Unit 2—Lesson 1:
Strings

Assignment Project Exam Help

https://eduassistpro.github.io/

Say

Add WeChat edu_assist_pro

• Because Swift needs to be used for things that other languages e need a String type.

Strings

```
let greeting = "Hello"
var otherGreeting = "Salutations"
```

```
let joke = """
  Q: Why did the chicken cross the road?
  A: To get to the other side!
  """
print(joke)
```

```
Q: Why did the chicken cross the road?
A: To get to the other side!
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Say

- String instances can be created with the `""` literal.
- `let` strings can't be changed.
- `var` strings can be changed.
- Unicode is supported.
- If your string literal needs to be multiple lines, simply surround your set of characters with three double quotation marks `"""`. In its multiline form, the string literal includes all of the lines between its opening and closing quotes. The string begins on the first line after the opening quotes and ends on the line before the closing quotes.

String basics
Escaping

```
let greeting = "It is traditional in programming to print \"Hello, world!\""
```

Escape	Description
`\"`	Double quote
`\\`	Backslash
`\t`	Tab
`\r`	Carriage return (return to beginning of the next line)

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Do

• Click to display the escape quotes.

Say

• If the string will include double quotes, you'll need to use the backslash (\), known in Swift as the escape character.

String basics

Empty strings

```
var myString = ""

if myString.isEmpty {
  print("The string is empty")
}
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

String basics
Characters

```
let a = "a" // 'a' is a string
let b: Character = "b" // 'b' is a Character
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Say

Add WeChat edu_assist_pro

• If you need a Character instance, you can still use "", but you n he Character type.

• Swift strings are not a collection of characters, but you can get the characters (someString.characters).

Do

• Show String under swiftdoc.org and point out the "extended grapheme clusters."

• Explain that if you need all the details of how String is built and stored, you can find it.

Concatenation

```
let string1 = "Hello"
let string2 = ", world!"
var myString = string1 + string2 // "Hello, world!"
```

```
myString += " Hello!" // "Hello, world! Hello!"
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Say

- If you have two constant strings, you can use + to combine the ring.
- If you have a variable string, you can use += to append to it.
- As strings grow in complexity, the use of the + operator can make code tricky to handle. In the code above, for example, you might forget to add a space before "Hello!"

Interpolation

```
let name = "Rick"
let age = 30
print("\(name) is \(age) years old")
```

```
Rick is 30 years old
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Say

- You can insert the raw value of a constant or variable into a Stri g the name with a backslash \ and wrapping the name in parentheses ().

Interpolation
Expressions

```
let a = 4
let b = 5
print("If a is \(a) and b is \(b), then a + b equals \(a+b)")
```

```
If a is 4 and b is 5, then a + b equals 9
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

String equality and comparison

```
let month = "January"
let otherMonth = "January"
let lowercaseMonth = "january"

if month == otherMonth {
  print("They are the same")
}

if month != lowercaseMonth {
  print("They are not the same.")
}
```

```
They are the same.
They are not the same.
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

String equality and comparison

Ignoring case

```
let name = "Johnny Appleseed"
if name.lowercased() == "joHnnY aPPleseeD".lowercased() {
  print("The two names are equal.")
}
```

```
The two names are equal.
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Say

Add WeChat edu_assist_pro

- You can use the lowercased() method to normalize the two strin an all-lowercase version of the string with an all-lowercase version of the calling string.

String equality and comparison
Prefix and suffix

```
let greeting = "Hello, world!"

print(greeting.hasPrefix("Hello"))
print(greeting.hasSuffix("world!"))
print(greeting.hasSuffix("World!"))
```

```
true
true
false
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Say

- Note that they are case sensitive.

String equality and comparison
Finding substrings

```
let greeting = "Hi Rick, my name is Amy."
if greeting.contains("my name is") {
  print("Making an introduction")
}
```

```
Making an introduction
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Say

- Use the contains(_:) method to return a Boolean value that indic r not the substring was found.

String equality and comparison
Checking length

```
let name = "Ryan Mears"
let count = name.count
let newPassword = "1234"

if newPassword.count < 8 {
    print("This password is too short. Passwords should have at least 8 characters.")
}
```

```
This password is too short. Passwords should have at least 8 characters.
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Say

- You can use the count property to determine the number of ch

String equality and comparison
Using switch

```
let someCharacter: Character = "e"
switch someCharacter {
  case "a", "e", "i", "o", "u":
    print("\(someCharacter) is a vowel.")
  default:
    print("\(someCharacter) is not a vowel.")
}
```

```
e is a vowel.
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Say

- You can use the switch statement to pattern-match multiple val r characters and respond accordingly.

Unicode

```
let cow = "🐮"
let credentials = "résumé"
let myBook = "私の本"
print("∞".characters.count)
```

```
1
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Say

- Note that the size of a string in bytes is not equal to the number

Unit 2—Lesson 1

Lab: Strings

Open and complete the exercises in `Lab - Strings.playground`

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Unit 2—Lesson 2:
Functions

Assignment Project Exam Help

https://eduassistpro.github.io/

Say

Add WeChat edu_assist_pro

- Because most programs don't just run linear code, we need fun

Functions

```
tieMyShoes()
```

```
makeBreakfast(food: "scrambled eggs", drink: "orange juice")
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Say

- `tieMyShoes()`—No parameters required; shoes are always tie y.
- `makeBreakfast(food: ["eggs", "smoothie"])`—Use parameters when you want to do the work differently at different times.

