Scala

Advanced Functional Programming

Scala

ADVANCED FUNCTIONAL PROGRAMMING

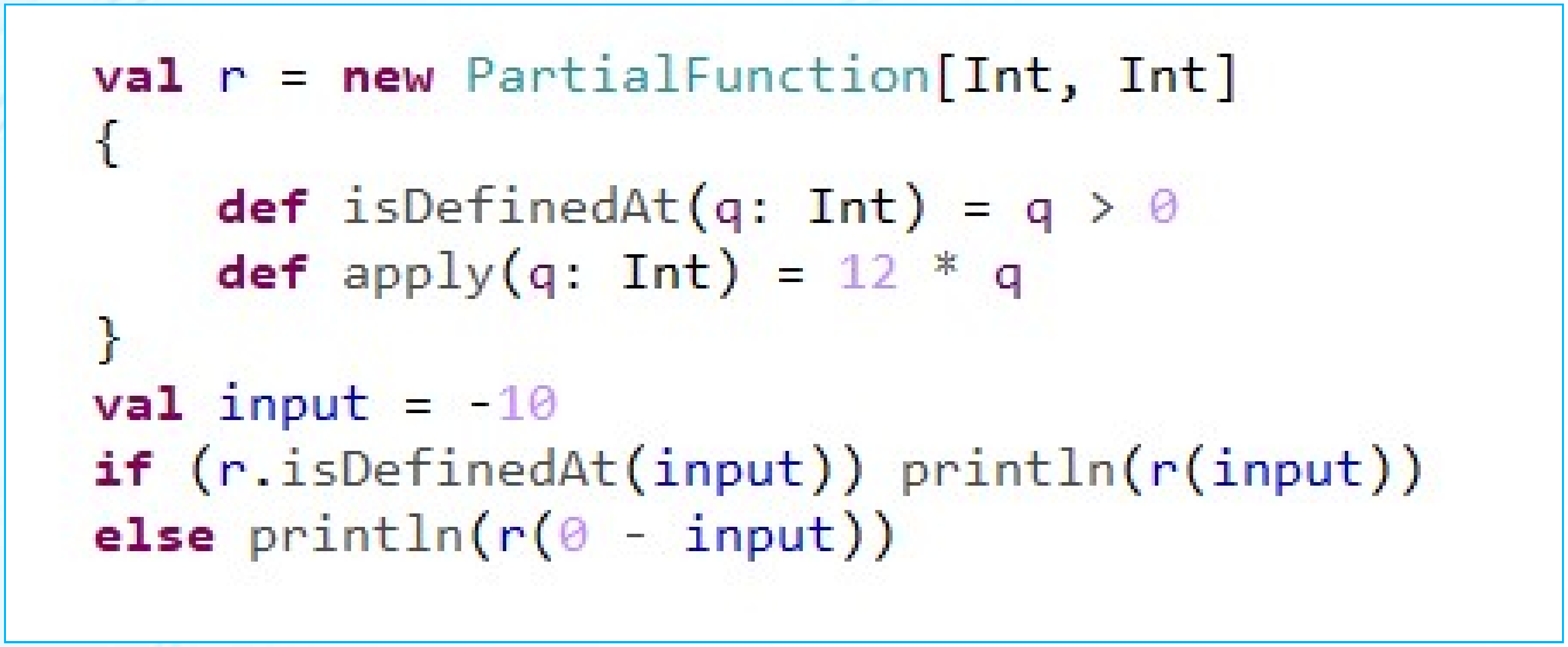
Partial Functions

Partial Functions

A Partial function is a function is not able to produce a return for every single input data given to it.

- Partial function can determine an output for a subset of some practicable inputs only. Partial function can only be applied partially to the stated inputs.
- It is a Trait, which needs two methods namely **isDefinedAt** and **apply** to be implemented.

