmt.Println(f1())
}

func f1() int {
    return f2()
}

func f2() int {
    return 1
}
```



golang : function

create main.go in folder chapter6-2 :

```
package main

import "fmt"

func main() {
    fmt.Println(f2())
}

func f2() (r int) {
    r = 1
    return
}
```

Return types can have names

golang : function

create main.go in folder chapter6-3 :

```go
package main

import "fmt"

func main() {
    x, y := f()
    fmt.Println(x, y)
}

func f() (int, int) {
    return 5, 7
}
```

Multiple values can be returned

golang : function

create main.go in folder chapter6-4 :

```go
package main

import "fmt"

func main() {
    fmt.Println(add(1,2,3))

    xs := []int{1,2,3}
    fmt.Println(add(xs...))
}

func add(args ...int) int {
    total := 0
    for _, v := range args {
        total += v
    }
    return total
}
```

Variadic Function

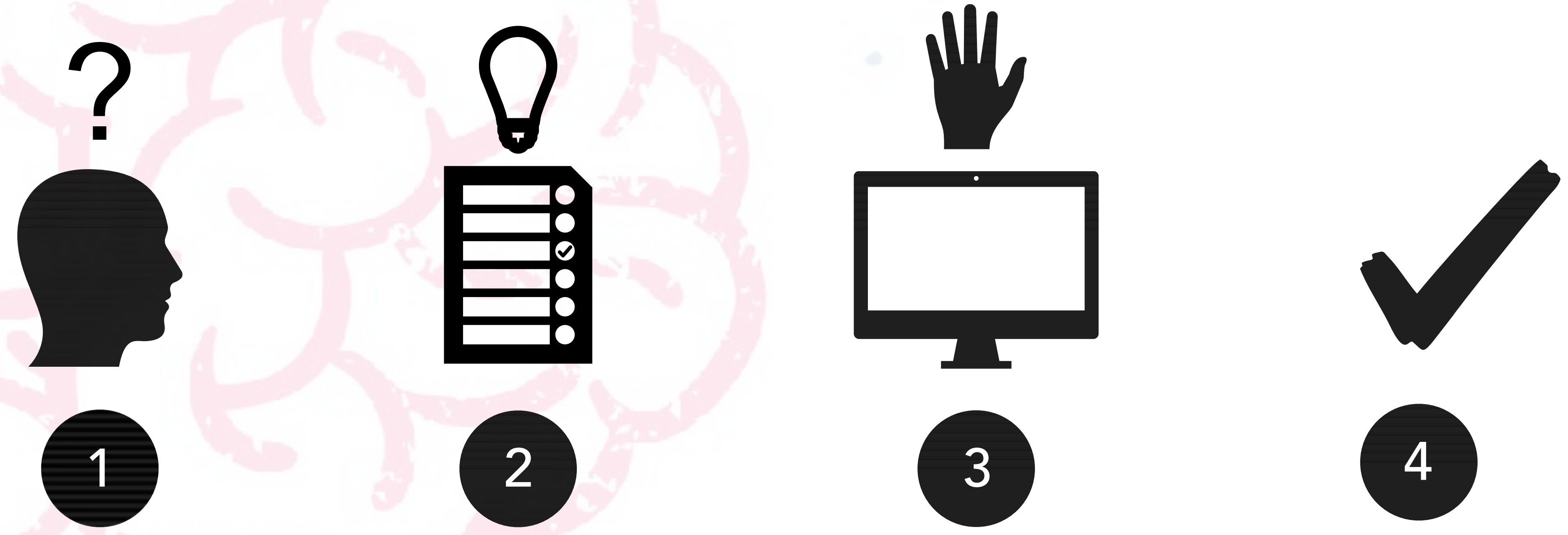
Exercise

create exercise.go in folder chapter6-5 :

REFACTOR FIZZBUZZ ใน CHAPTER5-2

ให้เรียกใช้งาน FUNCTION

แทนที่จะทำงานทุกอย่างใน FUNC MAIN



run -> no error -> push to your git repository

Collections:

Arrays, Slices, Map

golang : collections

```go
func main() {
    var x [5]int // array
    var x []int // slice
    var x map[string]int // map
}
```

golang : arrays

create main.go in folder chapter7-1 :

```go
package main

import "fmt"

func main() {
    var x [5]int
    x[3] = 4
    fmt.Println(x)

    x = [5]int{1, 2, 3, 4, 5}
    fmt.Println(x)

    y := [...]int{1, 2, 3, 4, 5, 6, 7, 8, 9, 0}
    fmt.Println(y)
}
```

golang : slice

create main.go in folder chapter7-2 :

```go
package main

import "fmt"

func main() {
    slice := make([]int, 3)
    slice[0] = 1
    slice[1] = 2
    slice[2] = 3

    fmt.Println(slice)

    slice2 := []int{1, 2, 3, 4, 5}
    fmt.Println(slice2)

    fmt.Println("Slice with length and capacity")
    fmt.Printf("slice: length %v, capacity %v, %v\n", len(slice), cap(slice), slice)

    // append
    for i := 4; i < 15; i++ {
        slice = append(slice, i)
    }
    fmt.Printf("slice: length %v, capacity %v, %v\n", len(slice), cap(slice), slice)
}
```

golang : slice

create main.go in folder chapter7-3 :

```
package main

import "fmt"

func main() {
    arr := [5]int{1, 2, 3, 4, 5}
    fmt.Println(arr)

    slice := arr[0:3]
    fmt.Println(slice)
}
```

Create slice from array

golang : slice

create main.go in folder chapter7-4 :

```
package main

import "fmt"

func main() {
    slice := []int{1, 2, 3}
    fmt.Println(slice)
    newSlice := make([]int, 2)
    fmt.Println(newSlice)
    copy(slice, newSlice)
    fmt.Printf("slice: %v\n", slice)
    fmt.Printf("slice: %v\n", newSlice)
}
```

Copy slices

golang : map

create main.go in folder chapter7-5 :

```go
package main

import "fmt"

func main() {
    var x map[string]int
    x = make(map[string]int)
    x["key"] = 10
    fmt.Println(x)
    fmt.Println(x["key"])

    y := map[string]int{
        "one":   1,
        "two":   2,
        "three": 3,
    }
    fmt.Println(y)
}
```

golang : map

create main.go in folder chapter7-6 :

```go
package main

import "fmt"

func main() {
    x := map[string]int{
        "one":   1,
        "two":   2,
        "three": 3,
    }
    fmt.Println(x)

    delete(x, "two")
    fmt.Printf("After delete: %v\n", x)
}
```

Delete map

golang : map

create main.go in folder chapter7-7 :

```
package main

import "fmt"

func main() {
    mymap := make(map[int]int)
    mymap[1] = 1
    mymap[2] = 2

    fmt.Println(mymap[3])
    if mymap[3] != 0 {
        fmt.Println(mymap[3])
    }

    // ok?
    if value, ok := mymap[3]; ok {
        fmt.Println(value)
    }
}
```

Avoid to check zero value

golang : range and collections

create main.go in folder chapter7-8 :

```go
package main

import "fmt"

func main() {
	numbers := [5]int{1, 2, 3, 4, 5}
	for i := 0; i < len(numbers); i++ {
		fmt.Println(i, numbers[i])
	}
	fmt.Println("With Range")
	for i, number := range numbers {
		fmt.Println(i, number)
	}
}
```

Range: Array

golang : range and collections

create main.go in folder chapter7-9 :

```go
package main

import "fmt"

func main() {
    slice := []int{1, 2, 3, 4, 5}
    for i, number := range slice {
        fmt.Println(i, number)
    }
}
```

Range: Slice

golang : range and collections

create main.go in folder chapter7-10 :

```
package main

import "fmt"

func main() {
    maps := map[string]int{
        "one":   1,
        "two":   2,
        "three": 3,
    }

    for key, number := range maps {
        fmt.Println(key, number)
    }
}
```

Range: Map

golang : range and collections

create main.go in folder chapter7-11 :

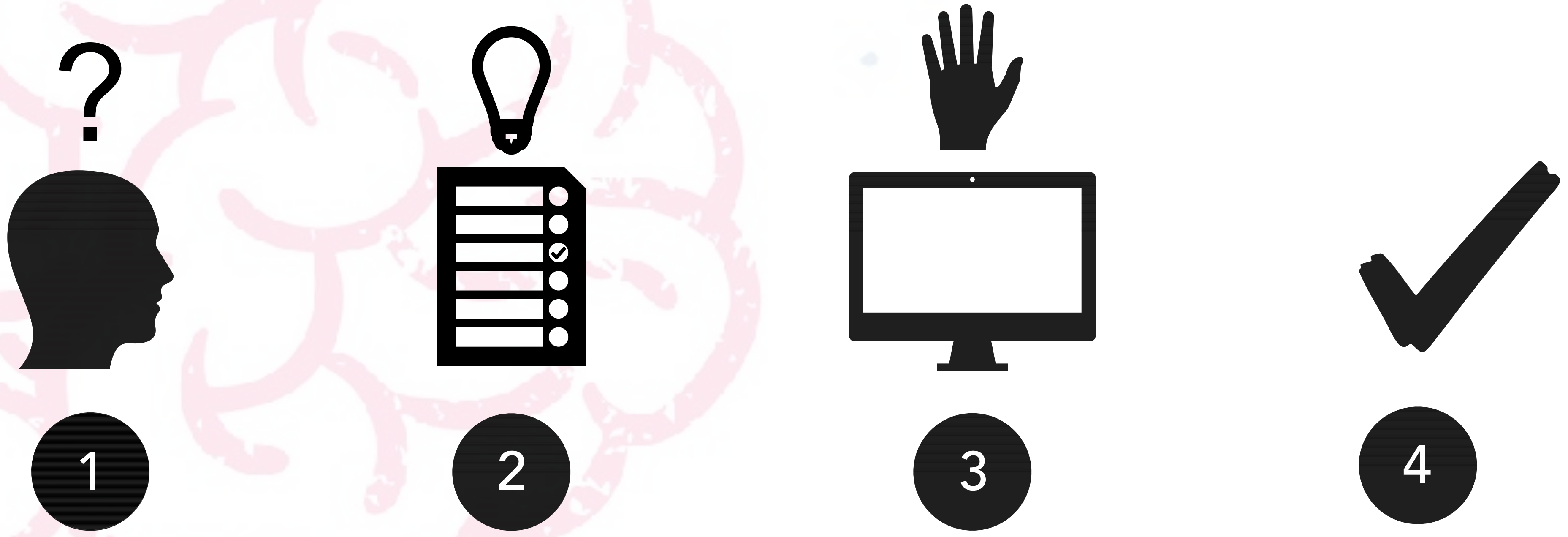
```
package main

import "fmt"