Functions

Defining a function

```
func functionName (parameters) -> ReturnType {
    // Body of the function
}
```

```
func displayPi() {
  print("3.1415926535")
}

displayPi()
```

```
3.1415926535
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Note

- This slide shows the syntax for defining a function.
- It also shows an implementation and call of a function with no arguments and no return.

Parameters

```
func triple(value: Int) {
  let result = value * 3
  print("If you multiply \(value) by 3, you'll get \(result).")
}

triple(value: 10)
```

```
If you multiply 10 by 3, you'll get 30.
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Note

- This slide shows an implementation and call of function with a p

Parameters

Multiple parameters

```
func multiply(firstNumber: Int, secondNumber: Int) {
  let result = firstNumber * secondNumber
  print("The result is \(result).")
}

multiply(firstNumber: 10, secondNumber: 5)
```

```
The result is 50.
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Say

- This slide shows using more than one argument.
- Properly named arguments help document the function ("self-documenting code").
- Note that named arguments must be passed in name order.

Return values

```
func multiply(firstNumber: Int, secondNumber: Int) -> Int {
  let result = firstNumber * secondNumber
  return result
}
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Do

- Talk about functions returning a result.
- Click to highlight `-> Int` to show the return type.
- Click to highlight `return result` to show how the function returns the result.

Return values

```swift
func multiply(firstNumber: Int, secondNumber: Int) -> Int {
 return firstNumber * secondNumber
}
```

```swift
let myResult = multiply(firstNumber: 10, secondNumber: 5)
print("10 * 5 is \(myResult)")
```

```swift
print("10 * 5 is \(multiply(firstNumber: 10, secondNumber: 5))")
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Do

- Click to display capturing the return value, then printing it.
- Click again to display calling the function in String interpolation.

Argument labels

```
func sayHello(firstName: String) {
  print("Hello, \(firstName)!")
}

sayHello(firstName: "Amy")
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Say

- Commonly use the same label internally and externally.

Argument labels

```
func sayHello(to: String, and: String) {
  print("Hello \(to) and \(and)")
}

sayHello(to: "Luke", and: "Dave")
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Say

Add WeChat edu_assist_pro

• Sometimes having the same names inside and when calling isn'

Argument labels

External names

```
func sayHello(to person: String, and anotherPerson: String) {
  print("Hello \(person) and \(anotherPerson)")
}

sayHello(to: "Luke", and: "Dave")
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Say

- It may be better to have different descriptive names for calling a g.

Argument labels
Omitting labels

```
print("Hello, world!")
```

```
func add(_ firstNumber: Int, to secondNumber: Int) -> Int {
    return firstNumber + secondNumber
}

let total = add(14, to: 6)
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Say

- First is example of a function students have used that omitted t
- The second example defines a function that omits the label for the first parameter.

Default parameter values

```
func display(teamName: String, score: Int = 0) {
  print("\(teamName): \(score)")
}

display(teamName: "Wombats", score: 100)
display(teamName: "Wombats")
```

```
Wombats: 100
Wombats: 0
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Say

- Functions can have default values for parameters, and if so, you pass them.
- Note that functions can have more than one parameter with a default value.
- This is a tricky language feature; go to the documentation to see the full function.

Unit 2—Lesson 2
Lab: Functions

Open and complete the exercises in `Lab - Functions.playground`

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Unit 2—Lesson 3: Structures

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Note

- This is a long presentation.
- The recommendation is to stop partway through and ask students to complete a few of the lab exercises.
- Then resume the lecture, followed by students completing the exercises.

Structures

```
struct Person {
  var name: String
}
```

Capitalize type names

Use lowercase for property names

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Say

- Use the struct keyword.
- Note that because structs are value types, if you have a struct with var properties and an instance created into a let variable, the properties aren’t changeable.

Structures

Accessing property values

```
struct Person {
  var name: String
}

let person = Person(name: "Jasmine")
print(person.name)
```

```
Jasmine
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Say

- Use the dot syntax to access properties.

Structures

Adding functionality

```
struct Person {
  var name: String

 func sayHello() {
    print("Hello there! My name is \(name)!")
  }

}

let person = Person(name: "Jasmine")
person.sayHello()
```

```
Hello there! My name is Jasmine!
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Say

- Structures can have behavior.
- "Methods" are functions on a type.

Instances

```
struct Shirt {
  var size: String
  var color: String
}

let myShirt = Shirt(size: "XL", color: "blue")

let yourShirt = Shirt(size: "M", color: "red")
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Note

- This slide shows creating two instances of a struct.