Partial Function Example 1



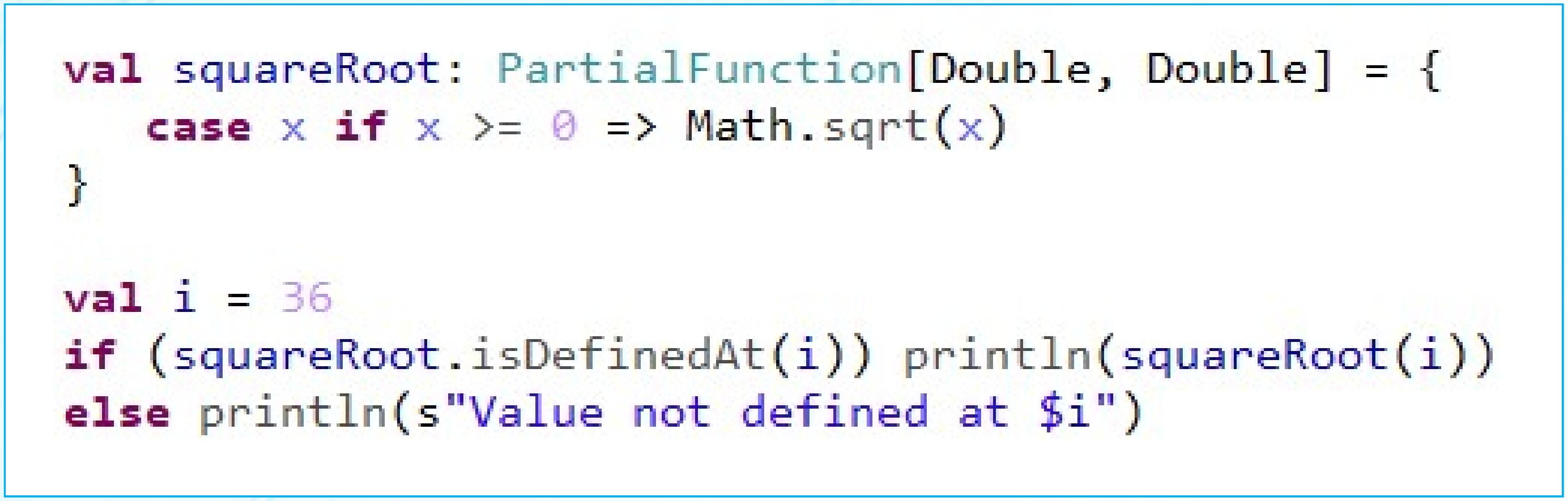
```
val r = new PartialFunction[Int, Int]
{
    def isDefinedAt(q: Int) = q > 0
    def apply(q: Int) = 12 * q
}
val input = -10
if (r.isDefinedAt(input)) println(r(input))
else println(r(0 - input))
```

Methods to define Partial functions

- There are some methods to define Partial function, which includes:

  - *case statements*
  - *collect method*
  - *andThen*
  - *orElse*

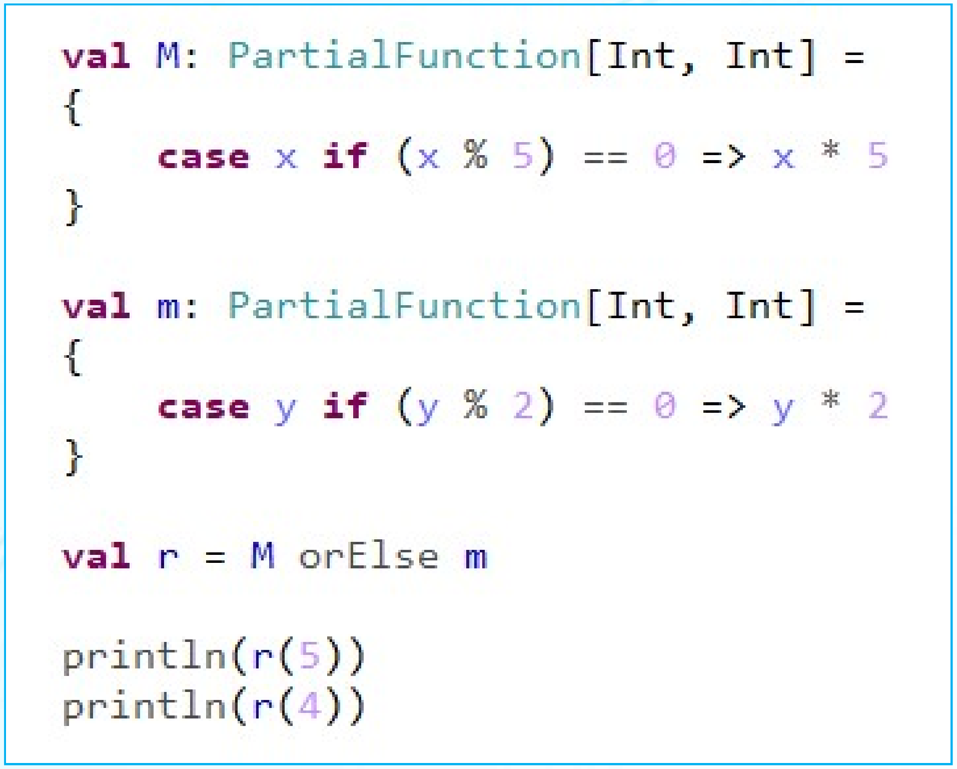
Partial Function using Case statements



```scala
val squareRoot: PartialFunction[Double, Double] = {
   case x if x >= 0 => Math.sqrt(x)
}

val i = 36
if (squareRoot.isDefinedAt(i)) println(squareRoot(i))
else println(s"Value not defined at $i")
```

Here, Partial function is created using case statement. So, **`apply`** and **`isDefinedAt`** is not required here.

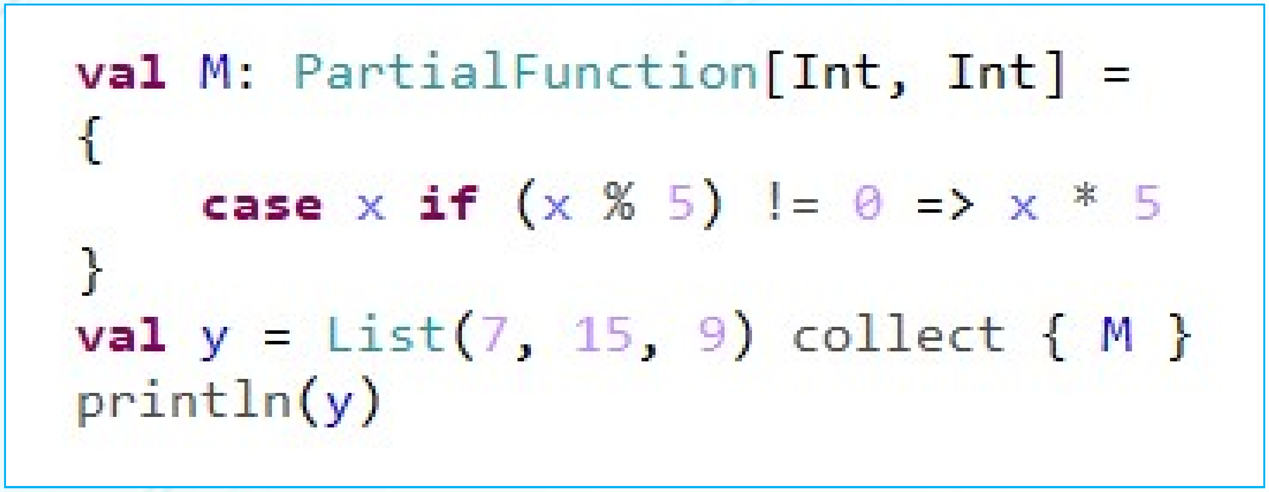
Partial function using `orElse`



```
val M: PartialFunction[Int, Int] =
{
    case x if (x % 5) == 0 => x * 5
}

val m: PartialFunction[Int, Int] =
{
    case y if (y % 2) == 0 => y * 2
}

val r = M orElse m

println(r(5))
println(r(4))
```

`orElse` method is helpful in chaining Partial functions together.