func main() {
    for i, c := range "golang" {
        fmt.Println(i, c)
        fmt.Printf("%v\n", string(c))
    }
}
```

Range: String

Exercise

create exercise.go in folder chapter6-5 :

REFACTOR FIZZBUZZ ใน CHAPTER5-2
โดยใช้ TYPE ประเภท COLLECTION ของ GO
มาแทนที่เพื่อลด DUPLICATION ใน CODE



run -> no error -> push to your git repository

บริษัท สยามชำนาญกิจ จำกัด และเพื่อนพ้องน้องพี่

Sum up

Type: string, int, float, bool

Operation: string: +

int, float: +, -, *, /, %

convert: string: string(**rune**), string(**int**)

int: int(**rune**), int(**str**)

strconv.**Atoi**(**str**), strconv.**Itoa**(**num**)

collection: array, slice, map

Operation: slice: append(slice, value)

Sum up

control structure: if, for

example: for {…}

for i:=0; i < len; i++ {…}

for index, value := **range** collection {…}

for index, value := **range** string {…}

fmt:

example: fmt.Printf("%v %t %d %f %s", num, num, num, float, str)

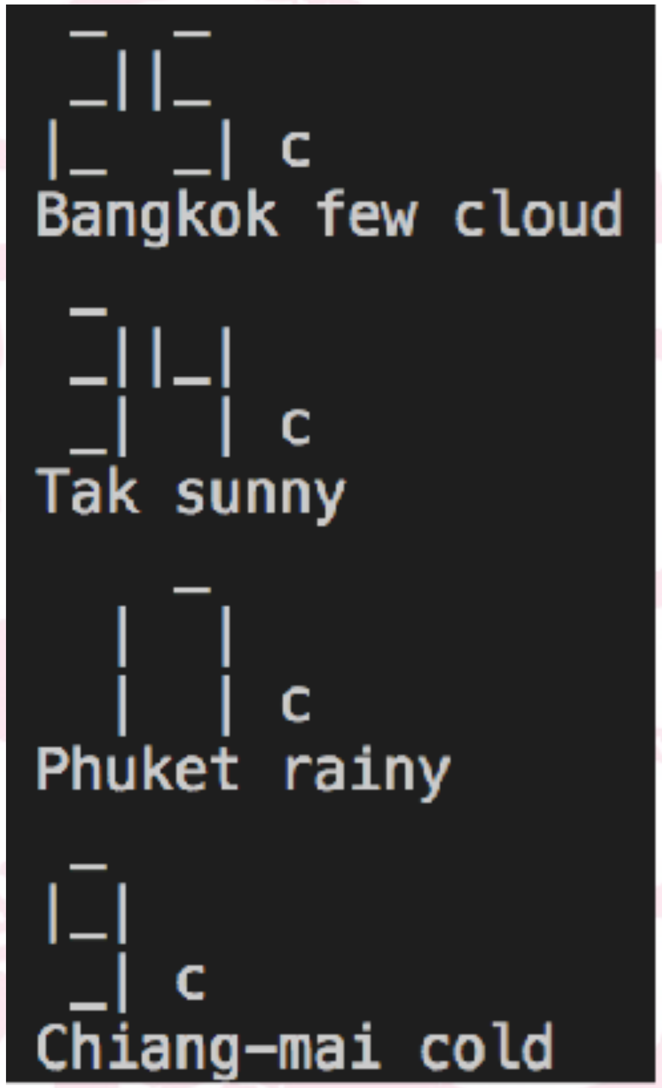
fmt.Println(num, num, num, float, str)

fmt.Sprintf("%v %t %d %f %s", num, num, num, float, str)

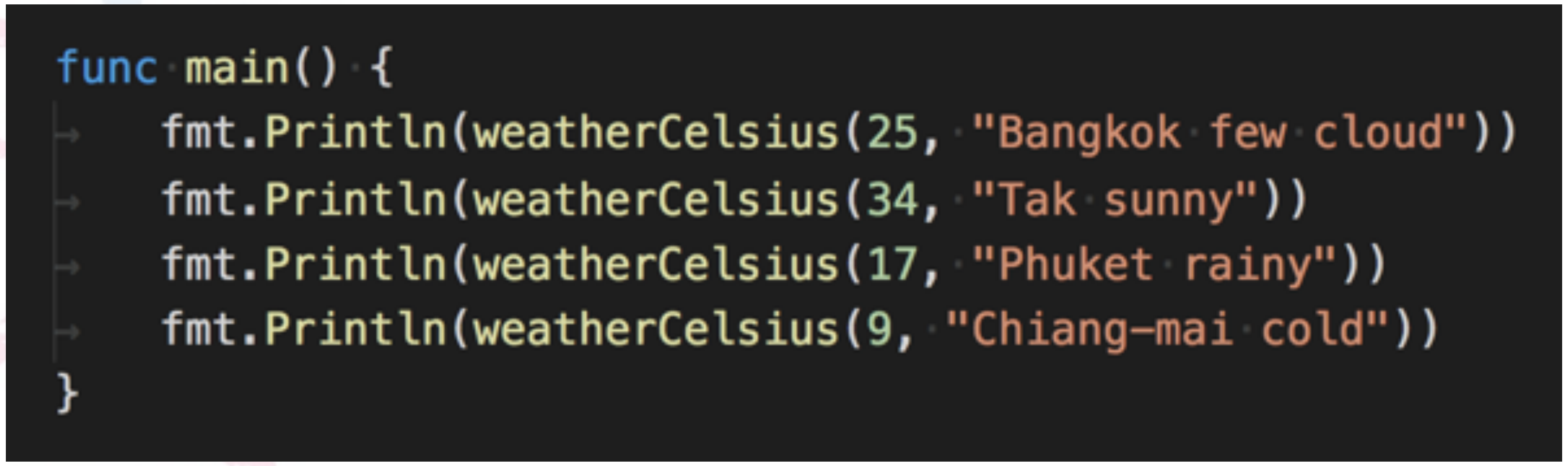
Exercise

create console-weather.go in folder exercise :

แสดงผลอุณหภูมิผ่าน TERMINAL โดยมีรูปแบบดังนี้



```
 _  _
 _||_
|_  _| c
Bangkok few cloud

 _
 _||_|
 _|  | c
Tak sunny

    _
  |  |
  |  | c
Phuket rainy

 _
|_|
 _| c
Chiang-mai cold
```



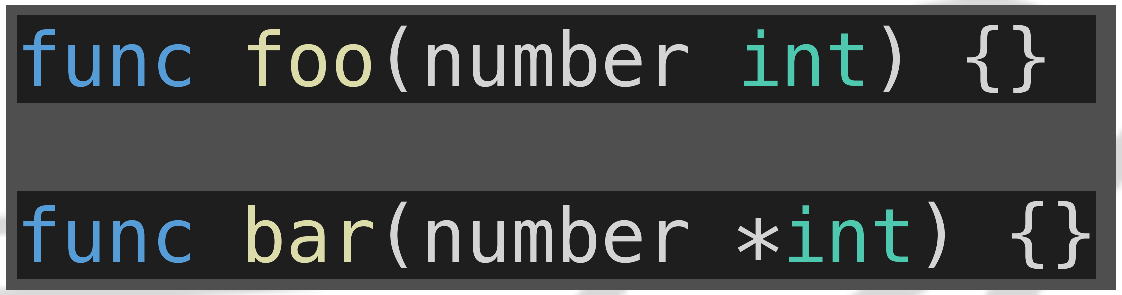
```go
func main() {
	fmt.Println(weatherCelsius(25, "Bangkok few cloud"))
	fmt.Println(weatherCelsius(34, "Tak sunny"))
	fmt.Println(weatherCelsius(17, "Phuket rainy"))
	fmt.Println(weatherCelsius(9, "Chiang-mai cold"))
}
```

run -> no error -> push to your git repository

Pointers

Pointer

value , & and *

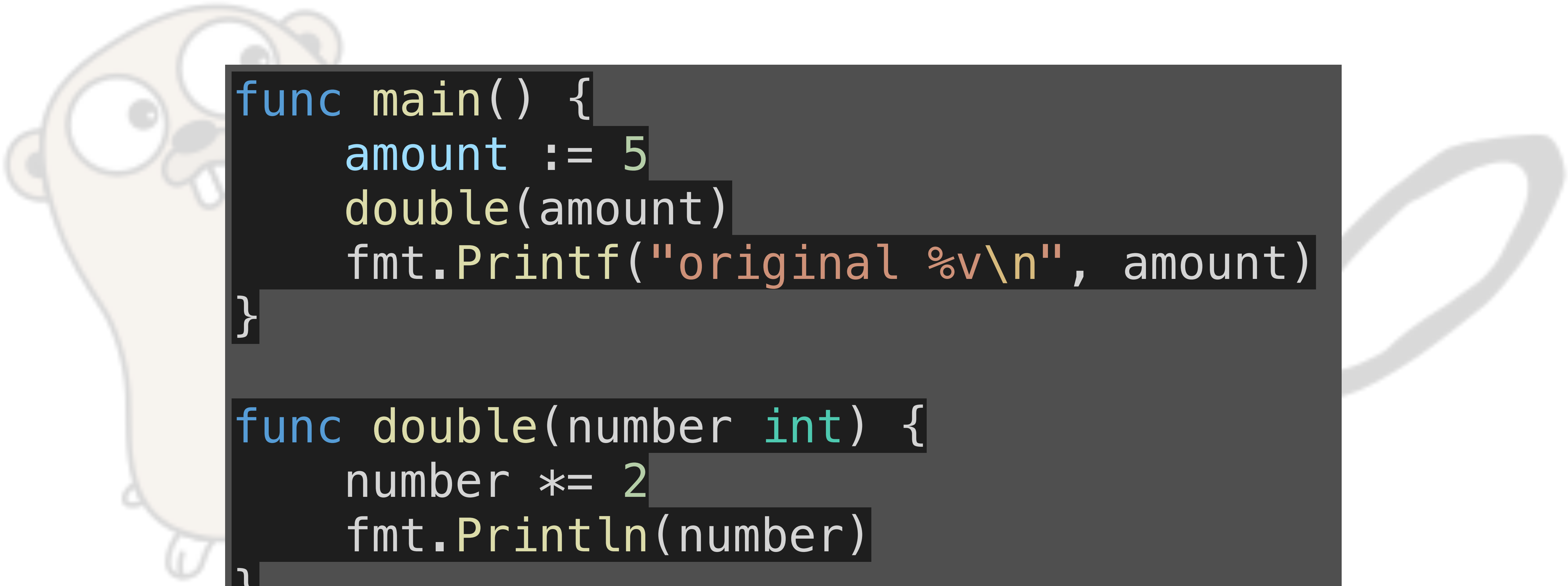


```go
func foo(number int) {}

func bar(number *int) {}
```

Parameters in Go are always passed by value, and a copy of the value being passed is made.

golang : pass by copy value

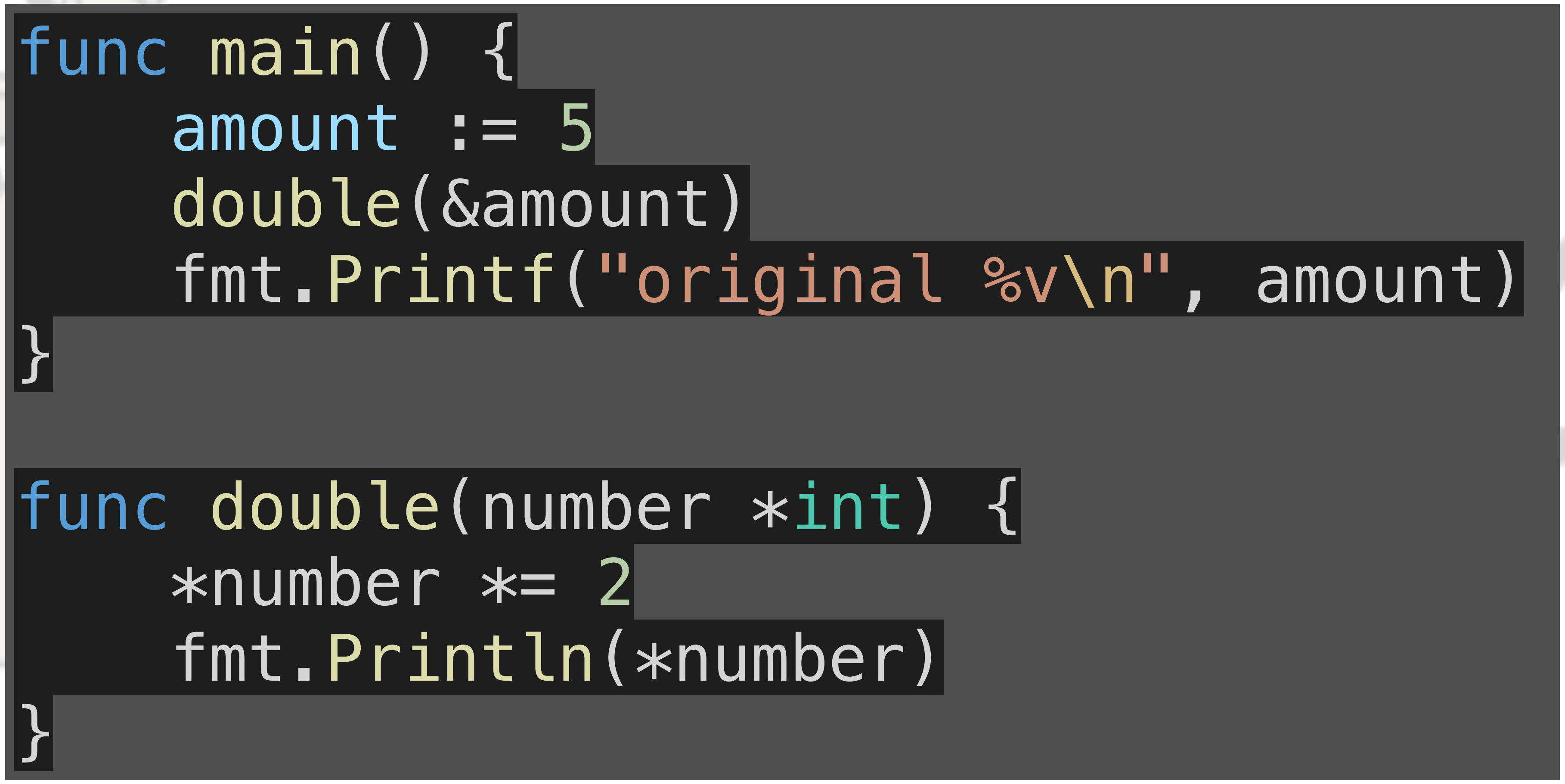
create main.go in folder chapter8-1 :