```
struct Car {
  var make: String
  var year: Int
  var color: String

  func startEngine() {...}

  func drive() {...}

  func park() {...}

  func steer(direction: Direction) {...}
}

let firstCar = Car(make: "Honda", year: 2010, color: "blue")
let secondCar = Car(make: "Ford", year: 2013, color: "black")

firstCar.startEngine()
firstCar.drive()
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Note

- This slide shows how to call methods on an instance: The firstC way, and the secondCar is still sitting there, not running.

Initializers

```
let string = String.init() // ""
let integer = Int.init() // 0
let bool = Bool.init() // false
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Say

Add WeChat edu_assist_pro

- The standard library types all have `init()`, which returns an e instance.

Initializers

```
var string = String() // ""
var integer = Int() // 0
var bool = Bool() // false
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Say

• Whenever you’re using a new type, look at the inits. How can I ?

Note

• This slide shows the () shortcut.

• Go to String in the docs and show the inits. They can all be run with or without the init. part.

Initializers

Default values

```
struct Odometer {
  var count: Int = 0
}

let odometer = Odometer()
print(odometer.count)
```

```
0
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Say

- For types we create: If all the stored properties of your struct ha es, the compiler writes the no-argument initializer for you
- init() creates an instance with default values.

Note

- Some time during this part of the lesson, you should say that before initialization completes, all properties need a value.

Initializers

Memberwise initializers

```
let odometer = Odometer(count: 27000)
print(odometer.count)
```

```
27000
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Say

- Structs always get a memberwise initializer from the compiler, ou have default values.
- We saw that Odometer has a default value, but we can override that by calling the memberwise initializer.

Initializers

Memberwise initializers

```
struct Person {
  var name: String
}
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Say

- Person with a "name" property probably shouldn't have a defau ring (no default value, so no init())
- So call the memberwise initializer.

Note

- The next slide builds upon this one.

Initializers

Memberwise initializers

```
struct Person {
  var name: String

  func sayHello() {
    print("Hello there!")
  }
}

let person = Person(name: "Jasmine") // Memberwise initializer
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

```swift
struct Shirt {
  let size: String
  let color: String
}

let myShirt = Shirt(size: "XL", color: "blue") // Memberwise initializer


struct Car {
  let make: String
  let year: Int
  let color: String
}

let firstCar = Car(make: "Honda", year: 2010, color: "blue") // Memberwise initializer
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Note

- This slide shows two structs and their respective memberwise i

Initializers

Custom initializers

```
struct Temperature {
  var celsius: Double
}

let temperature = Temperature(celsius: 30.0)
```

```
let fahrenheitValue = 98.6
let celsiusValue = (fahrenheitValue - 32) / 1.8

let newTemperature = Temperature(celsius: celsiusValue)
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Say

- In this example, the memberwise initializer requires you to calcu sValue before you initialize a newTemperature object.

Do

- Click to display using the Fahrenheit example.

Say

- What if we want to create one from a Fahrenheit value? We'd have to convert to Celsius in code and then pass that in.

```
struct Temperature {
  var celsius: Double

  init(celsius: Double) {
    self.celsius = celsius
  }

  init(fahrenheit: Double) {
    celsius = (fahrenheit - 32) / 1.8
  }
}

let currentTemperature = Temperature(celsius: 18.5)
let boiling = Temperature(fahrenheit: 212.0)

print(currentTemperature.celsius)
print(boiling.celsius)

18.5
100.0
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Say

- Instead of calculating Fahrenheit > Celsius outside the struct, m r that takes a Fahrenheit value and converts it for us.
- When we write our own initializers, we must make sure all properties are set to something before we're done, so this one is valid.
- Show String in the docs and point out the many init(...) methods.
- Note that as soon as we write ANY init methods, we no longer get:
  - The init() that we get by having default values
  - The memberwise initializer

Note

- If we write inits in an extension, we still get the compiler-written ones.

Unit 2—Lesson 3

Lab: Structures

Open and complete the following exercises in `Lab – Structures.playground`:

- Exercise - Structs, Instances, and Default Values
- App Exercise - Workout Tracking

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Instance methods

```
struct Size {
  var width: Double
  var height: Double

  func area() -> Double {
    return width * height
  }
}

var someSize = Size(width: 10.0, height: 5.5)

let area = someSize.area() // Area is assigned a value of 55.0
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Say

- The methods so far are "instance methods," meant to be called .
- Calling area() will return different values depending on the width and height of the receiving instance.

Mutating methods

```
struct Odometer {
  var count: Int = 0 // Assigns a default value to the 'count' property.
}
```

Need to

- Increment the mileage
- Reset the mileage

Assignment Project Exam Help

https://eduassistpro.github.io/

In the following example, a simple structure stores mileage data Car object. Before looking at the code, consider what data the mileage counter needs to store and what s to perform.

