

R Wizardry Homework 1 Answer Key

Homework 1 – The basics of R

Directions – Use the attached RMarkdown document to submit your answers, placing the code inside the chunks of code and text-based answers outside the chunks.

There are a total of 10 questions, each question gives you 1 point. Upload the RMarkdown file (the file with the extension “.rmd”) to the folder for Homework 1 on Desire2Learn, naming the file with your name and “homework 1” (e.g. “John Smith Homework 1”).

Question 1.

Make a variable named X which is equal to 17

```
x <- 17
```

Question 2.

Add 28 to the variable you just created and multiply the result by 45. Divide the product by 78. Hint: every new operation will give you a new variable

```
a <- x + 28  
b <- a * 45  
d <- b / 78
```

Question 3.

Write the entire code from question #2 as a single line (hint: as you would if you were using a scientific calculator or Excel!)

```
((x + 28) * 45) / 78
```

```
## [1] 25.96154
```

Question 4.

Overwrite the ‘x’ variable with a new value equal to 89

```
x <- 89
```

Question 5.

Create a second variable which will be $x + 5!$ (i.e. 5 factorial), and divide your new variable by x

```
e <- x + factorial(5)
```

Question 6.

Take the squared root of the result from question 5 and store it as a named object.

```
f <- sqrt(e)
```

Question 7.

What is the difference between a matrix and a data frame?

Answer: Both are two-dimensional objects but matrices can store only one class of data, i.e. can have numeric or character but not a mixture of the two.

Question 8.

The dataset below has been stored as a matrix. However, the data type of some of the elements have lost their original characteristics. Use the functions `mode()`, `str()` and `class()` to inquire about the dataset's properties.

What data structure (e.g. list, data frame, array, etc.) would you use instead to store the dataset below, and why?

```
peter_piper <- matrix(c("Peter", 5, "Piper", 8.5, "couldn't", "find", 10, "peppers"), nrow = 2, ncol = 4)
```

```
mode(peter_piper)
```

```
## [1] "character"
```

```
str(peter_piper)
```

```
## chr [1:2, 1:4] "Peter" "5" "Piper" "8.5" "couldn't" ...
```

```
class(peter_piper)
```

```
## [1] "matrix"
```

```
#It'll be better to store the object as a data frame as data frames can store different types of data
```

Question 9.

Take the vectors below and create a data frame called “weather”. Did the objects and elements preserve their original data types (i.e. still being character or numeric?). Use the functions `mode()`, `str()` and `class()` to inquire about the dataset's properties. Any differences compared to matrix created in question #8?

```
day <- 1:10
```

```
min_temp <- c(50.7,52.8,48.6,53.0,49.9,47.9,54.1,47.6,43.6,45.5)
```

```
max_temp <- c(59.5,55.7,57.3,71.5,69.8,68.8,67.5,66.0,66.1,61.7)
```

```
sky <- c("cloudy", "clear", "cloudy", "clear", "cloudy", "clear", "cloudy", "clear", "cloudy", "clear")
```

```
weather <- data.frame(day, min_temp, max_temp, sky)
```

```
mode(weather)
```

```
## [1] "list"
```

```
str(weather)
```

```
## 'data.frame':   10 obs. of  4 variables:
## $ day      : int  1 2 3 4 5 6 7 8 9 10
## $ min_temp: num  50.7 52.8 48.6 53 49.9 47.9 54.1 47.6 43.6 45.5
## $ max_temp: num  59.5 55.7 57.3 71.5 69.8 68.8 67.5 66 66.1 61.7
## $ sky      : Factor w/ 2 levels "clear","cloudy": 2 1 2 1 2 1 2 1 2 1
```

```
class(weather)
```

```
## [1] "data.frame"
```

#The main difference versus the matrix from question #8 is that numbers remained as numbers.

Question 10.

R is an object-oriented programming language. Briefly define what is object-oriented programming.

Answer:

Here is a very interesting way to describe what object-oriented programming is:

“Here’s an example: If I’m your laundry object, you can give me your dirty clothes and send me a message that says, “Can you get my clothes laundered, please.” I happen to know where the best laundry place in San Francisco is. And I speak English, and I have dollars in my pockets. So I go out and hail a taxicab and tell the driver to take me to this place in San Francisco. I go get your clothes laundered, I jump back in the cab, I get back here. I give you your clean clothes and say, “Here are your clean clothes.”

You have no idea how I did that. You have no knowledge of the laundry place. Maybe you speak French, and you can’t even hail a taxi. You can’t pay for one, you don’t have dollars in your pocket. Yet I knew how to do all of that. And you didn’t have to know any of it. All that complexity was hidden inside of me, and we were able to interact at a very high level of abstraction. That’s what objects are. They encapsulate complexity, and the interfaces to that complexity are high level.”

Taken from an [interview with Steve Jobs in 1994] (<http://www.rollingstone.com/culture/news/steve-jobs-in-1994-the-rolling-stone-interview-20110117>)