```go
func main() {
    amount := 5
    double(amount)
    fmt.Printf("original %v\n", amount)
}

func double(number int) {
    number *= 2
    fmt.Println(number)
}
```

golang : pass by pointer

create main.go in folder chapter8-2 :

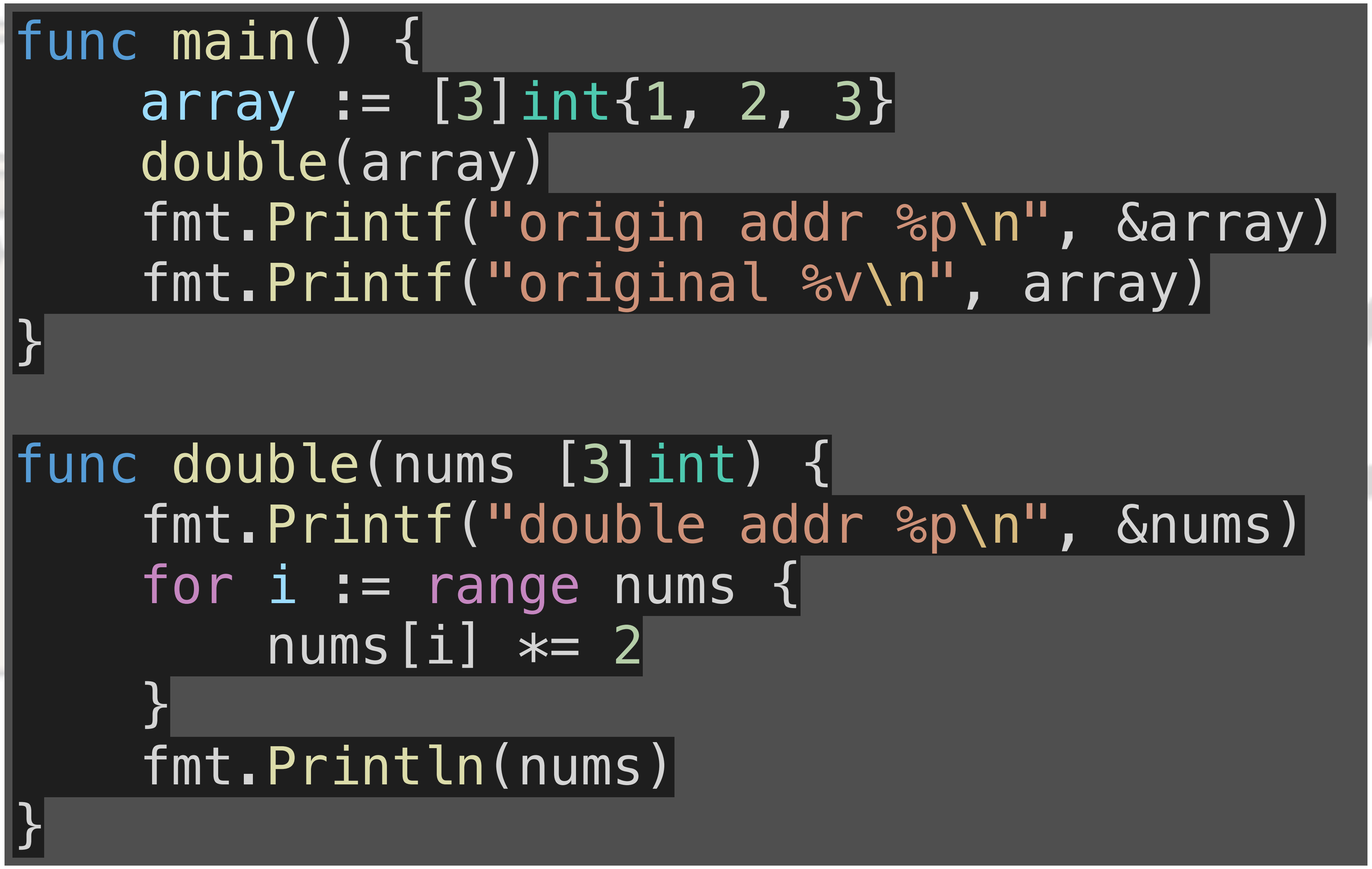


```
func main() {
    amount := 5
    double(&amount)
    fmt.Printf("original %v\n", amount)
}

func double(number *int) {
    *number *= 2
    fmt.Println(*number)
}
```

When you pass a pointer, the pointer value will be copied and passed.

golang : pass by array value

create main.go in folder chapter8-3 :



```go
func main() {
    array := [3]int{1, 2, 3}
    double(array)
    fmt.Printf("origin addr %p\n", &array)
    fmt.Printf("original %v\n", array)
}

func double(nums [3]int) {
    fmt.Printf("double addr %p\n", &nums)
    for i := range nums {
        nums[i] *= 2
    }
    fmt.Println(nums)
}
```

golang : pass by array pointer

create main.go in folder chapter8-4 :

```go
func main() {
    array := [3]int{1, 2, 3}
    double(&array)
    fmt.Printf("origin addr %p\n", &array)
    fmt.Printf("original %v\n", array)
}

func double(nums *[3]int) {
    fmt.Printf("double addr %p\n", nums)
    fmt.Printf("double value %v\n", *nums)
    for i := range *nums {
        nums[i] *= 2
    }

    fmt.Println(*nums)
}
```

golang : pass by slice value

create main.go in folder chapter8-5 :

```go
func main() {
    slice := []int{1, 2, 3}
    double(slice)
    fmt.Printf("origin addr %p\n", slice)
    fmt.Printf("original %v\n", slice)
}

func double(nums []int) {
    fmt.Printf("double addr %p\n", nums)
    for i := 0; i < len(nums); i++ {
        nums[i] *= 2
    }

    fmt.Println(nums)
}
```

golang : pass by map value

create main.go in folder chapter8-6 :

```go
func main() {
    m := map[int]int{1:1, 2:2, 3:3,}
    double(m)
    fmt.Printf("origin addr %p\n", m)
    fmt.Printf("original %v\n", m)
}

func double(nums map[int]int) {
    fmt.Printf("double addr %p\n", nums)
    for i := range nums {
        nums[i] *= 2
    }

    fmt.Println(nums)
}
```

Type

golang : struct type

create main.go in folder chapter9-1 :

```go
type Circle struct {
    x float64
    y float64
    r float64
}

func main() {
    var c Circle
    fmt.Printf("c type: %T\n", c)
    fmt.Println(c.x, c.y, c.r)

    c1 := new(Circle)
    fmt.Printf("c1 type: %T\n", c1)
    fmt.Println(c1.x, c1.y, c1.r)
}
```

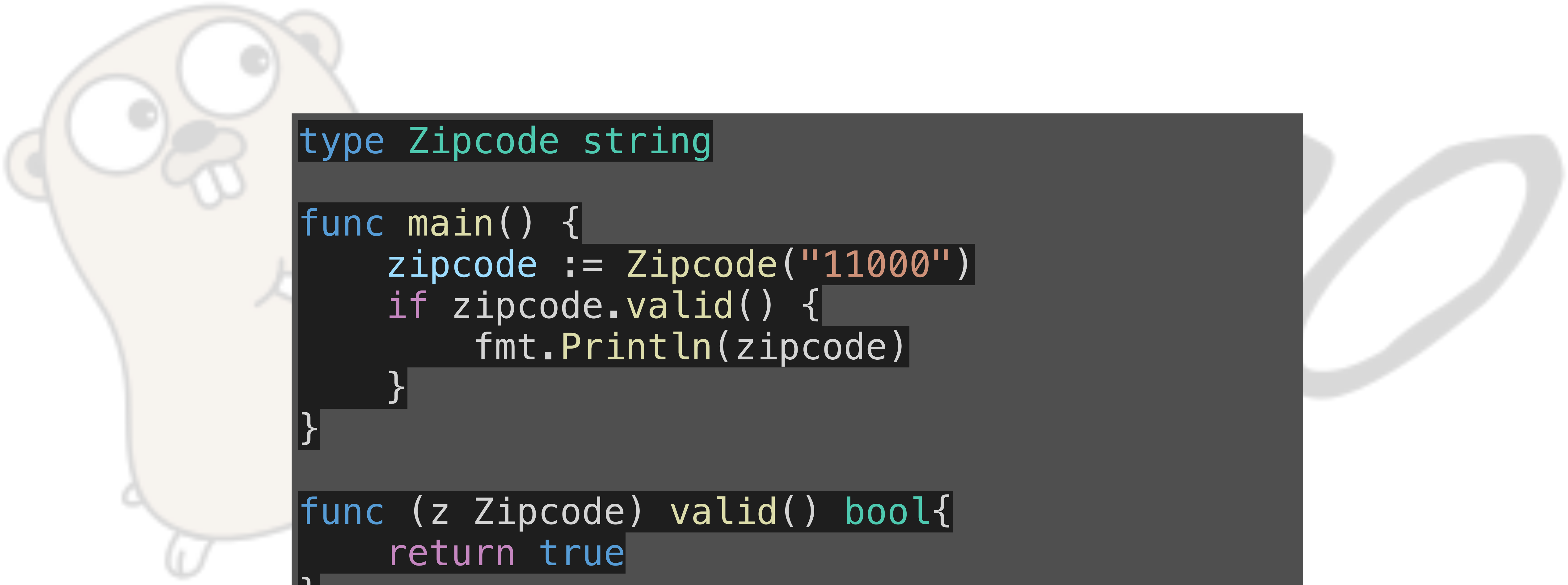
golang : struct type

create main.go in folder chapter9-1 :

```go
func main() {
    .
    .

    c2 := Circle{x: 0, y: 0, r: 5}
    fmt.Printf("c2 type: %T\n", c2)
    fmt.Println(c2.x, c2.y, c2.r)

    c3 := NewCircle(1, 2, 3)
    fmt.Printf("c3 type: %T\n", c3)
    fmt.Println(c3.x, c3.y, c3.r)
}

func NewCircle(x, y, r float64) *Circle {
    return &Circle{x, y, r}
}
```

golang : specific type

create main.go in folder chapter9-2 :