Add WeChat edu_assist_pro

1 Store the mileage count to be displayed on an odometer

2 Increment the mileage count to update the mileage when the car drives

3 Potentially reset the mileage count if the car drives beyond the number of miles that can be displayed on the odometer

The last two require modifying the count property within the struct.

```swift
struct Odometer {
  var count: Int = 0 // Assigns a default value to the 'count' property.

  mutating func increment() {
    count += 1
  }

  mutating func increment(by amount: Int) {
    count += amount
  }

  mutating func reset() {
    count = 0
  }
}

var odometer = Odometer() // odometer.count defaults to 0
odometer.increment() // odometer.count is incremented to 1
odometer.increment(by: 15) // odometer.count is incremented to 16
odometer.reset() // odometer.count is reset to 0
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Note

- Odometer type—Can have A and B trip odometers like a car do n instance with its own count property value.
- Note mutating—If a method on a value type changes a property, it must be annotated with mutating (another example of Swift safety).
- Note that mutating isn't required for Classes.

Computed properties

```
struct Temperature {
  let celsius: Double
  let fahrenheit: Double
  let kelvin: Double
}

let temperature = Temperature(celsius: 0, fahrenheit: 32, kelvin: 273.15)
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Say

- Let’s say we want to be able to get Celsius, Fahrenheit, and kel perature instance.
- Here’s a bad way to do it: properties for all three and a memberwise initializer.
- It’s bad because the caller has to calculate all three values to pass in.

```swift
struct Temperature {
  var celsius: Double
  var fahrenheit: Double
  var kelvin: Double

  init(celsius: Double) {
    self.celsius = celsius
    fahrenheit = celsius * 1.8 + 32
    kelvin = celsius + 273.15
  }

  init(fahrenheit: Double) {
    self.fahrenheit = fahrenheit
    celsius = (fahrenheit - 32) / 1.8
    kelvin = celsius + 273.15
  }

  init(kelvin: Double) {
    self.kelvin = kelvin
    celsius = kelvin - 273.15
    fahrenheit = celsius * 1.8 + 32
  }
}

let currentTemperature = Temperature(celsius: 18.5)
let boiling = Temperature(fahrenheit: 212.0)
let freezing = Temperature(kelvin: 273.15)
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Say

Add WeChat edu_assist_pro

- Another way would be an initializer for each scale of temperatur
- It’s better for the inits—only one value is needed.
- It’s still challenging for the state. Imagine that this thing can somehow do measurements itself; any time the temperature changes, all three properties would need to be updated.

```swift
struct Temperature {
  var celsius: Double

  var fahrenheit: Double {
    return celsius * 1.8 + 32
  }
}

let currentTemperature = Temperature(celsius: 0.0)
print(currentTemperature.fahrenheit)

32.0
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Say

- Computed properties would potentially simplify the state—have operty and compute the others.
- You would probably still want an init for each kind of temperature, but only one property for state.

Note

- Computed properties are "get" and optionally "set," and if there's only the getter you can omit the "get."
- Computed properties must be "var."

Challenge

Add support for Kelvin

Modify the following to allow the temperature to be read as Kelvin

```
struct Temperature {
  let celsius: Double

  var fahrenheit: Double {
    return celsius * 1.8 + 32
  }

}
```

Hint: Temperature in Kelvin is Celsius + 273.15

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Do

- Add the kelvin-computed property as a demo or walkthrough:

```
var kelvin: Double {
    return Celsius + 273.15
}
```

```
struct Temperature {
  let celsius: Double

  var fahrenheit: Double {
    return celsius * 1.8 + 32
  }

  var kelvin: Double {
    return celsius + 273.15
  }

}

let currentTemperature = Temperature(celsius: 0.0)
print(currentTemperature.kelvin)

273.15
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Note

- Here’s the solution for the challenge.

Property observers

```
struct StepCounter {
    var totalSteps: Int = 0 {
        willSet {
            print("About to set totalSteps to \(newValue)")
        }
        didSet {
            if totalSteps > oldValue  {
                print("Added \(totalSteps - oldValue) steps")
            }
        }
    }
}
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Say

- Swift allows you to observe any property and respond to the ch operty's value.
- willSet is an observer that defines a block of code that will be called before a property's value is set.

  You will have access to the new value that will be set to the property in a constant value named newValue.
- didSet defines a block of code that will be called after a property's value has been set.

  You will have access to the previous value of the property in a constant value named oldValue.

Property observers

```
var stepCounter = StepCounter()
stepCounter.totalSteps = 40
stepCounter.totalSteps = 100
```

```
About to set totalSteps to 40
Added 40 steps
About to set totalSteps to 100
Added 60 steps
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Type properties and methods

```
struct Temperature {
  static var boilingPoint = 100.0

  static func convertedFromFahrenheit(_ temperatureInFahrenheit: Double) -> Double {
    return(((temperatureInFahrenheit - 32) * 5) / 9)
  }

}

let boilingPoint = Temperature.boilingPoint

let currentTemperature = Temperature.convertedFromFahrenheit(99)

let positiveNumber = abs(-4.14)
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Say

- Use the static keyword on a property to make it "one per type."
- Ask the type for the property.
- The naming convention is that types are capitalized and everything else is lowercase. This helps you see what’s going on.

