

Basic Course on R: Programming Structures 1 Practical Answers

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1 Part A: if(), else, and ifelse() and Vectorization

1. Write a function `evenOrOdd()` involving `if()` and `else` that takes an argument `x` and returns "Even" or "Odd" depending on whether or not `x` is divisible by 2. (*Do not* use the `ifelse()` function).

```
evenOrOdd <- function(x) {  
  if(x %% 2 == 0) {  
    return("Even")  
  } else {  
    return("Odd")  
  }  
}
```

2. Is your function `evenOrOdd()` *vectorized*? Check by passing it the vector:

```
w <- c(3, 6, 6, 4, 7, 9, 11, 6)
```

```
w <- c(3, 6, 6, 4, 7, 9, 11, 6)  
evenOrOdd(w)  
  
## Warning in if (x%%2 == 0) {: the condition has length > 1 and only  
the first element will be used  
  
## [1] "Odd"
```

The function is not vectorized because it only runs on the first element!

3. Another way to determine if each element of a vector is even or odd is to use the `ifelse()` function, which serves as a vectorized version `if()` and `else`. Use `ifelse()` to obtain "Even" or "Odd" for each element of `w`.

```
w <- c(3, 6, 6, 4, 7, 9, 11, 6)  
ifelse(w %% 2 == 0, "Even", "Odd")  
  
## [1] "Odd" "Even" "Even" "Even" "Odd" "Odd" "Odd" "Even"
```

2 Part B: Loops

1. How many times will "Frisbee Sailing" be printed to the screen in each of the following sets of commands? Try to answer without using R.

a)

```
i <- 5
while(i < 1) {
  print("Frisbee Sailing")
  i <- i + 1
}
```

It will not print because the original i is not less than 1.

b)

```
## not run
i <- 0
while(i < 5) {
  print("Frisbee Sailing")
}
```

It will print indefinitely - until you hit escape on the keyboard or click stop in RStudio because i is always less than 5.

c)

```
i <- 0
while(i < 5) {
  print("Frisbee Sailing")
  i <- i + 1
}

## [1] "Frisbee Sailing"
## [1] "Frisbee Sailing"
## [1] "Frisbee Sailing"
## [1] "Frisbee Sailing"
## [1] "Frisbee Sailing"
```

The phrase will print five times; it stops once the i+1 value reaches 5.

2. How many times will "Masked Marvel" be printed to the screen in the following set of commands? Try to answer without using R.

```
i <- 1
repeat {
  if(i > 5) break
```

```

print("Masked Marvel")
i <- i + 1
}

## [1] "Masked Marvel"
## [1] "Masked Marvel"
## [1] "Masked Marvel"
## [1] "Masked Marvel"
## [1] "Masked Marvel"

```

The phrase will print five times; it stops once the $i+1$ value reaches 5.

3. The file **kennedys.txt** has a command to create a list containing two generations of the famous Kennedy family:

```

Kennedys <- list(
  JosephJr = character(0),
  John = c("Caroline", "JohnJr", "Patrick"),
  Rosemary = character(0),
  Kathleen = character(0),
  Eunice = c("RobertIII", "Maria", "Timothy", "Mark", "Anthony"),
  Patricia = c("Christopher", "Sydney", "Victoria", "Robin"),
  Robert = c("Kathleen", "JosephII", "RobertJr", "David",
    "MaryC", "Michael", "MaryK", "Christopher",
    "Matthew", "Douglas", "Rory"),
  Jean = c("Stephen", "William", "Amanda", "Kym"),
  Edward = c("Kara", "EdwardJr", "Patrick")
)

```

Read in the file with the use of `source()` and type `ls()` to see if the list was created (type `Kennedys` to view the object).

```
source("kennedys.txt")
```

Loop over the list of the first generation of Kennedys, keeping track of how many children each one has in a vector.

```

children <- NULL
for(i in Kennedys){
  children <- c(children, length(i))
}

```

```
}
children

## [1] 0 3 0 0 5 4 11 4 3
```

3 Part C: Logical Operators &, |, and !

1. What will be the result of the following:

```
(10 < 20 && 15 < 16) || 9 == 10

## [1] TRUE
```

TRUE because the first statement (in parentheses) is TRUE and the second is FALSE.

2. One of the following evaluates to TRUE, the other to FALSE. Which is which?

```
4 < 3 && (5 < 6 || 8 < 9)

## [1] FALSE

(4 < 3 && 5 < 6) || 8 < 9

## [1] TRUE
```

The first one FALSE because the first statement before && is FALSE. The second one is TRUE because one of the two statements to the left and right of || is TRUE.

3. The data set below contains the systolic and diastolic blood pressure readings for 22 patients (and can be found in the file **BPressure.txt**).

- a) Read the data from **BPressure.txt** into a data frame called **bp** using `read.table()`.

```
bp <- read.table("BPressure.txt", header=TRUE)
```

- b) A person's blood pressure is classified as normal if the systolic level is below 120 and the diastolic level is below 80. Use square brackets [] to extract from `bp` the rows corresponding to patients with normal blood pressures.

```
bp[(bp$Systolic < 120 & bp$Diastolic < 80), ]
```

##	PatientID	Systolic	Diastolic
## 2	SS	96	60
## 3	FR	100	70
## 8	JI	110	40
## 9	MC	119	66
## 12	KD	108	54
## 13	DS	110	50
## 17	SB	118	76
## 21	EC	112	62

- c) Now use square brackets [] to extract the rows corresponding to patients whose blood pressures *aren't* normal.

```
bp[!(bp$Systolic < 120 & bp$Diastolic < 80), ]
```

##	PatientID	Systolic	Diastolic
## 1	CK	120	50
## 4	CP	120	75
## 5	BL	140	90
## 6	ES	120	70
## 7	CP	165	110
## 10	FC	125	76
## 11	RW	133	60
## 14	JW	130	80
## 15	BH	120	65
## 16	JW	134	80
## 18	NS	122	78
## 19	GS	122	70
## 20	AB	122	78
## 22	HH	122	82