```go
type Zipcode string

func main() {
    zipcode := Zipcode("11000")
    if zipcode.valid() {
        fmt.Println(zipcode)
    }
}

func (z Zipcode) valid() bool{
    return true
}
```

Method

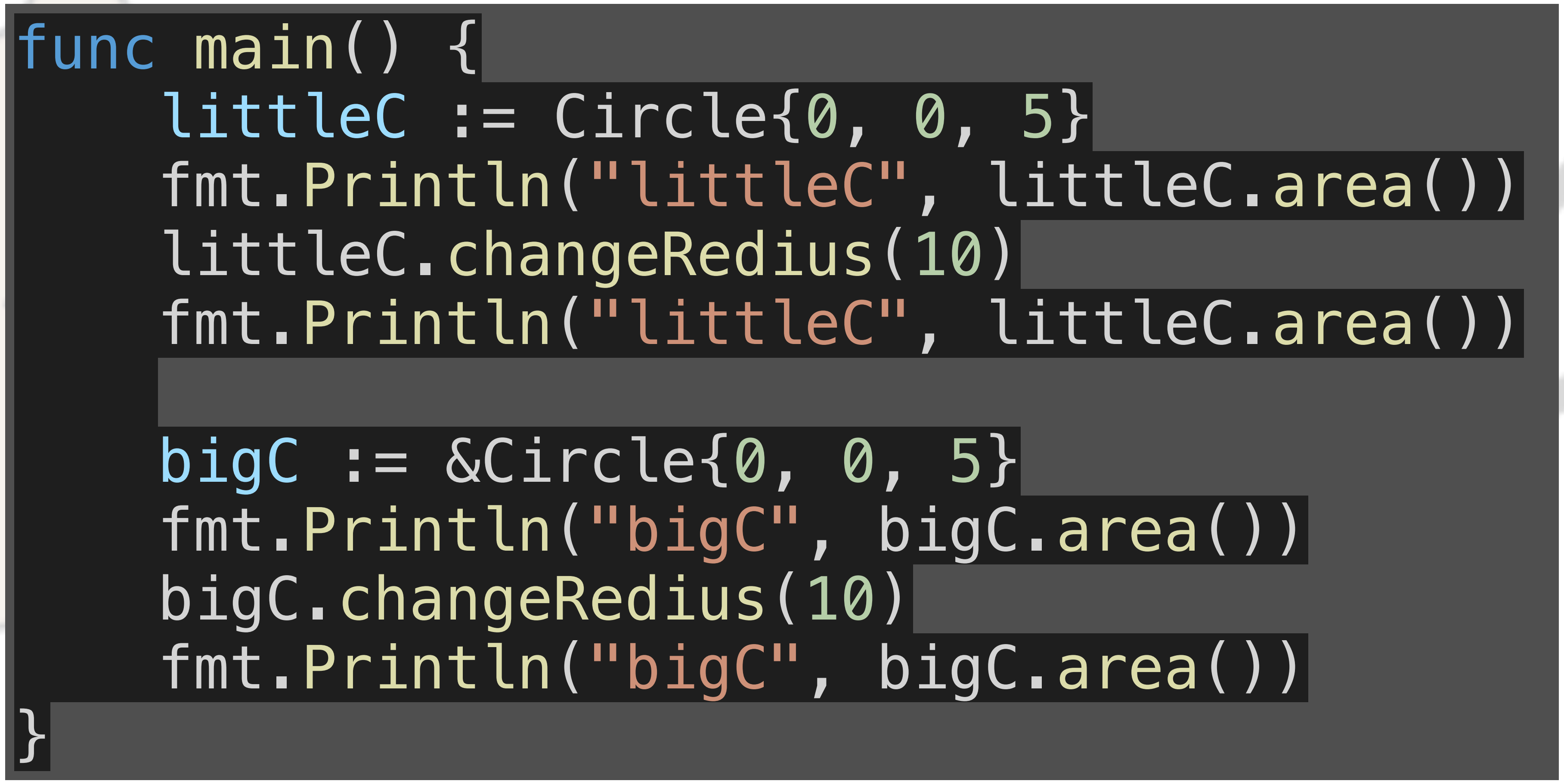
golang : method

create main.go in folder chapter10-1 :

```go
type Circle struct {
    x float64
    y float64
    r float64
}

func (c Circle) area() float64 {
    return math.Pi * c.r * c.r
}

func (c *Circle) changeRedius(r float64) {
    c.r = r
}
```

golang : method

create main.go in folder chapter10-1 :



```go
func main() {
	littleC := Circle{0, 0, 5}
	fmt.Println("littleC", littleC.area())
	littleC.changeRedius(10)
	fmt.Println("littleC", littleC.area())

	bigC := &Circle{0, 0, 5}
	fmt.Println("bigC", bigC.area())
	bigC.changeRedius(10)
	fmt.Println("bigC", bigC.area())
}
```

Interface

golang : interface

create main.go in folder chapter11-1 :

```go
type Rectangle struct {
    w float64
    h float64
}

func (r Rectangle) area() float64 {
    return r.w * r.h
}

type Circle struct {
    x float64
    y float64
    r float64
}

func (c *Circle) area() float64 {
    return math.Pi * c.r * c.r
}
```

golang : interface

create main.go in folder chapter11-1 :

```go
type measure interface {
    area() float64
}

func printArea(m measure) {
    fmt.Println(m.area())
}


func main() {
    c := &Circle{0, 0, 5}
    printArea(c)

    r := Rectangle{3, 4}
    printArea(r)
}
```

Exercise

create vending-machine.go in folder exercise :

```
Vending Machine
Coin: TEN(10), Five(5), TWO(2), ONE(1)
      T        F        TW      O

Item: Soft Drink(18),
      Canned Coffee(12),
      Drinking Water(7)

Coin Return: returns all inserted money

#Criteria
Unlimited items
Unlimited change
Currently inserted money
```

run -> no error -> push to your git repository

Exercise

vending-machine: Test Cases

```
1. Buy SD(soft drink) with exact change
Insert: T, F, TW, O
Currently inserted money: 18
Choose: Select SD
Return: SD

2. Start adding change but hit coin return
Insert: T, T, F
Currently inserted money: 25
Choose: Coin Return
Return: T, T, F

3. Buy CC(canned coffee) without exact change
Insert: T, T
Currently inserted money: 20
Choose: Select CC
Return: CC, F, TW, O
```

run -> no error -> push to your git repository

Exercise

vending-machine:

```go
func main() {
    vm := NewVendingMachine(coins, items)

    // Buy SD(soft drink) with exact change
    vm.InsertCoin("T")
    vm.InsertCoin("F")
    vm.InsertCoin("TW")
    vm.InsertCoin("O")
    fmt.Println("Inserted Money:", vm.GetInsertedMoney())
    // 18
    can := vm.SelectSD()
    fmt.Println(can) // SD
    .
    .
    .
}
```

run -> no error -> push to your git repository

Exercise

vending-machine:

```go
func main() {
    vm := NewVendingMachine(coins, items)

    .
    .
    .
    // Buy CC(canned coffee) without exact change
    vm.InsertCoin("T")
    vm.InsertCoin("T")
    fmt.Println("Inserted Money:", vm.GetInsertedMoney())
    // 20
    can = vm.SelectCC()
    fmt.Println(can) // CC, F, TW, O
    .
    .
    .
}
```

run -> no error -> push to your git repository

Exercise

vending-machine:

```
func main() {
    vm := NewVendingMachine(coins, items)

    .
    .
    .
    // Start adding change but hit coin return
    vm.InsertCoin("T")
    vm.InsertCoin("T")
    vm.InsertCoin("F")
    fmt.Println("Inserted Money:", vm.GetInsertedMoney())
    // 25
    change := vm.CoinReturn()
    fmt.Println(change) // T, T, F
}
```

run -> no error -> push to your git repository

Exercise

vending-machine:

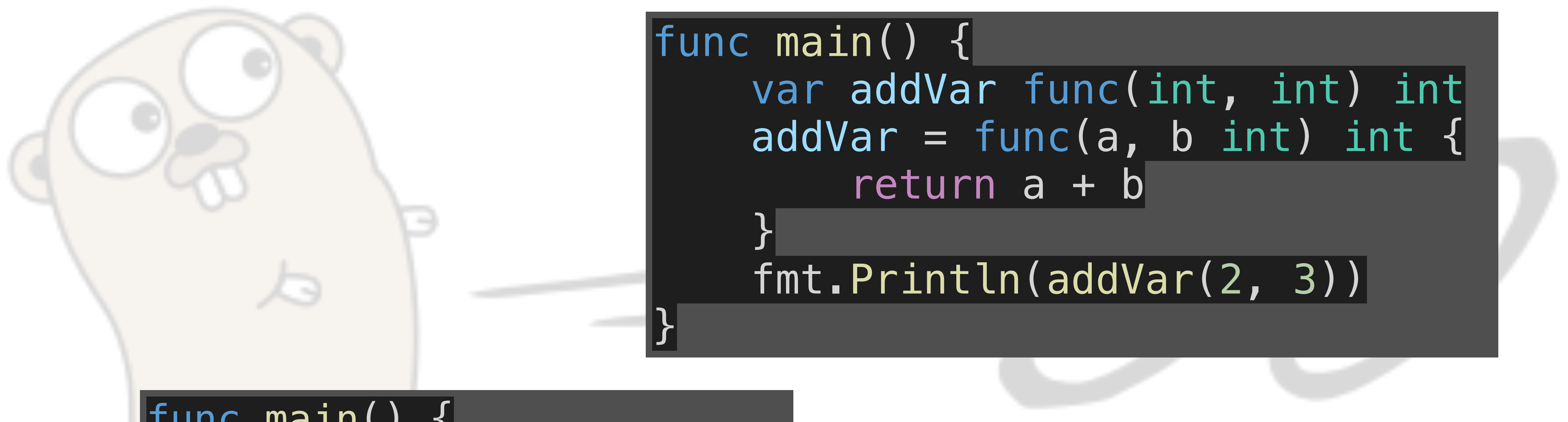
```go
func main() {
    vm := NewVendingMachine(coins, items)

    // Buy SD(soft drink) with exact change
    vm.InsertCoin("T")
    vm.InsertCoin("F")
    vm.InsertCoin("TW")
    vm.InsertCoin("O")
    fmt.Println("Inserted Money:", vm.GetInsertedMoney()) // 18
    can := vm.SelectSD()
    fmt.Println(can) // SD

    // Buy CC(canned coffee) without exact change
    vm.InsertCoin("T")
    vm.InsertCoin("T")
    fmt.Println("Inserted Money:", vm.GetInsertedMoney()) // 20
    can = vm.SelectCC()
    fmt.Println(can) // CC, F, TW, O

    // Start adding change but hit coin return
    vm.InsertCoin("T")
    vm.InsertCoin("T")
    vm.InsertCoin("F")
    fmt.Println("Inserted Money:", vm.GetInsertedMoney()) // 25
    change := vm.CoinReturn()
    fmt.Println(change) // T, T, F
}
```

First Class Function

In Go you can assign function to variables, pass functions to functions, and even write fucntions that return functions.

golang : first class function

create main.go in folder chapter12-1 :



```
func main() {
    var addVar func(int, int) int
    addVar = func(a, b int) int {
        return a + b
    }
    fmt.Println(addVar(2, 3))
}
```

```
func main() {
    fmt.Println(add(2, 3))
}
func add(a, b int) int {
    return a + b
}
```

golang : first class function

create main.go in folder chapter12-2 :

```go
func main() {
    fmt.Println(
    func(a, b int) int {
        return a + b
    }(2, 3))
}
```

```go
func main() {
    fmt.Println(add(2, 3))
}
func add(a, b int) int {
    return a + b
}
```

golang : first class function

create main.go in folder chapter12-3 :