Copying

```
var someSize = Size(width: 250, height: 1000)
var anotherSize = someSize

someSize.width = 500

print(someSize.width)
print(anotherSize.width)
```

```
500
250
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Say

- Struct is a "value type"—copied on assignment when passed in function and when returned from a function.
- This shows that if a struct is copied and then a change is made to the original, the copy doesn’t change.

Note

- This is conceptual—"copy on write" is really how it works. A copy isn't made unless a property changes.

self

```
struct Car {
  var color: Color

  var description: String {
    return "This is a \(self.color) car."
  }
}
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Say

- "self" is the instance itself.
- This shows that "self.color" works to access properties.

self

When not required

Not required when property or method names exist on the current object

```
struct Car {
  var color: Color

  var description: String {
    return "This is a \(color) car."
  }
}
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

self

When required

```
struct Temperature {
  var celsius: Double

  init(celsius: Double) {
    self.celsius = celsius
  }
}
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Say

Add WeChat edu_assist_pro

- In this example, the argument to init is the same as the property quired to disambiguate.

Unit 2—Lesson 3

Lab: Structures

Open and complete the remaining exercises in
`Lab - Structures.playground`

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Unit 2—Lesson 4:
Classes, Inheritance

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Note

- Depending upon how long it takes for you to go through the earl ay want to break after about 15 minutes and ask students to complete a few of the lab exercises.
- Then resume the lecture and complete the remaining exercises at the end.

Say

- We're going to see that classes and structures are very similar.
- The main differences we'll see in this lesson are inheritance, and value versus reference types.

```
class Person {
  let name: String

  init(name: String) {
    self.name = name
  }

  func sayHello() {
    print("Hello there!")
  }
}

let person = Person(name: "Jasmine")
print(person.name)
person.sayHello()

Jasmine
Hello there!
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Say

- Use the class keyword to create a class
- In this example, that's the only difference from a struct.
- As part of explanation for class, comparing it to struct, discuss how the capitalization indicates that "Person" is the class or type and "person" is an instance.

Do

- Ask: "Why is self required in the init?"
- Answer: Because it’s ambiguous otherwise.

Inheritance

Base class	`Vehicle`
Subclass	`TandemBicycle`
Superclass	`Bicycle`

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Say

- Use the class keyword to create a class
- In this example, that's the only difference from a struct.
- As part of explanation for class, comparing it to struct, discuss how the capitalization indicates that "Person" is the class or type and "person" is an instance.

Do

- Ask: "Why is self required in the init?"
- Answer: Because it’s ambiguous otherwise.

Inheritance

Defining a base class

```
class Vehicle {
   var currentSpeed = 0.0

   var description: String {
      return "traveling at \(currentSpeed) miles per hour"
   }

   func makeNoise() {
      // do nothing - an arbitrary vehicle doesn't necessarily make a noise
   }
}

let someVehicle = Vehicle()
print("Vehicle: \(someVehicle.description)")
```

```
Vehicle: traveling at 0.0 miles per hour
```

Assignment Project Exam Help
https://eduassistpro.github.io/
Add WeChat edu_assist_pro

Note

- This slide shows a `Vehicle` class.

Inheritance

Create a subclass

```
class SomeSubclass: SomeSuperclass {
    // subclass definition goes here
}
```

```
class Bicycle: Vehicle {
    var hasBasket = false
}
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Note

- This slide shows how to make a subclass.
- This slide shows `Bicycle` as subclass of `Vehicle`: `Bicycle` adds a `hasBasket` property.

Inheritance

Create a subclass

```
class Bicycle: Vehicle {
    var hasBasket = false
}

let bicycle = Bicycle()
bicycle.hasBasket = true

bicycle.currentSpeed = 15.0
print("Bicycle: \(bicycle.description)")
```

```
Bicycle: traveling at 15.0 miles per hour
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Note

- This slide shows how to:
  - Make an instance of Bicycle
  - Set a Vehicle property on bicycle (currentSpeed)
  - Set a Bicycle property on bicycle (hasBasket)

Inheritance

Create a subclass

```
class Tandem: Bicycle {
    var currentNumberOfPassengers = 0
}
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Note

- This slide shows TandemBike as a subclass of `Bicycle`.
- Side note: Classes DO get an empty init() if the class has default values for all properties and you don't write any other inits (and the "write your extra inits in an extension and you still get the compiler-generated ones probably applies to classes).
- Side note: Classes get deinit. Value types don’t.

Inheritance

Create a subclass

```
class Tandem: Bicycle {
    var currentNumberOfPassengers = 0
}

let tandem = Tandem()
tandem.hasBasket = true
tandem.currentNumberOfPassengers = 2
tandem.currentSpeed = 22.0
print("Tandem: \(tandem.description)")
```

```
Tandem: traveling at 22.0 miles per hour
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Note

- This slide shows:
  - How to make an instance of `Tandem`
  - Setting properties of all levels of the hierarchy

Inheritance

Override methods and properties

```
class Train: Vehicle {
    override func makeNoise() {
        print("Choo Choo!")
    }
}

let train = Train()
train.makeNoise()
```

```
Choo Choo!
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Say

- This slide shows `Train` overriding `makeNoise()`.
- The `override` keyword is required for Swift coding safety.
- You can immediately tell that code is overriding something.
- You can't override something by mistake—the compiler will complain.