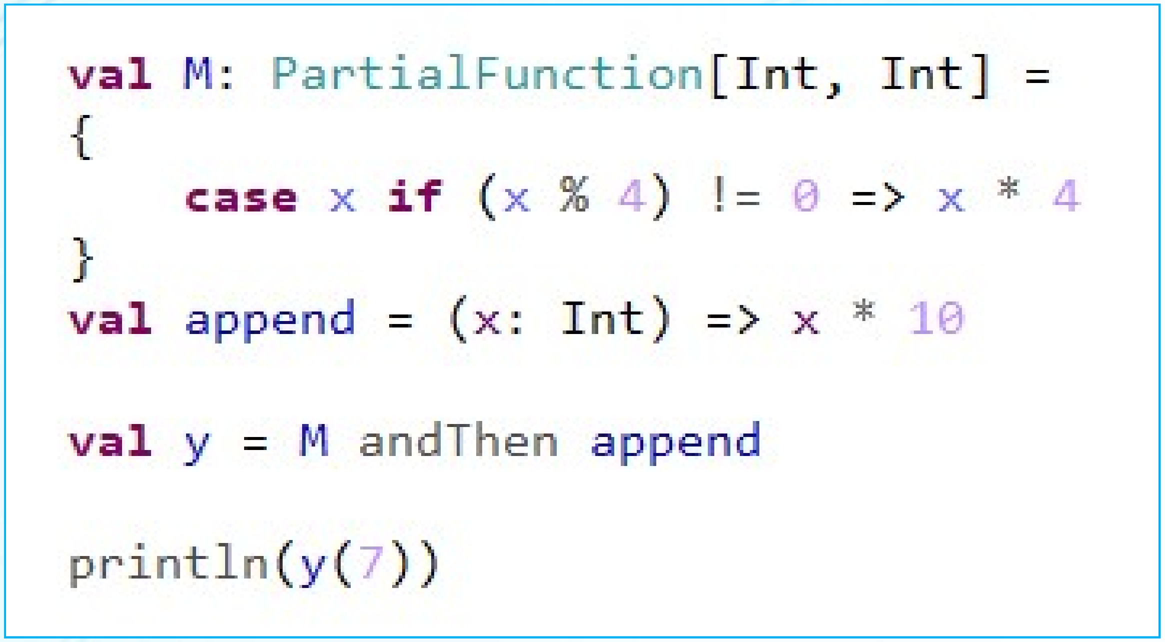
Partial function using `collect`



```
val M: PartialFunction[Int, Int] =
{
    case x if (x % 5) != 0 => x * 5
}
val y = List(7, 15, 9) collect { M }
println(y)
```

Here, ***`Collect`*** will apply Partial function to all the elements of the List and will return a new List on the basis of the conditions stated.

Partial function using andThen



```
val M: PartialFunction[Int, Int] =
{
    case x if (x % 4) != 0 => x * 4
}
val append = (x: Int) => x * 10

val y = M andThen append

println(y(7))
```

Here, ***andThen*** will append the output of Partial function with the another function given and then will return that value.