```
func main() {
    addFunc := func(a int) (func(b int) int) {
        return func(b int) int {
            return a + b
        }
    }

    add2With := addFunc(2)
    fmt.Println(add2With(3))
}
```

```
func main() {
    fmt.Println(add(2, 3))
}
func add(a, b int) int {
    return a + b
}
```

First Class Function

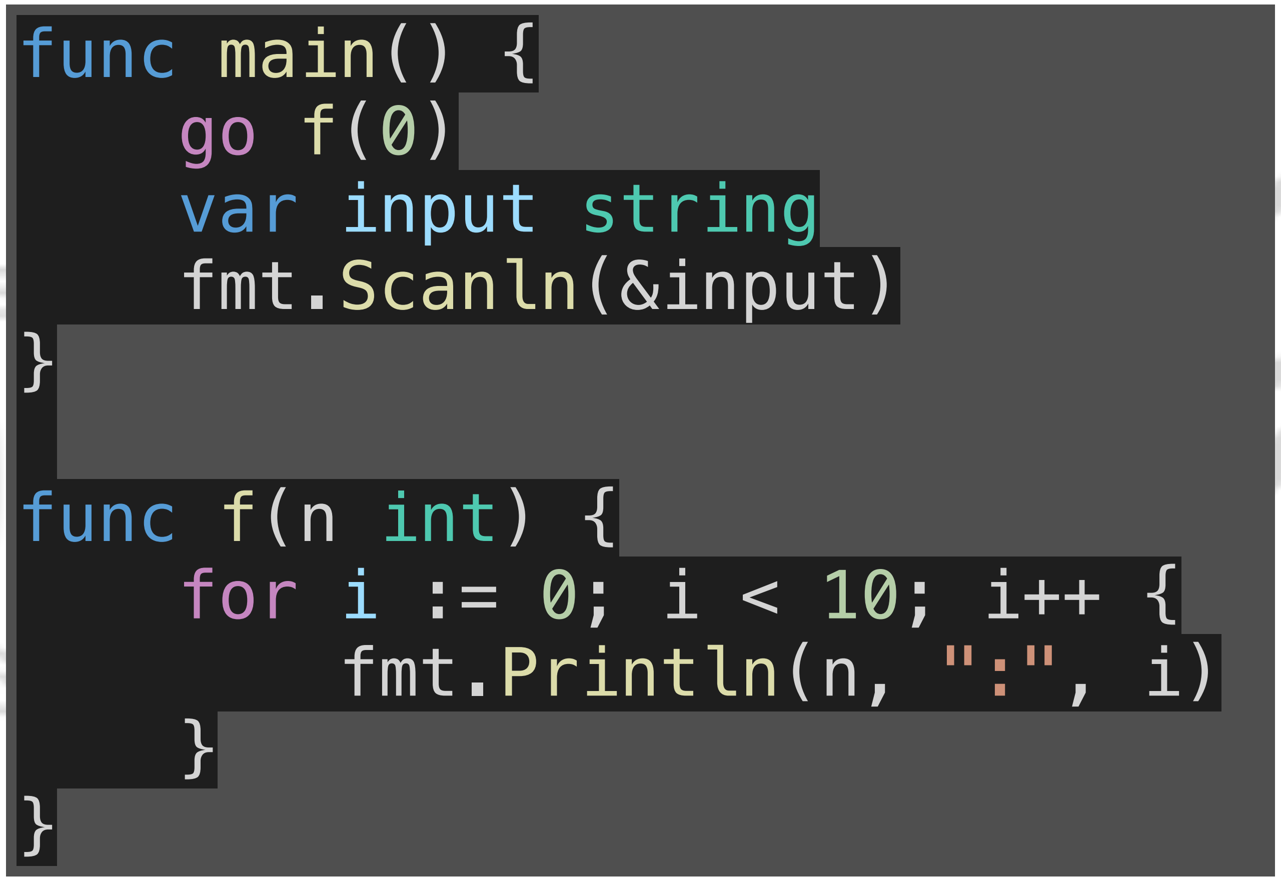
create main.go in folder chapter12-3 :

Change FizzBuzz to Functional Style

Goroutine

golang : goroutine

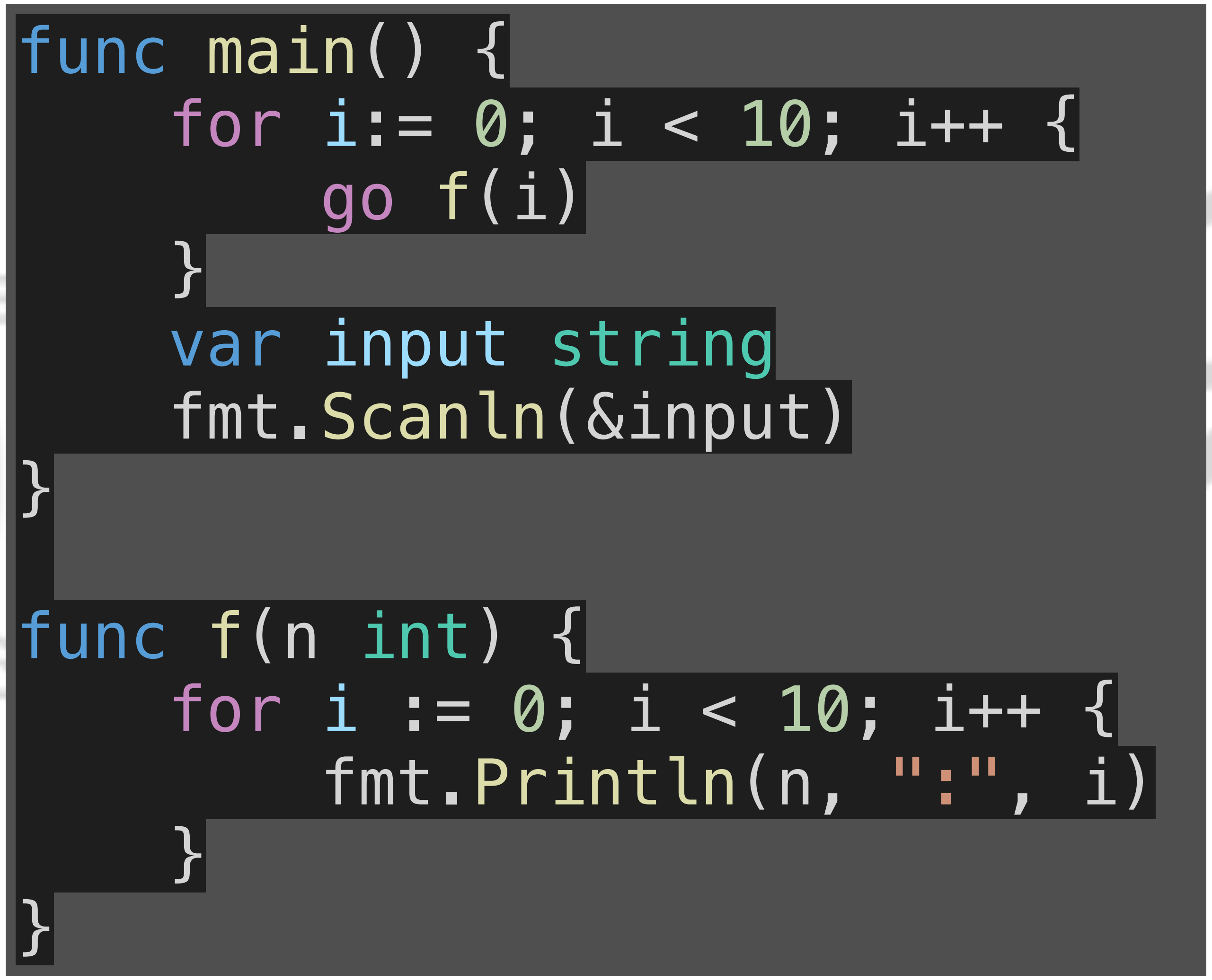
create main.go in folder chapter13-1 :



```go
func main() {
    go f(0)
    var input string
    fmt.Scanln(&input)
}

func f(n int) {
    for i := 0; i < 10; i++ {
        fmt.Println(n, ":", i)
    }
}
```

golang : goroutine

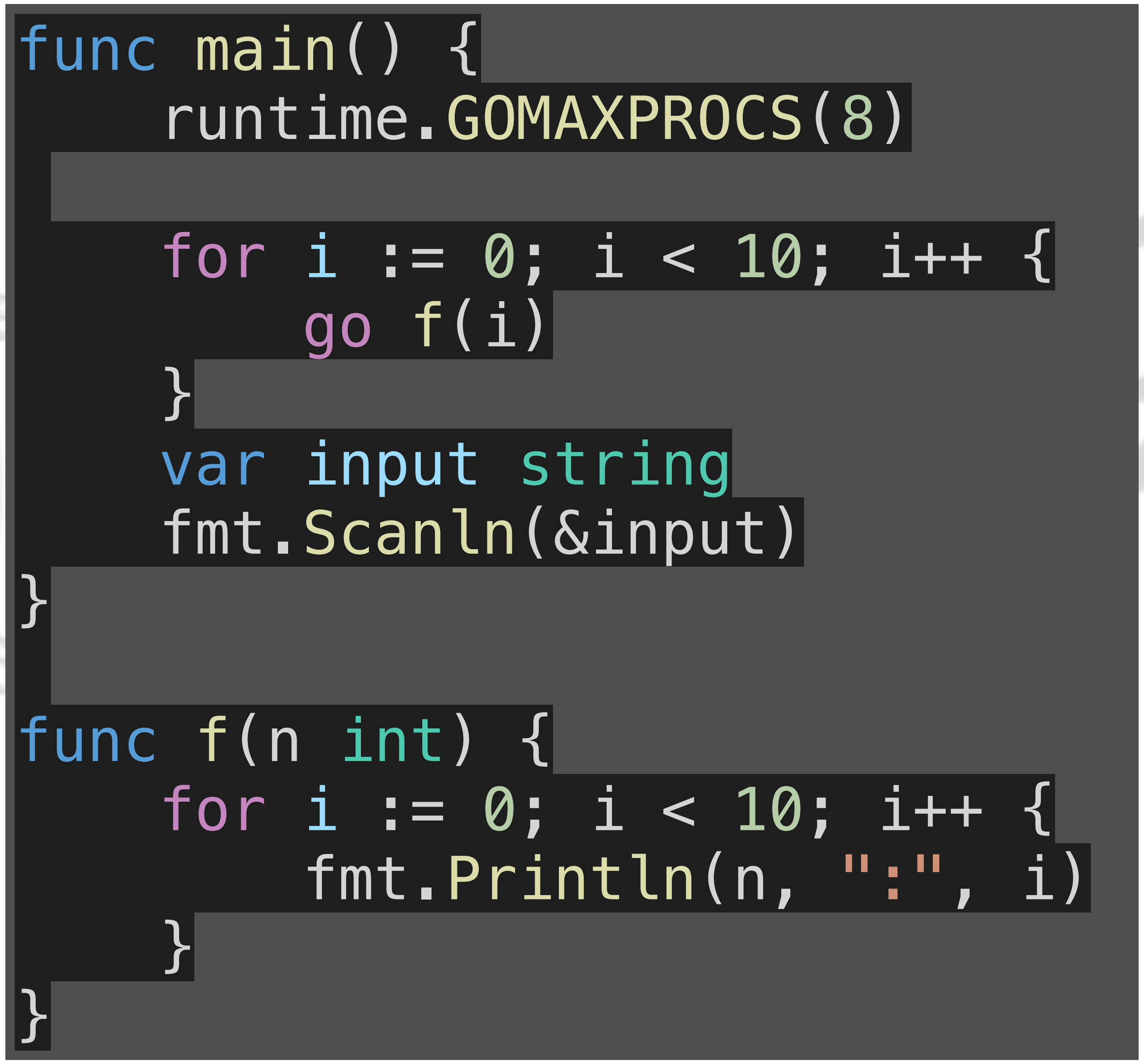
create main.go in folder chapter13-2 :