Inheritance

Override methods and properties

```
class Car: Vehicle {
    var gear = 1
    override var description: String {
        return super.description + " in gear \(gear)"
    }
}
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Say

- This slide shows `Car` overriding `description`.
- Properties can also be overridden with a getter.

Inheritance

Override methods and properties

```
class Car: Vehicle {
    var gear = 1
    override var description: String {
        return super.description + " in gear \(gear)"
    }
}

let car = Car()
car.currentSpeed = 25.0
car.gear = 3
print("Car: \(car.description)")
```

```
Car: traveling at 25.0 miles per hour in gear 3
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Note

- This slide shows using `Car` and calling `description`.

Inheritance

Override initializer

```
class Person {
  let name: String

  init(name: String) {
    self.name = name
  }
}

class Student: Person {
  var favoriteSubject: String
}
```

Class ‘Student’ has no initializers

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Do

- Click to display the error.

Note

- The fix is on the next slide.

Inheritance

Override initializer

```
class Person {
  let name: String

  init(name: String) {
    self.name = name
  }
}

class Student: Person {
  var favoriteSubject: String
  init(name: String, favoriteSubject: String) {
    self.favoriteSubject = favoriteSubject
    super.init(name: name)
  }
}
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

References

- When you create an instance of a class:
  - Swift returns the address of that instance
  - The returned address is assigned to the variable
- When you assign the address of an instance to multiple variables:
  - Each variable contains the same address
  - Update one instance, and all variables refer to the updated instance

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

```
class Person {
  let name: String
  var age: Int

  init(name: String, age: Int) {
    self.name = name
    self.age = age
  }
}

var jack = Person(name: "Jack", age: 24)
var myFriend = jack

jack.age += 1

print(jack.age)
print(myFriend.age)
```

```
25
25
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Note

- This slide shows two references to the same instance of a `Person` class.
- It also shows that if you change a property, both references reflect that.

```swift
struct Person {
  let name: String
  var age: Int
}

var jack = Person(name: "Jack", age: 24)
var myFriend = jack

jack.age += 1

print(jack.age)
print(myFriend.age)


25
24
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Say

- This slide shows:
  - The same code implemented as a `Person` struct
  - That changing the value of a property of one instance doesn't change the other instance
- That's because `myFriend` is a copy of `jack`.

Memberwise initializers

- Swift does not create memberwise initializers for classes
- Common practice is for developers to create their own for their defined classes

Assignment Project Exam Help

https://eduassistpro.github.io/

Say

Add WeChat edu_assist_pro

- Classes don't get memberwise initializers.
- Classes DO get an empty `init()` if the class has default values for all properties and you don't write any other inits.

Class or structure?

- Start new types as structures
- Use a class:
  - When you're working with a framework that uses classes
  - When you want to refer to the same instance of a type in multiple places
  - When you want to model inheritance

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Unit 2, Lesson 4

Lab: Classes.playground

Open and complete the exercises in `Lab - Classes.playground`

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Unit 2—Lesson 5:
Collections

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Collection types

Array

Dictionary

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Arrays
Defining

```
[value1, value2, value3]
```

```
var names: [String] = ["Anne", "Gary", "Keith"]
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Note
• Shows the syntax: [value1, value2, value3, …].
Say
• True or false: Swift should be able to infer the "[String]" part.
• Answer: True (as shown on the next slide).

Arrays
Defining

```
[value1, value2, value3]
```

```
var names = ["Anne", "Gary", "Keith"]
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Say

- The compiler can do type inference for collections, too

Note

- Shows var names as type inferred to [String].

Arrays
Defining

```
var numbers = [1, -3, 50, 72, -95, 115]
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Say

Add WeChat edu_assist_pro

- The var numbers = [1, -3, 50] would be [Int].
- What if you want to restrict the array to Int8? Just specify it.

Arrays
Defining

```
var numbers: [Int8] = [1, -3, 50, 72, -95, 115]
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Arrays
contains

```
let numbers = [4, 5, 6]
if numbers.contains(5) {
  print("There is a 5")
}
```

```
There is a 5
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Say

- someArray.contains(someInstance) returns true if true.

Note

- Contains uses == (the Equatable protocol).

Array types

```
var myArray: [Int] = []
```

```
var myArray: Array<Int> = []
```

```
var myArray = [Int]()
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Note

- Shows the many ways to declare the type of things in an array.

Working with arrays
repeating

```
var myArray = [Int](repeating: 0, count: 100)

let count = myArray.count

if myArray.isEmpty { }
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Note
- Shows the repeating Array initializer:
  var myArray = [Int](repeating: 0, count: 100)
  Creates an array filled with 100 zeros.

- Shows someArray.count (returns Int).
- Shows someArray.isEmpty (returns Bool).

