module_07.R

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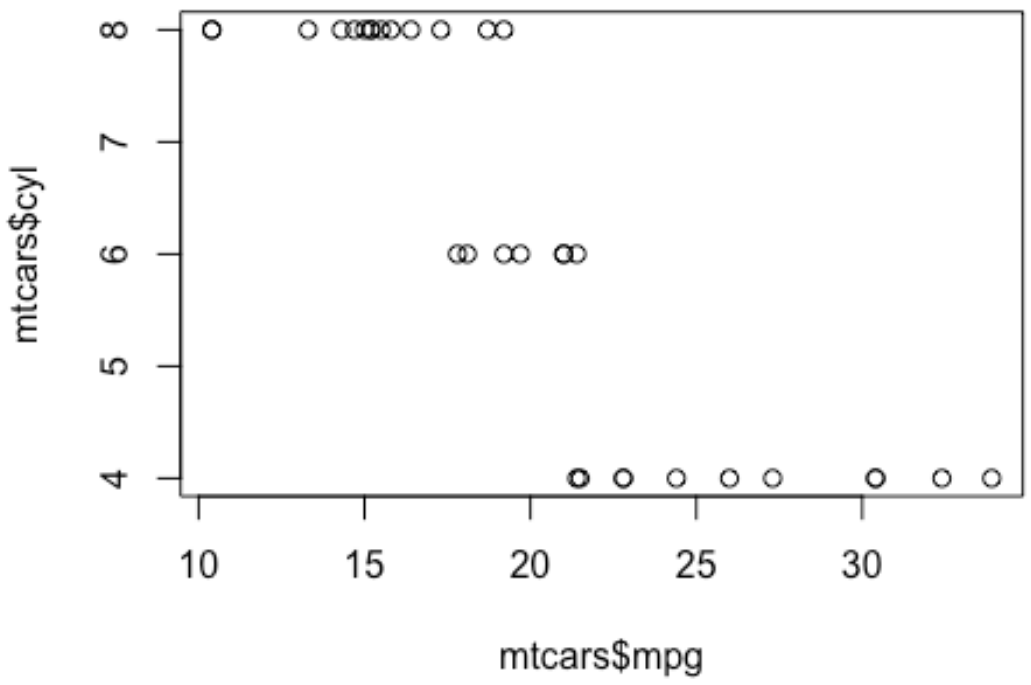
```
#Module 07 Open Source R Programming

#Assigning the mtcars data set to a data frame named "cars"
cars <- data.frame(mtcars)
cars
```

```
##                      mpg cyl  disp  hp drat    wt  qsec vs am gear carb
## Mazda RX4           21.0   6 160.0 110 3.90 2.620 16.46  0  1    4    4
## Mazda RX4 Wag       21.0   6 160.0 110 3.90 2.875 17.02  0  1    4    4
## Datsun 710          22.8   4 108.0  93 3.85 2.320 18.61  1  1    4    1
## Hornet 4 Drive      21.4   6 258.0 110 3.08 3.215 19.44  1  0    3    1
## Hornet Sportabout   18.7   8 360.0 175 3.15 3.440 17.02  0  0    3    2
## Valiant             18.1   6 225.0 105 2.76 3.460 20.22  1  0    3    1
## Duster 360          14.3   8 360.0 245 3.21 3.570 15.84  0  0    3    4
## Merc 240D           24.4   4 146.7  62 3.69 3.190 20.00  1  0    4    2
## Merc 230            22.8   4 140.8  95 3.92 3.150 22.90  1  0    4    2
## Merc 280            19.2   6 167.6 123 3.92 3.440 18.30  1  0    4    4
## Merc 280C           17.8   6 167.6 123 3.92 3.440 18.90  1  0    4    4
## Merc 450SE          16.4   8 275.8 180 3.07 4.070 17.40  0  0    3    3
## Merc 450SL          17.3   8 275.8 180 3.07 3.730 17.60  0  0    3    3
## Merc 450SLC         15.2   8 275.8 180 3.07 3.780 18.00  0  0    3    3
## Cadillac Fleetwood  10.4   8 472.0 205 2.93 5.250 17.98  0  0    3    4
## Lincoln Continental 10.4   8 460.0 215 3.00 5.424 17.82  0  0    3    4
## Chrysler Imperial   14.7   8 440.0 230 3.23 5.345 17.42  0  0    3    4
## Fiat 128            32.4   4  78.7  66 4.08 2.200 19.47  1  1    4    1
## Honda Civic         30.4   4  75.7  52 4.93 1.615 18.52  1  1    4    2
## Toyota Corolla      33.9   4  71.1  65 4.22 1.835 19.90  1  1    4    1
## Toyota Corona       21.5   4 120.1  97 3.70 2.465 20.01  1  0    3    1
## Dodge Challenger    15.5   8 318.0 150 2.76 3.520 16.87  0  0    3    2
## AMC Javelin         15.2   8 304.0 150 3.15 3.435 17.30  0  0    3    2
## Camaro Z28          13.3   8 350.0 245 3.73 3.840 15.41  0  0    3    4
## Pontiac Firebird    19.2   8 400.0 175 3.08 3.845 17.05  0  0    3    2
## Fiat X1-9           27.3   4  79.0  66 4.08 1.935 18.90  1  1    4    1
## Porsche 914-2       26.0   4 120.3  91 4.43 2.140 16.70  0  1    5    2
## Lotus Europa        30.4   4  95.1 113 3.77 1.513 16.90  1  1    5    2
## Ford Pantera L      15.8   8 351.0 264 4.22 3.170 14.50  0  1    5    4
## Ferrari Dino        19.7   6 145.0 175 3.62 2.770 15.50  0  1    5    6
## Maserati Bora       15.0   8 301.0 335 3.54 3.570 14.60  0  1    5    8
## Volvo 142E          21.4   4 121.0 109 4.11 2.780 18.60  1  1    4    2
```

