R: Apply Functions

1. `apply(X, MARGIN, FUN, ...)`: applying a function to each row or column of a 2D data structure
   - Arguments:
     - o X: input (e.g., matrix, data frame, tibble)
     - o MARGIN:
       - ▪ 1: applying FUN to each row of X
       - ▪ 2: applying FUN to each column of X
     - o FUN: function to be applied
   - Example:

```
> mat = matrix(1:9, 3, 3)
> mat
     [,1] [,2] [,3]
[1,]    1    4    7
[2,]    2    5    8
[3,]    3    6    9
> apply(mat, 1, sum) # Sum each row
[1] 12 15 18
> apply(mat, 2, sum) # Sum each column
[1]  6 15 24
```

2. `sapply(X, FUN, ...)`: apply a function to each element of a 1D data structure
   - Arguments:
     - o X: input (e.g., vector, list)
     - o FUN: function to be applied
     - o return: vector
   - Example:

```
> x <- list(a = 1, b = 1:3, c = 10:100)
> sapply(x, FUN = sum)
 a    b    c
 1    6 5005
```

3. `lapply(X, FUN, ...)`: apply a function to each element of a 1D data structure
   - Arguments:
     - o X: input (e.g., vector, list)
     - o FUN: function to be applied
     - o return: list
   - Example:

```
> x<- list(a = 1, b = 1:3, c = 10:100)
> lapply(x, FUN = sum)
$a
[1] 1
$b
[1] 6
$c
[1] 5005
```

Examples are adapted from https://gist.github.com/lyndametref/4d137fcba1ec4d9af80ad53245b358ff;
https://stackoverflow.com/questions/3505701/grouping-functions-tapply-by-aggregate-and-the-apply-family.