

CKME 132 Summer 2016 - Assignment #1 Solution

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June 22, 2016

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Use RStudio for this assignment. Edit the file `assignment-1.Rmd` and insert your R code where wherever you see the string “INSERT YOUR ANSWER HERE”

When you click the **Knit** button a document will be generated that includes both content as well as the output of any embedded R code chunks within the document.

Sample Question and Solution

Use `seq()` to create the vector $(1, 2, 3, \dots, 10)$.

`seq(1,10)` “

Question 1

- a) Use the `seq()` function to create the vector $(1, 5, 9, 13, \dots, 41)$. Note that each term in this sequence is of the form $1 + 4n$ where $n = 1, \dots, 10$.

```
seq(1,41,4)
```

```
## [1] 1 5 9 13 17 21 25 29 33 37 41
```

- b) Use `seq()` and `c()` to create the vector $(2, 3, 4, \dots, 10, 9, 8, \dots, 2)$.

```
c(seq(2,10), seq(9,2))
```

```
## [1] 2 3 4 5 6 7 8 9 10 9 8 7 6 5 4 3 2
```

- c) Use `rep()` to create the vector $(1, 2, 3, \dots, 1, 2, 3)$ in which the sequence $(1, 2, 3)$ is repeated 5 times.

```
rep(1:3,5)
```

```
## [1] 1 2 3 1 2 3 1 2 3 1 2 3 1 2 3
```

- d) Use `rep()` to create the vector $(1, 1, \dots, 1, 2, 2, \dots, 2, 3, 3, \dots, 3)$ where each number is repeated 7 times.

```
rep(1:3,each=7)
```

```
## [1] 1 1 1 1 1 1 1 2 2 2 2 2 2 2 3 3 3 3 3 3 3
```

- e) Use `rep()` to create the vector $(10, 20, 20, 30, 30, 30, \dots, 100, \dots, 100)$ where $10n$ is repeated n times.

```
rep(seq(10,100,10),1:10)
```

```
## [1] 10 20 20 30 30 30 40 40 40 40 50 50 50 50 50 60 60
## [18] 60 60 60 60 70 70 70 70 70 70 80 80 80 80 80 80 80
## [35] 80 80 90 90 90 90 90 90 90 90 100 100 100 100 100 100
## [52] 100 100 100 100
```

Question 2

a) Compute:

$$\sum_{n=1}^{100} n$$

```
sum(1:100)
```

```
## [1] 5050
```

b) Compute:

$$\sum_{n=1}^{100} n^2$$

```
sum((1:100)^2)
```

```
## [1] 338350
```

c) Compute:

$$\sum_{n=10}^{20} \left(\frac{2^n}{n} + \frac{3^n}{n^3} \right)$$

```
n <- 10:20
sum(2^n/n+3^n/n^3)
```

```
## [1] 826751
```

d) Compute:

$$\sum_{n=0}^{10} \frac{1}{n!}$$

Hint: Use `factorial(n)` to compute $n!$

```
sum(1/factorial(0:10))
```

```
## [1] 2.718282
```

e) Compute:

$$\sum_{n=1}^{20} \left(2n + \frac{1}{n^2} \right)$$

```
sum(2*(1:20) + 1/((1:20)^2))
```

```
## [1] 421.5962
```

Question 3

- a) Create an empty list `mylist`.

```
mylist <- list()
```

- b) Add a component named `aa` whose value is 42.

```
mylist$aa <- 42
```

- c) Add a component named `bb` whose value is the numeric vector $(1, 2, \dots, 10)$.

```
mylist$bb <- 1:10
```

- d) Add a component named `cc` whose value is the character vector ("Hello", "CKME 132").

```
mylist$cc <- c("Hello", "CKME 132")
```

- e) Add a component named `dd` whose value is a 4x3 matrix whose elements are $(1, 2, \dots, 12)$ in column-major order.

```
mylist$dd <- matrix(1:12, 4)
```

- f) Print `mylist`.

```
mylist
```

```
## $aa
## [1] 42
##
## $bb
## [1] 1 2 3 4 5 6 7 8 9 10
##
## $cc
## [1] "Hello" "CKME 132"
##
## $dd
##      [,1] [,2] [,3]
## [1,]    1    5    9
## [2,]    2    6   10
## [3,]    3    7   11
## [4,]    4    8   12
```

Question 4

If you have not already done so, install the ISwR package on your computer using the command `install.packages("ISwR")`.

Load the ISwR package into your session.

```
library(ISwR)
```

a) Print the head of the `thuesen` data frame.

```
head(thuesen)
```

```
##   blood.glucose short.velocity
## 1          15.3          1.76
## 2          10.8          1.34
## 3           8.1          1.27
## 4          19.5          1.47
## 5           7.2          1.27
## 6           5.3          1.49
```

b) Compute the mean of each variable using `sapply()`, removing NA values.

```
sapply(thuesen, mean, na.rm=T)
```

```
##   blood.glucose short.velocity
##      10.300000      1.325652
```

c) Create a numeric vectors `n1`, `n2`, and `n3` whose elements are the integers from 1 to 20, their squares, and their cubes.

```
n1 <- 1:20
n2 <- n1^2
n3 <- n1^3
```

d) Create a new data frame `nn` from the above three vectors.

```
nn <- data.frame(n1,n2,n3)
```

e) Print the tail of `nn`.

```
tail(nn)
```

```
##    n1  n2  n3
## 15 15 225 3375
## 16 16 256 4096
## 17 17 289 4913
## 18 18 324 5832
## 19 19 361 6859
## 20 20 400 8000
```

f) Compute the sum of each variable in `nn` using `sapply`.

```
sapply(nn,sum)
```

```
##      n1      n2      n3  
##  210  2870 44100
```

Question 6

a) Create a 4x4 empty matrix, i.e. all elements equal to NA, print mat1.

```
mat1 <- matrix(,nrow=4,ncol=4)  
mat1
```

```
##      [,1] [,2] [,3] [,4]  
## [1,]  NA  NA  NA  NA  
## [2,]  NA  NA  NA  NA  
## [3,]  NA  NA  NA  NA  
## [4,]  NA  NA  NA  NA
```

b) fill the middle 4 elements with the values 'This' 'is' 'the' 'middle' and print mat1.

```
mat1[c(2,3),c(2,3)] <- c('this' , 'is' , 'the' , 'middle')  
mat1
```

```
##      [,1] [,2] [,3] [,4]  
## [1,] NA  NA  NA  NA  
## [2,] NA  "this" "the" NA  
## [3,] NA  "is"  "middle" NA  
## [4,] NA  NA  NA  NA
```

END of Assignment #1.