```
#Using generic functions on the data set
plot
```

```
## function (x, y, ...)
## UseMethod("plot")
## <bytecode: 0x7fbf123c0d30>
## <environment: namespace:base>

plot(mtcars$mpg, mtcars$cyl)
```




```
summary

## function (object, ...)
## UseMethod("summary")
## <bytecode: 0x7fbf12981ac8>
## <environment: namespace:base>

summary(cars)

##       mpg             cyl             disp             hp
##  Min.   :10.40   Min.   :4.000   Min.   : 71.1   Min.   : 52.0
##  1st Qu.:15.43   1st Qu.:4.000   1st Qu.:120.8   1st Qu.: 96.5
##  Median :19.20   Median :6.000   Median :196.3   Median :123.0
##  Mean   :20.09   Mean   :6.188   Mean   :230.7   Mean   :146.7
##  3rd Qu.:22.80   3rd Qu.:8.000   3rd Qu.:326.0   3rd Qu.:180.0
##  Max.   :33.90   Max.   :8.000   Max.   :472.0   Max.   :335.0
##       drat             wt             qsec             vs
```

```
##  Min.   :2.760   Min.   :1.513   Min.   :14.50   Min.   :0.0000
##  1st Qu.:3.080   1st Qu.:2.581   1st Qu.:16.89   1st Qu.:0.0000
##  Median :3.695   Median :3.325   Median :17.71   Median :0.0000
##  Mean   :3.597   Mean   :3.217   Mean   :17.85   Mean   :0.4375
##  3rd Qu.:3.920   3rd Qu.:3.610   3rd Qu.:18.90   3rd Qu.:1.0000
##  Max.   :4.930   Max.   :5.424   Max.   :22.90   Max.   :1.0000
##        am              gear            carb
##  Min.   :0.0000   Min.   :3.000   Min.   :1.000
##  1st Qu.:0.0000   1st Qu.:3.000   1st Qu.:2.000
##  Median :0.0000   Median :4.000   Median :2.000
##  Mean   :0.4062   Mean   :3.688   Mean   :2.812
##  3rd Qu.:1.0000   3rd Qu.:4.000   3rd Qu.:4.000
##  Max.   :1.0000   Max.   :5.000   Max.   :8.000
```

```
#Designing an s3 generic function that will generate an object of the class
"fastCar"

fastCar <- function(cylinders=6, hp=110) {
  me <- list(numCylinder = cylinders,
             horsePower = hp)
  class(me) <- append(class(me), "fastCar")
  return(me)
}

#Taking data from the cars data frame to create objects of class "fastCar"
challenger <- fastCar(8,150)
firebird <- fastCar(8, 175)

challenger
```

```
## $numCylinder
## [1] 8
##
## $horsePower
## [1] 150
##
## attr(,"class")
## [1] "list"    "fastCar"
```

```
firebird
```

```
## $numCylinder
## [1] 8
##
## $horsePower
## [1] 175
##
## attr(,"class")
## [1] "list"    "fastCar"
```

```r
#Creating a method to change the number of cylinders of objects with the
"fastCar" class

setCylinders <- function(object, newValue) {
  print("Calling the base setCylinders function")
  UseMethod("setCylinders", object)
  print("Note this is not executed!")