```go
func main() {
    for i:= 0; i < 10; i++ {
        go f(i)
    }
    var input string
    fmt.Scanln(&input)
}

func f(n int) {
    for i := 0; i < 10; i++ {
        fmt.Println(n, ":", i)
    }
}
```

golang : goroutine

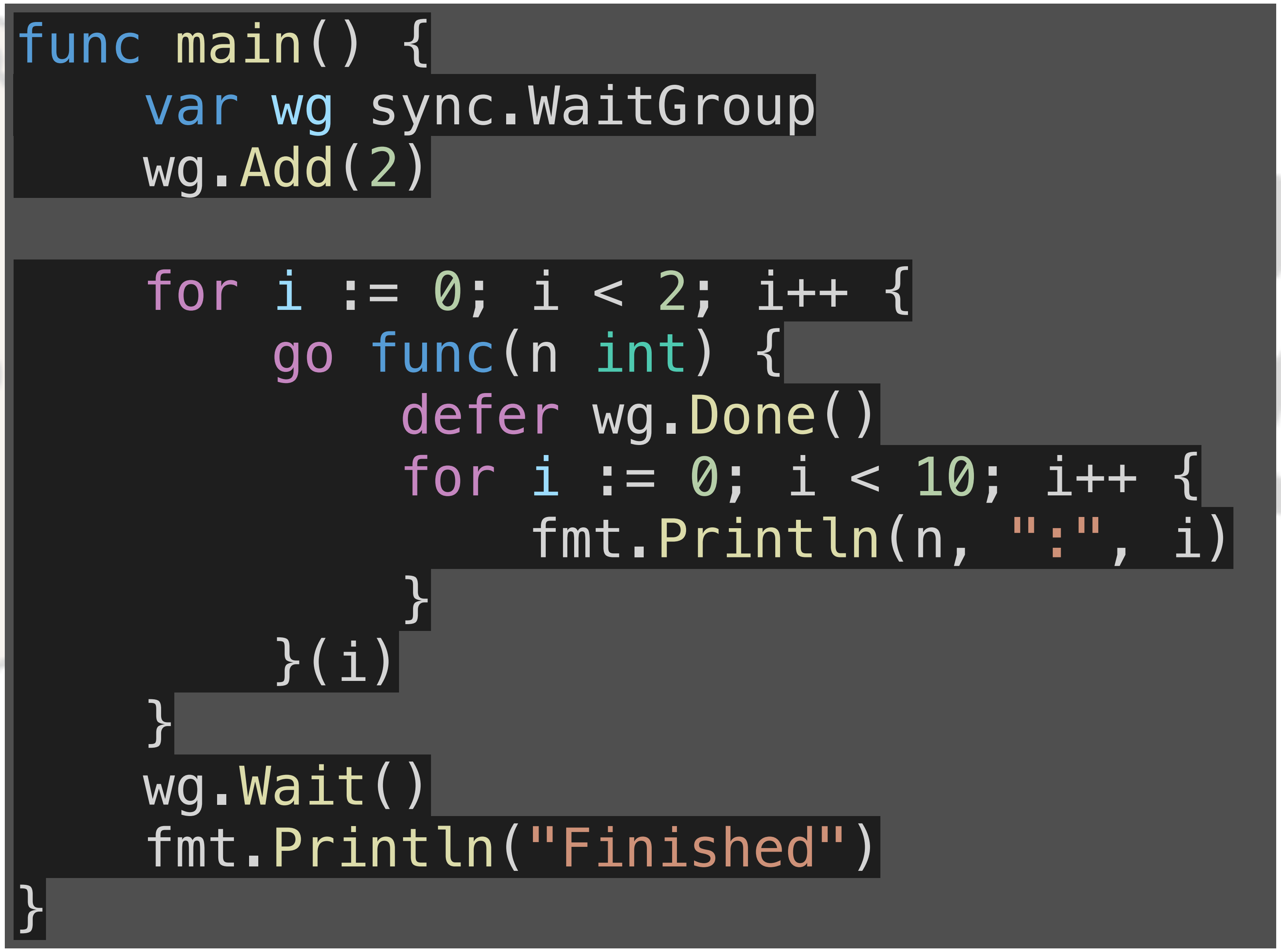
create main.go in folder chapter13-3 :



```go
func main() {
    runtime.GOMAXPROCS(8)

    for i := 0; i < 10; i++ {
        go f(i)
    }
    var input string
    fmt.Scanln(&input)
}

func f(n int) {
    for i := 0; i < 10; i++ {
        fmt.Println(n, ":", i)
    }
}
```

golang : goroutine

create main.go in folder chapter13-4 :



```go
func main() {
    var wg sync.WaitGroup
    wg.Add(2)

    for i := 0; i < 2; i++ {
        go func(n int) {
            defer wg.Done()
            for i := 0; i < 10; i++ {
                fmt.Println(n, ":", i)
            }
        }(i)
    }
    wg.Wait()
    fmt.Println("Finished")
}
```

golang : goroutine

create main.go in folder chapter13-5 :

```go
var (
    counter int
    wg      sync.WaitGroup
)
func main() {
    wg.Add(16)
    go increment(1)
    go increment(2)
    ………
    go increment(16)
    wg.Wait()
    fmt.Println("Final Counter:", counter)
}

func increment(n int) {
    defer wg.Done()
    for count := 0; count < 2; count++ {
        value := counter
        //runtime.Gosched()
        value++
        counter = value
    }
}
```

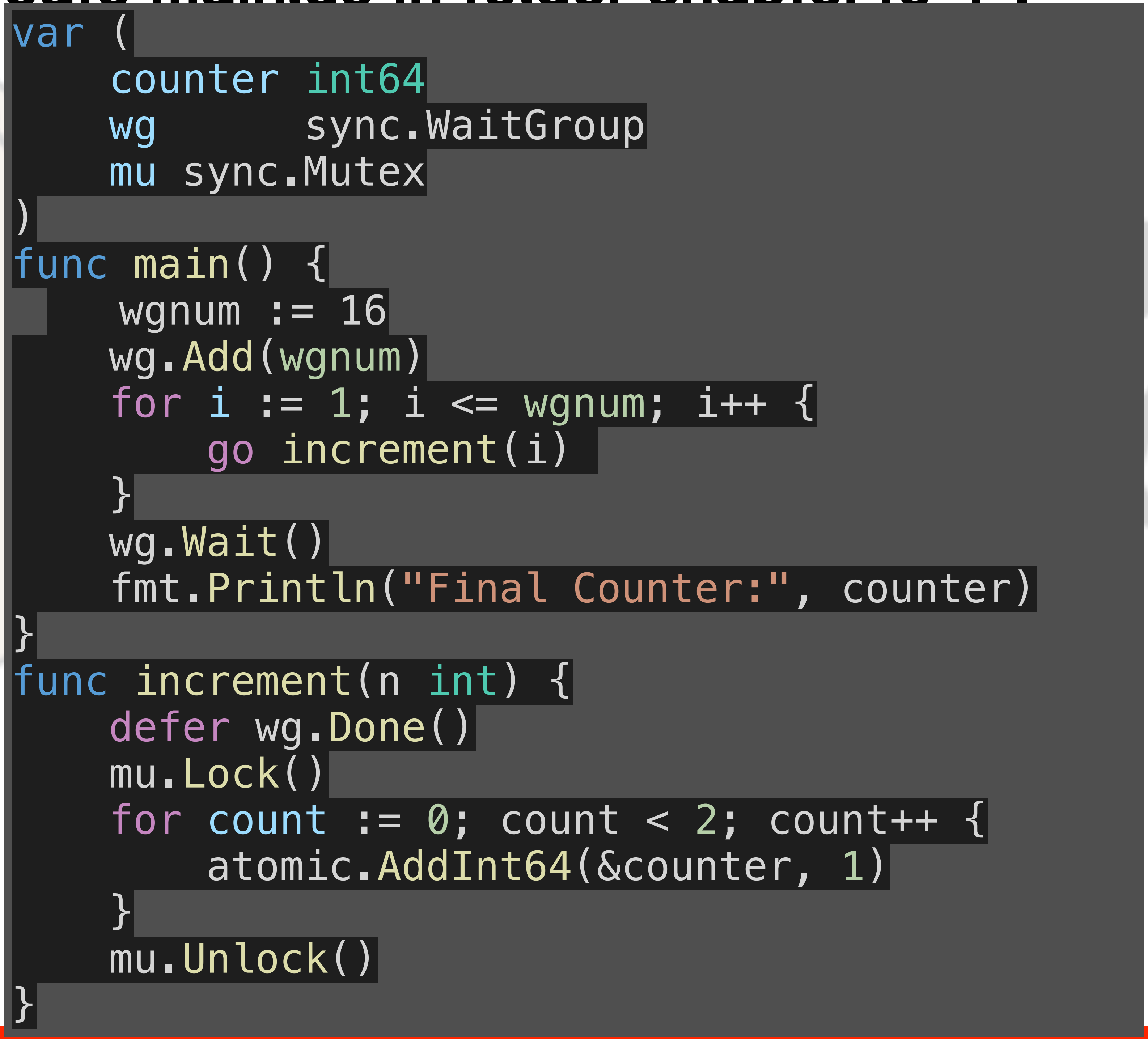
golang : Atomic

create main.go in folder chapter13-6 :

```go
var (
    counter int64
    wg      sync.WaitGroup
)

func main() {
    wg.Add(16)

    go increment(1)
    go increment(2)
    ...........
    go increment(16)

    wg.Wait()
    fmt.Println("Final Counter:", counter)
}

func increment(n int) {
    defer wg.Done()
    for count := 0; count < 2; count++ {
        atomic.AddInt64(&counter, 1)
    }
}
```

golang : Mutex

create main.go in folder chapter13-7 :



```go
var (
    counter int64
    wg      sync.WaitGroup
    mu sync.Mutex
)
func main() {
     wgnum := 16
    wg.Add(wgnum)
    for i := 1; i <= wgnum; i++ {
        go increment(i)
    }
    wg.Wait()
    fmt.Println("Final Counter:", counter)
}
func increment(n int) {
    defer wg.Done()
    mu.Lock()
    for count := 0; count < 2; count++ {
        atomic.AddInt64(&counter, 1)
    }
    mu.Unlock()
}
```

golang : Deadlock

create main.go in folder chapter13-8 :

```go
func main() {
    var a, b value
    var wg sync.WaitGroup
    wg.Add(2)
    go printSum(&a, &b, &wg)
    go printSum(&b, &a, &wg)
    wg.Wait()
}
type value struct {
    mu    sync.Mutex
    value int
}
```