Partially applied functions

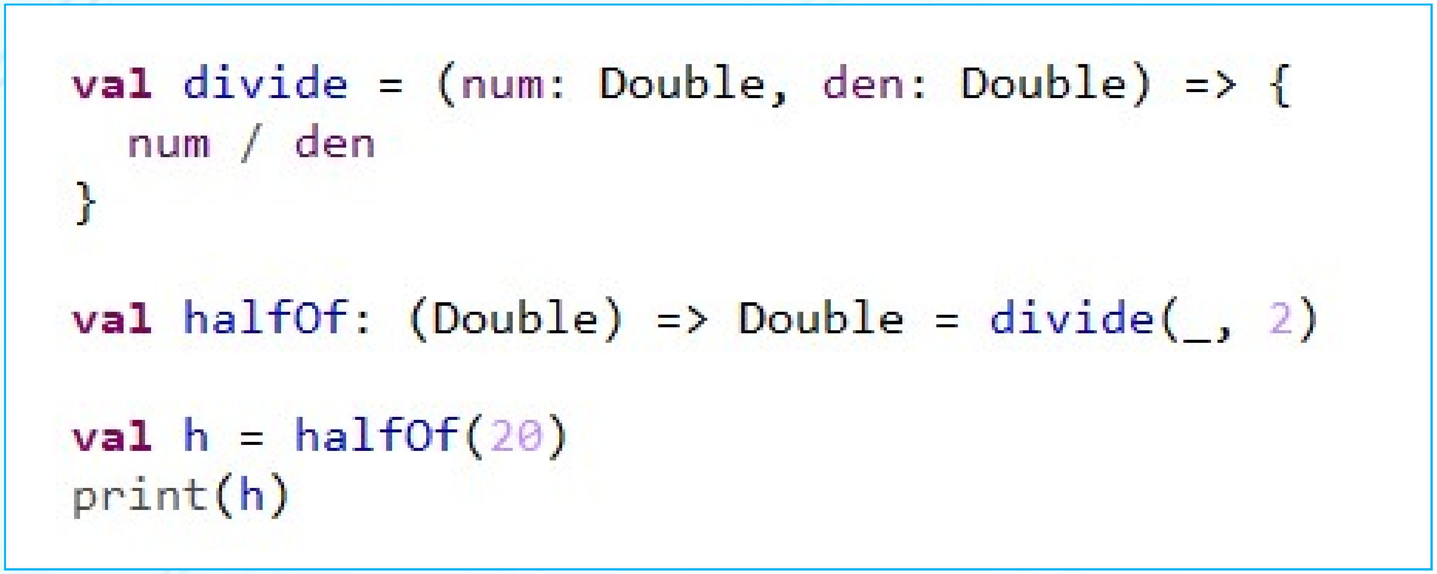
Partially applied functions

- In functional programming languages, a call to a function that has parameters can also be stated as applying the function to the parameters. When a function is called with all the required parameters, it has fully applied the function to all of the parameters.

- **But when only a subset of the parameters to the function is passed, the result of the expression is a Partially Applied Function.**

- Scala does not throw an exception when you provide fewer arguments to function, it simply applies them and returns a new function with rest of arguments which need to be passed.

Partially applied functions



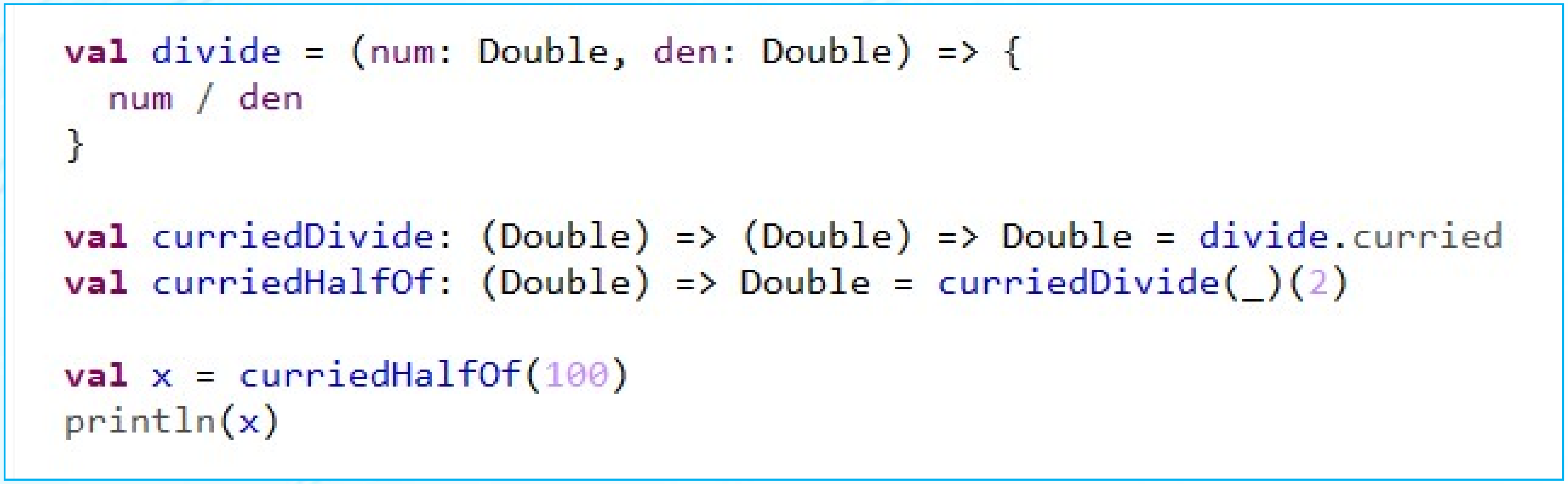
```
val divide = (num: Double, den: Double) => {
  num / den
}

val halfOf: (Double) => Double = divide(_, 2)

val h = halfOf(20)
print(h)
```

