STAT2005 Programming Languages for Statistics
Exercise for Chapter 1

1. Using `rep()` and `seq()` as needed to create the following vectors. (The use of `c()` function is prohibited in this question.)

(a) 5 10 15 20 25 30 35 40 45 50 seq(5, 50, by=5)

(b) 6 6 5 5 4 4 3 3 2 2 1 1 rep(seq(6, 1, by = -1), each = 2)

(c) 1 2 3 4 5 3 4 5 6 7 5 6 7 8 9 7 8 9 10 11 rep(seq(1,5), 4) + rep(seq(0, 6, by=2), each=5)
(+0 +2 +4 +6)

(d) 2 4 6 5 7 9 8 10 12 11 13 15 (Hint: `seq()` is not needed) alt: 1:20 - rep(seq(0,9,3), each=4)
(+0 +3 +6 +9)
rep(seq(2,6,by=2), 4) + rep(seq(0,9,by=3), each=3)
↳ means ugly `:`
alt: 1:12 + rep(1:3, 4)

2. The information of overseas exchange participants is collected. The information collected include

- `school` - school of participant
- `destination` - destination of overseas exchange participant
- `age` - age of participants

(a) The data are stored in a data frame named `participants` as shown below.

```
> participants
  school destination age
1   CUHK     Austria  18
2   <NA>       Japan  20
3   HKBU       Korea  22
4  HKUST     Austria  NA
5   CUHK      Sweden  20
```

Write the R codes to create this data frame.

(b) It is found that "Australia" is mistyped as "Austria" in the data. Write the R codes to replace all "Austria" by "Australia" in `participants`.

(c) Write the R codes to change "<NA>" in the second row of `school` column in `participants` into "HKU".

(a):
```
participants <- data.frame (
    school = c( "CUHK", NA, "HKBU", "HKUST", "CUHK"),
    destination = c("Austria", "Japan", "Korea", "Australia", "Sweden")
    age = c( 18, 20, 22, NA, 20)
)
```

(b) ifelse (participants$destination == "Austria", "Australia", participants$destination)

(c) ifelse (is.na(participants$school), "HKU", participants$school)
↳ needs to assign: participants$destination <- ifelse (...)

alt: (b)

participants$ destination ← factor(participants$ destination)
levels(participants $ destination) ← C("Australia", "Japan", Korea", "Sweden")

3. (a) Write the R codes to create the following ~~object named~~ `list1`.

```
> list1
[[1]]
[1] "apple"  "banana"

[[2]]
[1] 1 2 3

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

(b) Write the R codes to change `list1` to a long vector.

(c) After ~~finishing (b), write the~~ output of the following codes (without using computer):

i. `class(list1)`
ii. `mode(list1[3])`
iii. `class(mode(list1))`
iv. `mode(factor(c(list1[8],list1[9])))`

(a): list1 ← list(c("apple","banana"), c(1, 2, 3), matrix(1:10, nrow=2, byrow=T))

(b) list1 ← unlist(list1)

(c) i. "character"
ii. "character"
iii. "character"
iv. "numeric"