```go
func printSum(a, b *value, wg *sync.WaitGroup) {
    defer wg.Done()
    a.mu.Lock()
    defer a.mu.Unlock() // introduce deadlock

    time.Sleep(2 * time.Second)
    b.mu.Lock()
    defer b.mu.Unlock() // introduce deadlock

    fmt.Printf("sum=%v\n", a.value+b.value)
}
```

GO บริษัท สยามชำนาญกิจ จำกัด และเพื่อนพ้องน้องพี่

Go Channel

Communicating sequential processes(CSP)

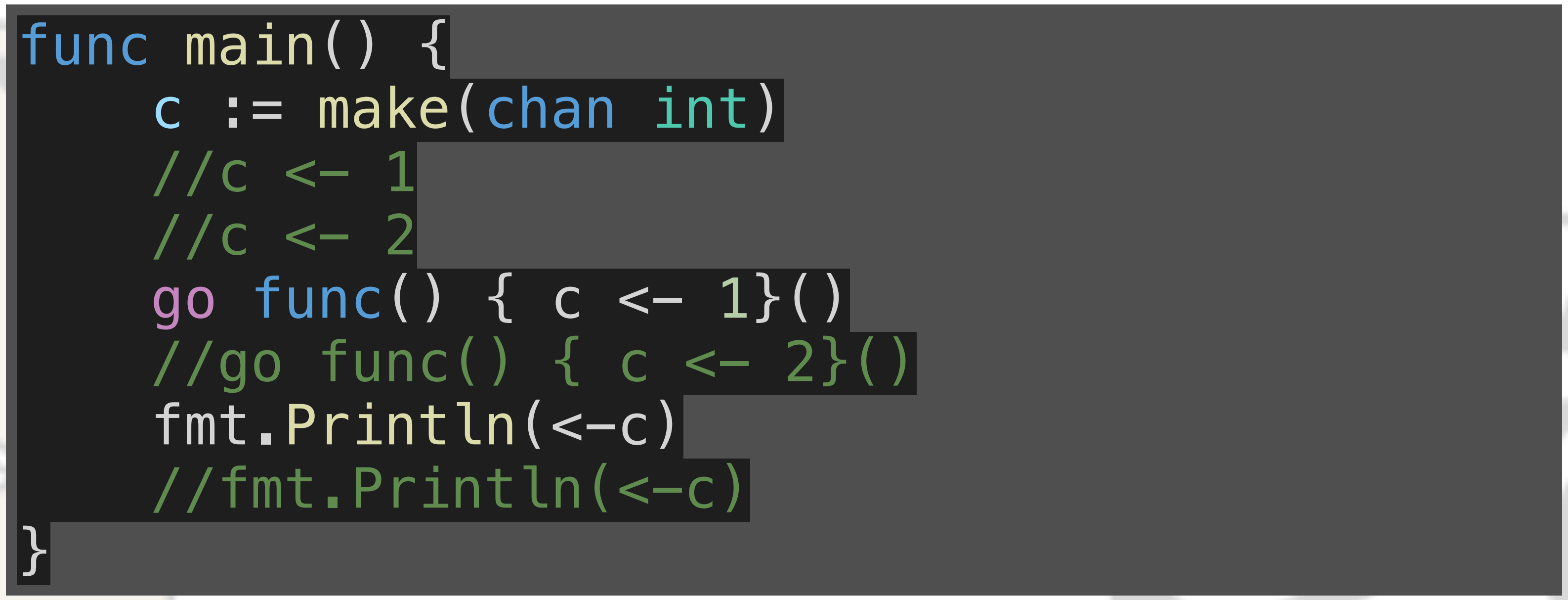
golang : Channel

create main.go in folder chapter13-9 :

```go
func main() {
    array := []int{7, 2, 8, -9, 4, 0}

    ch := make(chan int)

    go sum(array[:len(array)/2], ch)
    go sum(array[len(array)/2:], ch)
    x := <-ch
    y := <-ch
    fmt.Println(x, y, x+y)
}

func sum(array []int, ch chan int) {
    sum := 0
    for _, value := range array {
        sum += value
    }
    ch <- sum
}
```

golang : Unbuffered Channel

create main.go in folder chapter13-10 :



```
func main() {
    c := make(chan int)
    //c <- 1
    //c <- 2
    go func() { c <- 1}()
    //go func() { c <- 2}()
    fmt.Println(<-c)
    //fmt.Println(<-c)
}
```

A send operation on an unbuffered channel blocks the sending goroutine until another goroutine executes a corresponding receive on the same channel, at which point the value is transmitted and both goroutines may continue.

Brian W. Kernighan. "The Go Programming Language (Addison-Wesley Professional Computing Series)

golang : Buffered Channel

create main.go in folder chapter13-11 :

```
func main() {
    ch := make(chan int, 3)
    go func() { ch <- 1 }()
    ch <- 2
    fmt.Println("cap:", cap(ch))
    fmt.Println("len:", len(ch))
}
```

golang : Buffered Overfilled

create main.go in folder chapter13-12 :

```
func main() {
    c := make(chan int, 2)
    c <- 1
    c <- 2
    // c <- 3 // overfilled the buffer
    fmt.Println(<-c)
    fmt.Println(<-c)
}
```

golang : Goroutine Leak

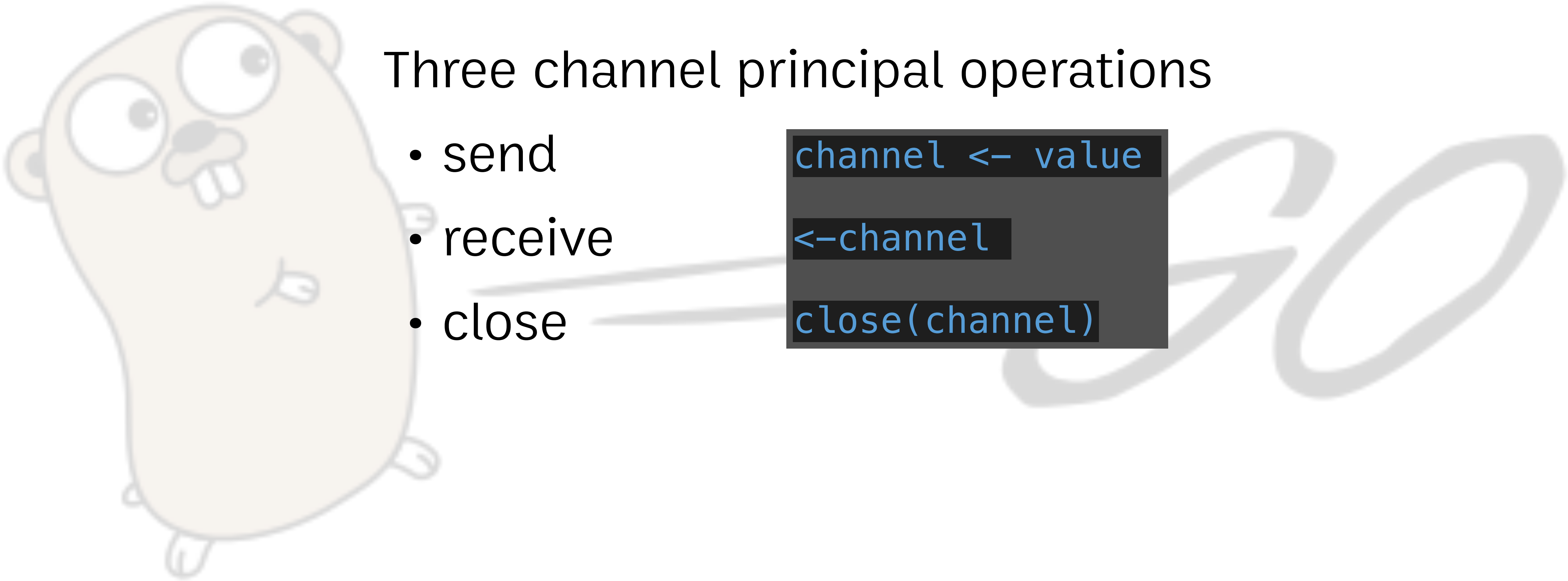
create main.go in folder chapter13-13 :

```
func main() {
    c := make(chan int)
    go func() { c <- 1}()
    go func() { c <- 2}()
    go func() { c <- 3}()
    fmt.Println(<-c)
    fmt.Println(<-c)
}
```

Fix by use buffered channel

```
func main() {
    c := make(chan int, 2)
    go func() { c <- 1}()
    go func() { c <- 2}()
    go func() { c <- 3}()
    fmt.Println(<-c)
    fmt.Println(<-c)
}
```

golang : Channel



Three channel principal operations

- send
- receive
- close

```
channel <- value

<-channel

close(channel)
```

golang : Channel-Direction

create main.go in folder chapter13-14 :

```go
func main() {
    pings := make(chan string, 1)
    pongs := make(chan string, 1)
    ping(pings, "passed message")
    pong(pings, pongs)
    fmt.Println(<-pongs)
}

func ping(pings chan<- string, msg string) {
    pings <- msg
}

func pong(pings <-chan string, pongs chan<- string) {
    msg := <-pings // receive
    pongs <- msg // send
}
```

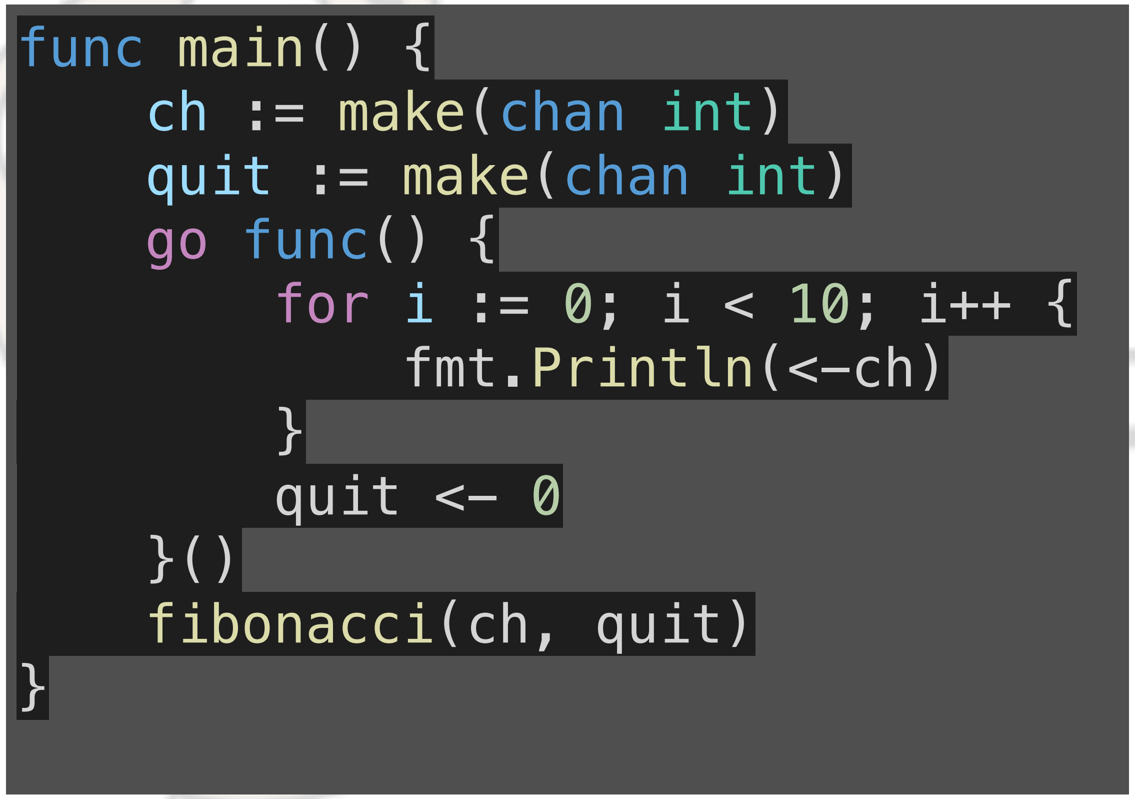
golang : Channel-Direction

create main.go in folder chapter13-15 :

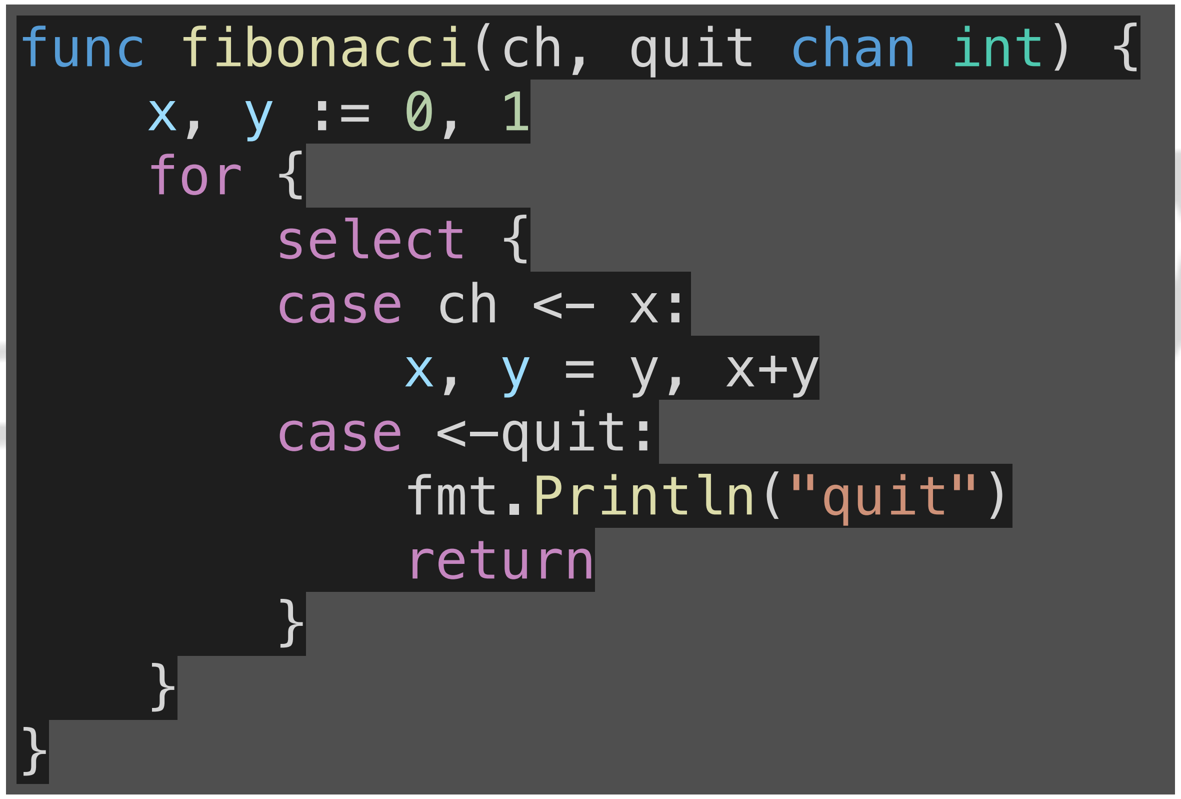
```go
func main() {
    ch := make(chan int, 10)
    go fibonacci(cap(ch), ch)