}

setCylinders.default <- function(object, newValue) {
  print("oops looks like you messed up, I didn't expect this input... try
again!")
  return(object)
}

setCylinders.fastCar <- function(object, newValue) {
  print("In setCylinders.fastCar and setting the value now!")
  object$numCylinder <- newValue
  return(object)
}

#Testing the method
challenger <- setCylinders(challenger, 12)

## [1] "Calling the base setCylinders function"
## [1] "In setCylinders.fastCar and setting the value now!"

challenger #Our challenger now has 12 cylinders!

## $numCylinder
## [1] 12
##
## $horsePower
## [1] 150
##
## attr(,"class")
## [1] "list"    "fastCar"

firebird <- setCylinders(firebird,24)

## [1] "Calling the base setCylinders function"
## [1] "In setCylinders.fastCar and setting the value now!"

firebird #Our firebird has a wopping 24 cylinders!

## $numCylinder
## [1] 24
##
## $horsePower
## [1] 175
##
```

```
## attr(,"class")
## [1] "list"    "fastCar"

#Designing an S4 function that will generate objects of the class "slowCar"

slowCar <- setClass("slowCar",
             slots=list(
               name="character",
               numCylinder = "numeric",
               horsePower = "numeric"
             ))

isS4(slowCar)

## [1] TRUE

#Using the function to create objects with data obtained from the cars data
frame
fiat <- new("slowCar", name="Fiat 128", numCylinder=4, horsePower=66)
civic <- new("slowCar", name="Honda Civic", numCylinder=4, horsePower=75.7)

fiat

## An object of class "slowCar"
## Slot "name":
## [1] "Fiat 128"
##
## Slot "numCylinder":
## [1] 4
##
## Slot "horsePower":
## [1] 66

civic

## An object of class "slowCar"
## Slot "name":
## [1] "Honda Civic"
##
## Slot "numCylinder":
## [1] 4
##
## Slot "horsePower":
## [1] 75.7

#Creating an S4 method to nicely print out the details of objects of class
"slowCar"
setMethod("show",
          "slowCar",
          function(object){
            print("It's not quick, but it's affordable!")
```

```
            cat("This bad boy is called the", object@name, "!\n")
            cat("He's got", object@numCylinder, "solid cylinders to take you
where you need to go!\n")
            cat("To top it off, this mini beast of a car has got a whopping",
object@horsePower, "horses under the hood!\n")
          })
fiat
```

```
## [1] "It's not quick, but it's affordable!"
## This bad boy is called the Fiat 128 !
## He's got 4 solid cylinders to take you where you need to go!
## To top it off, this mini beast of a car has got a whopping 66 horses under
the hood!
```

```
civic
```

```
## [1] "It's not quick, but it's affordable!"
## This bad boy is called the Honda Civic !
## He's got 4 solid cylinders to take you where you need to go!
## To top it off, this mini beast of a car has got a whopping 75.7 horses
under the hood!
```

```
#Modifying the amount of horsePower via manual reassignment
fiat@horsePower <- 300
fiat #Now that's more like it!
```

```
## [1] "It's not quick, but it's affordable!"
## This bad boy is called the Fiat 128 !
## He's got 4 solid cylinders to take you where you need to go!
## To top it off, this mini beast of a car has got a whopping 300 horses
under the hood!
```

```
#Determining which OO system given objects are associated with, using the
"isS4()" function
isS4(fiat)
```

```
## [1] TRUE
```

```
isS4(challenger)
```

```
## [1] FALSE
```

```
#Determining the base type of objects using the "typeof()" function
foo <- 3.14
oof <- c(1:100)

typeof(foo)
```

```
## [1] "double"
```

```
typeof(oof)
```

```
## [1] "integer"
```

```
typeof(fiat)
## [1] "S4"
typeof(challenger)
## [1] "list"
```