Working with arrays

Accessing or setting a specific item

```
var names = ["Anne", "Gary", "Keith"]
let firstName = names[0]
print(firstName)
```

```
Anne
```

```
names[1] = "Paul"
print(names)
```

```
["Anne", "Paul", "Keith"]
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Say

• Change or retrieve a value by using array subscripting syntax w o other languages.

Working with arrays
Appending

```
var names = ["Amy"]
names.append("Joe")
names += ["Keith", "Jane"]
print(names)
```

```
["Amy", "Joe", "Keith", "Jane"]
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Note

- Shows someArray.append("object").
- append() is limited to 1 item.
- append from array is: someArray.append(contentsOf: someOtherArray)
- Shows someArray += ["Keith", "Jane"].

Working with arrays
Inserting

```
var names = ["Amy", "Brad", "Chelsea", "Dan"]
names.insert("Bob", at: 0)
print(names)
```

```
["Bob", "Amy", "Brad", "Chelsea", "Dan"]
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Note

• Shows someArray.insert("object" at: 0).

Say

• Note that there's also someArray.insert(contentsOf: someOtherArray at:).

Working with arrays
Removing

```
var names = ["Amy", "Brad", "Chelsea", "Dan"]
let chelsea = names.remove(at:2)
let dan = names.removeLast()
print(names)
```

```
["Amy", "Brad"]
```

```
names.removeAll()
print(names)
```

```
[]
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Say

• Note that remove(at:) returns the removed item.

Note

• There's also removeFirst() and removeSubrange().

Working with arrays

```
var myNewArray = firstArray + secondArray
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Working with arrays

Arrays within arrays

```
let array1 = [1,2,3]
let array2 = [4,5,6]
let containerArray = [array1, array2]
let firstArray = containerArray[0]
let firstElement = containerArray[0][0]
print(containerArray)
print(firstArray)
print(firstElement)
```

```
[[1, 2, 3], [4, 5, 6]]
[1, 2, 3]
1
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Dictionaries

[key1 : value1, key2: value2, key3: value3]

```
var scores = ["Richard": 500, "Luke": 400, "Cheryl": 800]
```

```
var myDictionary = [String: Int]()
var myDictionary = Dictionary<String, Int>()
var myDictionary: [String: Int] = [:]
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Note

Shows literal syntax and ways to instantiate.

Add/remove/modify a dictionary

Adding or modifying

```
var scores = ["Richard": 500, "Luke": 400, "Cheryl": 800]

scores["Oli"] = 399

let oldValue = scores.updateValue(100, forKey: "Richard")
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Say

- scores["oli"] = 399 will update or insert a value for "oli".
- scores.updateValue(100, forKey: "Richard")
  - Returns old value if there is one.
  - Returns nil if not.

Add/remove/modify a dictionary

Adding or modifying

```
var scores = ["Richard": 500, "Luke": 400, "Cheryl": 800]

scores["Oli"] = 399

if let oldValue = scores.updateValue(100, forKey: "Richard") {
  print("Richard's old value was \(oldValue)")
}
```

```
Richard's old value was 500
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Say

- Use if-let to run code only if a value was returned.
- If there wasn't an existing value, the code with the brackets won't be executed.

Add/remove/modify a dictionary

Removing

```
var scores = ["Richard": 100, "Luke": 400, "Cheryl": 800]
scores["Richard"] = nil
print(scores)

if let oldValue = scores.removeValue(forKey: "Luke") {
  print("Luke's score was \(oldValue) before he stopped playing")
}
print(scores)
```

```
["Cheryl": 800, "Luke": 400]
Luke's score was 400 before he stopped playing
["Cheryl": 800]
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Say

- scores["oli"] = nil removes it if present.

  scores.removeValue(forKey: "oli")

- Returns old value if there is one.
- Returns nil if not.

Accessing a dictionary

```
var scores = ["Richard": 500, "Luke": 400, "Cheryl": 800]

let players = Array(scores.keys) //["Richard", "Luke", "Cheryl"]
let points = Array(scores.values) //[500, 400, 800]

if let myScore = scores["Luke"] {
  print(myScore)
}
```

```
400
```

```
if let henrysScore = scores["Henry"] {
  print(henrysScore)
}
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Say

- What's the return type?
- Answer: Int? because there may not be a key/value pair for the key.

Unit 2—Lesson 5

Lab: Collections

Open and complete the exercises in `Lab - Collections.playground`

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Unit 2—Lesson 6:
Loops

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Loops

```
for
while
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Say

- Swift provides several different methods for looping
- In this lesson we'll focus on just two: for and while.

Add WeChat edu_assist_pro

for loops

```
for index in 1...5 {
  print("This is number \(index)")
}
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Say

- "for" loops work with ranges—it has a nice, concise syntax:
  for index in 1...5 {}

for loops

```
for _ in 1...5 {
  print("Hello!")
}
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Do

- Click to highlight the underscore "_".

Say

- Use the underscore if you don't need to use the index value.

for loops

```
let names = ["Joseph", "Cathy", "Winston"]
for name in names {
  print("Hello \(name)")
}
```

```
for letter in "ABCDEFG".characters {
  print("The letter is \(letter)")
}
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Do

• Click to highlight "names" as the range being iterated over.

Say

• This is often used to iterate over a collection.

Do

• Click again to highlight a string as a range of characters.

for loops

```swift
for (index, letter) in "ABCDEFG".characters.enumerated() {
  print("\(index): \(letter)")
}
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Say

- enumerated() gives you the item and the index.