    for i := range ch {
        fmt.Println(i)
    }
}

func fibonacci(n int, ch chan int) {
    x, y := 0, 1
    for i := 0; i < n; i++ {
        ch <- x
        x, y = y, x+y
    }
    close(ch)
}
```

golang : Channel-Select

create main.go in folder chapter13-16 :



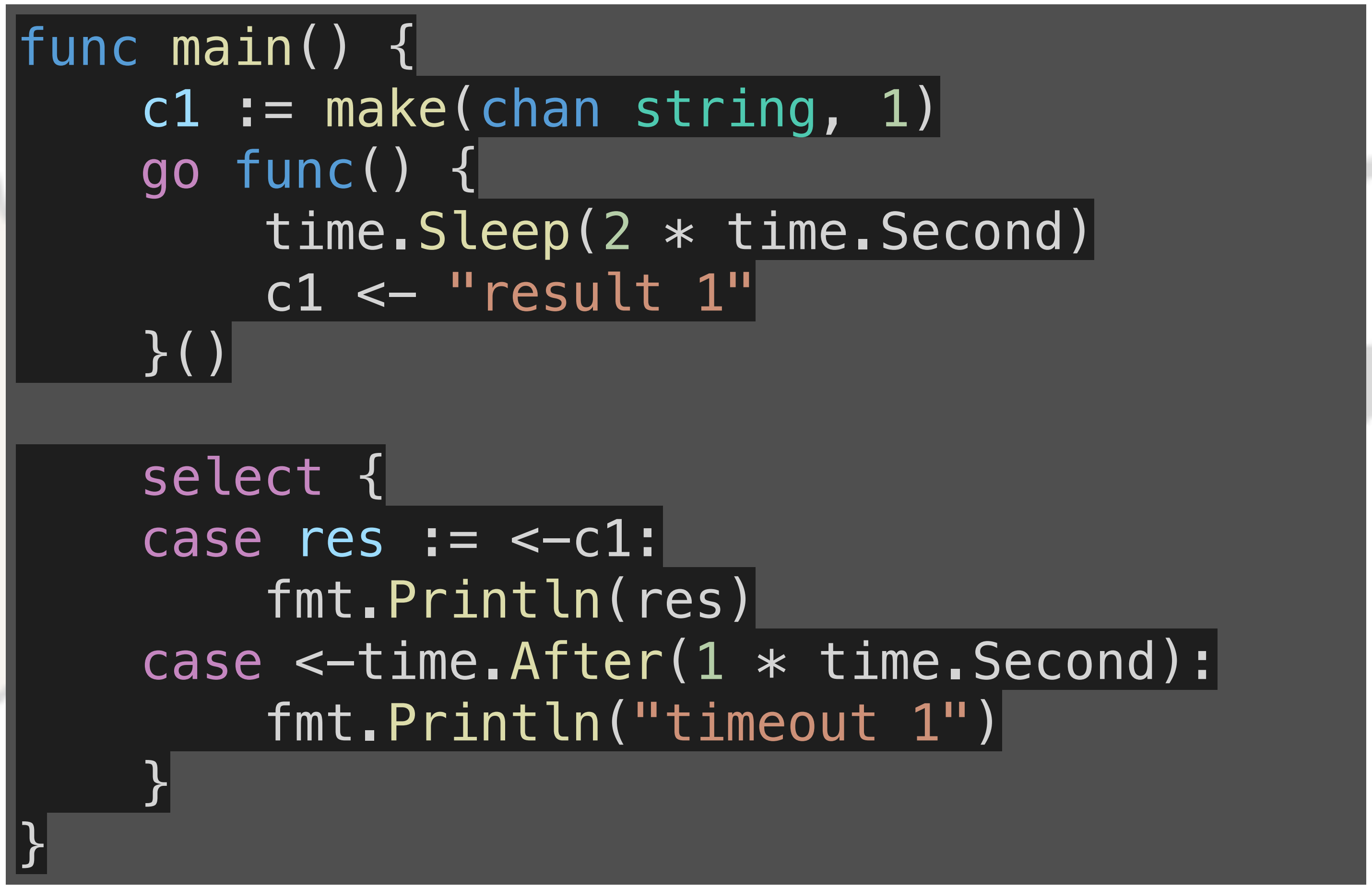
```go
func main() {
    ch := make(chan int)
    quit := make(chan int)
    go func() {
        for i := 0; i < 10; i++ {
            fmt.Println(<-ch)
        }
        quit <- 0
    }()
    fibonacci(ch, quit)
}
```



```go
func fibonacci(ch, quit chan int) {
    x, y := 0, 1
    for {
        select {
        case ch <- x:
            x, y = y, x+y
        case <-quit:
            fmt.Println("quit")
            return
        }
    }
}
```

golang : Select with Timeout

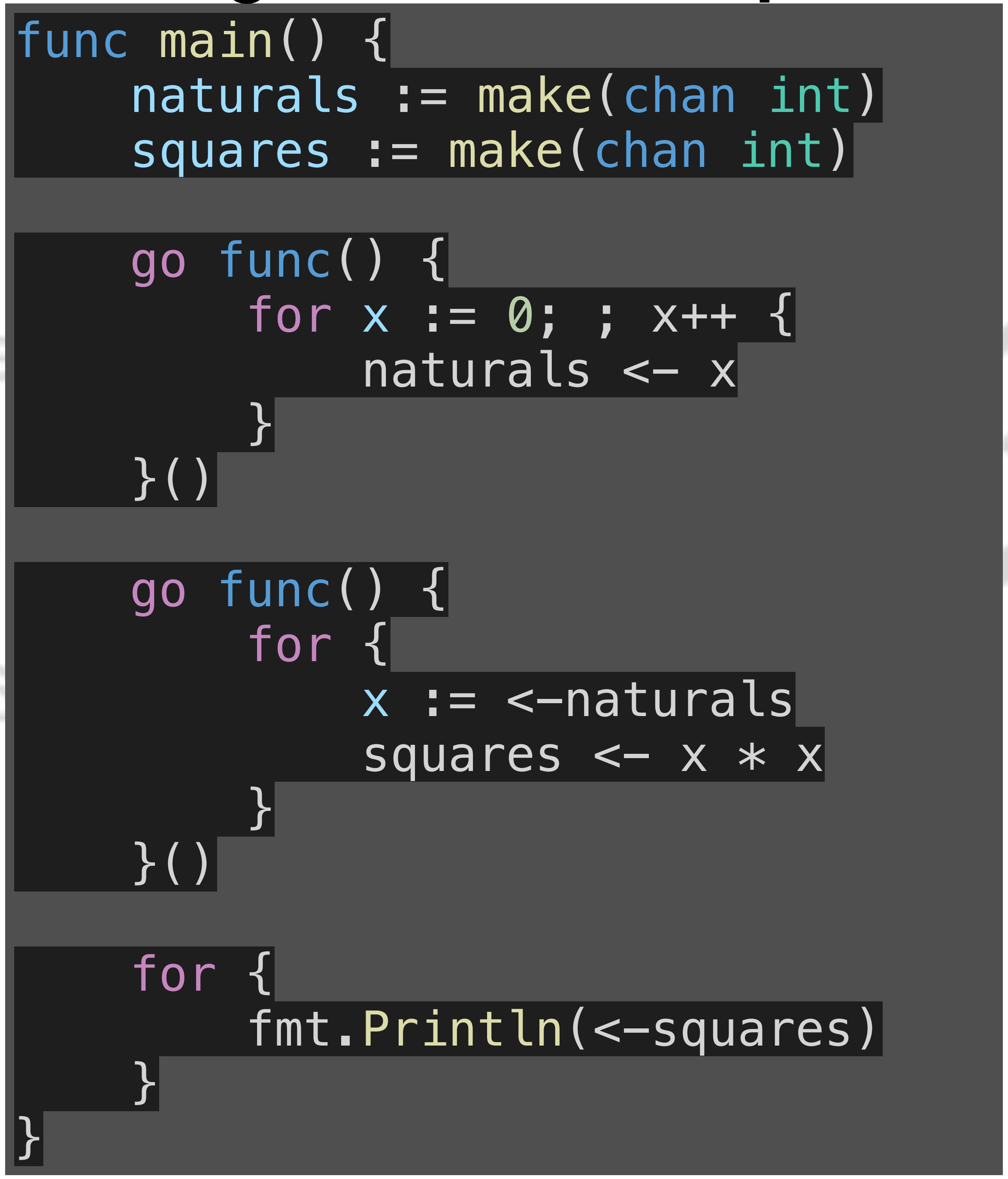
create main.go in folder chapter13-20 :



```go
func main() {
	c1 := make(chan string, 1)
	go func() {
		time.Sleep(2 * time.Second)
		c1 <- "result 1"
	}()

	select {
	case res := <-c1:
		fmt.Println(res)
	case <-time.After(1 * time.Second):
		fmt.Println("timeout 1")
	}
}
```

golang : Pipeline #1

create main.go in folder chapter13-17 :



```go
func main() {
    naturals := make(chan int)
    squares := make(chan int)

    go func() {
        for x := 0; ; x++ {
            naturals <- x
        }
    }()

    go func() {
        for {
            x := <-naturals
            squares <- x * x
        }
    }()

    for {
        fmt.Println(<-squares)
    }
}
```

golang : Pipeline #2

create main.go in folder chapter13-18 :

```go
func main() {
    naturals := make(chan int)
    squares := make(chan int)

    go func() {
        for x := 0; x < 100; x++ {
            naturals <- x
        }
        close(naturals)
    }()
    go func() {
        for x := range naturals{
            squares <- x * x
        }
        close(squares)
    }()

    for x := range squares {
        fmt.Println(x)
    }
}
```

golang : Pipeline #3

create main.go in folder chapter13-19 :

```go
func main() {
    naturals := make(chan int)
    squares := make(chan int)

    go counter(naturals)
    go squarer(naturals, squares)
    print(squares)
}
```

```go
func counter(out chan<- int) {

        for x := 0; x < 100; x++ {
            out <- x
        }
        close(out)

}

func squarer(in <-chan int, out chan<- int) {

        for x := range in {
            out <- x * x
        }
        close(out)

}

func print(in <-chan int) {
    for x := range in {
        fmt.Println(x)
    }
}
```