Partially applied functions

- Partially applied functions are easily confused to be the same thing as Currying in Scala.

- Currying extends the concept of partially applying the function to the next level. Currying is the process of decomposing a function that takes multiple arguments into a sequence of functions, each with a single argument.

Partially applied functions



```
val divide = (num: Double, den: Double) => {
  num / den
}

val curriedDivide: (Double) => (Double) => Double = divide.curried
val curriedHalfOf: (Double) => Double = curriedDivide(_)(2)

val x = curriedHalfOf(100)
println(x)
```

Monads

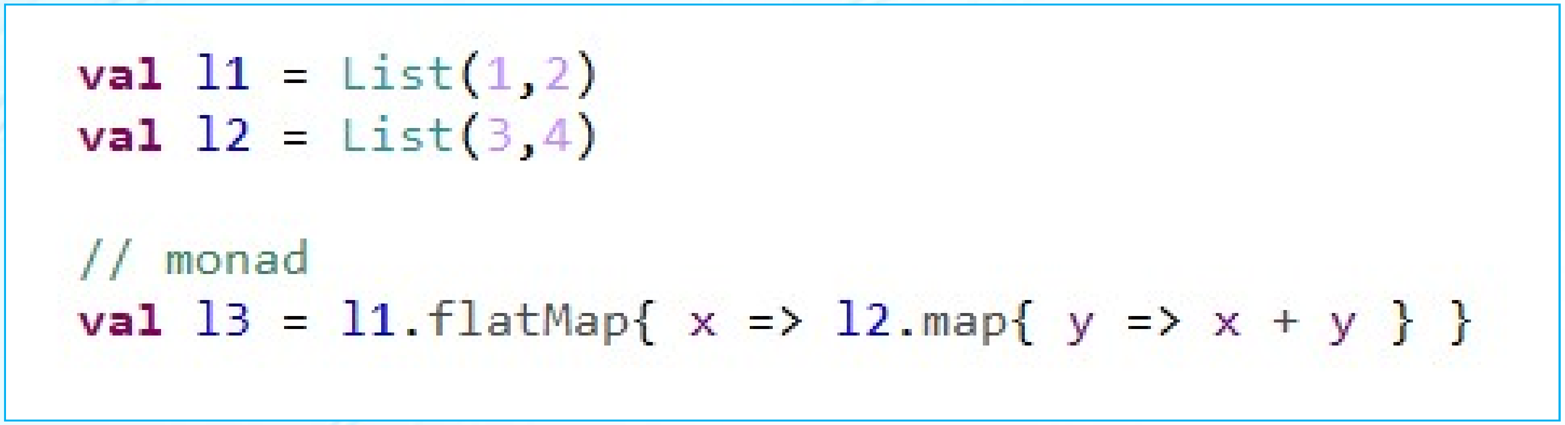
Monods

In Scala, **Monad is an object that wraps another object**

Monads are structures that represent sequential computations.

A Monad is not a class or a trait; it is a concept.

Monods



```
val l1 = List(1,2)
val l2 = List(3,4)

// monad
val l3 = l1.flatMap{ x => l2.map{ y => x + y } }
```

THANK YOU