Note

- (index, letter) is a tuple.

for loops

```
let vehicles = ["unicycle" : 1, "bicycle" : 2, "tricycle" : 3, "quad bike" : 4]
for (vehicleName, wheelCount) in vehicles {
  print("A \(vehicleName) has \(wheelCount) wheels")
}
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Say

- Iterating over a Dictionary also gives you a tuple.
- It’s unordered because Dictionary is unordered.

while loops

```
var numberOfLives = 3

while numberOfLives > 0 {
  playMove()
  updateLivesCount()
}
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Say

- Condition is at the top. The loop may happen zero times.

Add WeChat edu_assist_pro

while loops

```
var numberOfLives = 3

while numberOfLives > 0 {
  print("I still have \(numberOfLives) lives.")
}
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Say

- The code inside the loop needs to eventually make the conditio

Add WeChat edu_assist_pro

while loops

```
var numberOfLives = 3
var stillAlive = true

while stillAlive {
  print("I still have \(numberOfLives) lives.")
  numberOfLives -= 1
  if numberOfLives == 0 {
    stillAlive = false
  }
}
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Control transfer statements

```
for counter in -10...10 {
  print(counter)
  if counter == 0 {
    break
  }
}
```

```
-10
-9
...
0
```

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

Note

- Shows that "break" exits a loop.

Unit 2—Lesson 6

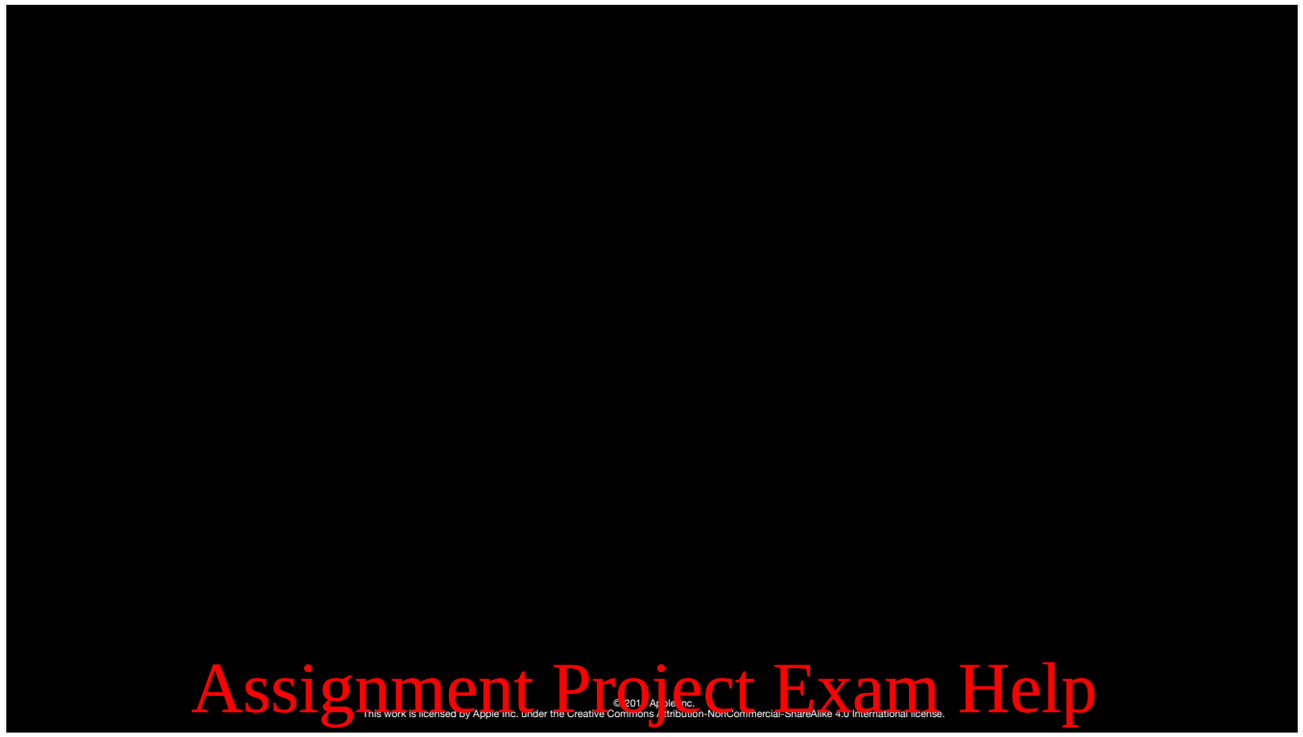
Lab: Loops

Open and complete the exercises in `Lab - Loops.playground`.

Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro



Assignment Project Exam Help

https://eduassistpro.github.io/

Add WeChat edu_assist_pro

L550025C-en_WW App Development with Swift © 2017 Apple Inc. This wo Apple Inc. under the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License (https://cre g/licenses/by-nc-sa/4.0/legalcode).