Task4

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Exercise I

```r
a = c(10:38)
print(a)
```

```
##  [1] 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34
## [26] 35 36 37 38
```

```r
b = c(30:1)
print(b)
```

```
##  [1] 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10  9  8  7  6
## [26]  5  4  3  2  1
```

```r
c = c(c(1:4),c(3:1))
print(c)
```

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

```r
d = seq(2, 20, by = 2)
print(d)
```

```
##  [1]  2  4  6  8 10 12 14 16 18 20
```

```r
e = c()
for (i in 1:10) {e = c(e,c(1,2,3))}
print(e)
```

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

```r
f = head(e,-2)
print(f)
```

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

```r
g = paste("label", 1:30)
print(g)
```

```
##  [1] "label 1"  "label 2"  "label 3"  "label 4"  "label 5"  "label 6"
##  [7] "label 7"  "label 8"  "label 9"  "label 10" "label 11" "label 12"
## [13] "label 13" "label 14" "label 15" "label 16" "label 17" "label 18"
## [19] "label 19" "label 20" "label 21" "label 22" "label 23" "label 24"
## [25] "label 25" "label 26" "label 27" "label 28" "label 29" "label 30"
```

```r
h = paste("label", 1:30, sep="-")
print(h)
```

```
## [1] "label-1"   "label-2"   "label-3"   "label-4"   "label-5"   "label-6"
## [7] "label-7"   "label-8"   "label-9"   "label-10" "label-11" "label-12"
## [13] "label-13" "label-14" "label-15" "label-16" "label-17" "label-18"
## [19] "label-19" "label-20" "label-21" "label-22" "label-23" "label-24"
## [25] "label-25" "label-26" "label-27" "label-28" "label-29" "label-30"
```

```r
i = seq(0.1, 1, by = 0.1)
i = (i^2)*exp(i)
print(i)
```

```
##  [1] 0.01105171 0.04885611 0.12148729 0.23869195 0.41218032 0.65596277
##  [7] 0.98673883 1.42434619 1.99227852 2.71828183
```

Exercise 2

With Loops

```r
r1 = 0
for (j in 5:23) {
  r1 = r1 + (j^2 + 3 * j^0.5)
}
print(r1)
```

```
## [1] 4502.766
```

```r
r2 = 0
for (i in 1:18) {
  r2 = r2 + (1.3^i)/i
}
print(r2)
```

```
## [1] 37.23156
```

```r
r3=0
for (i in 1:10) {
  for (j in 1:6) {
    r3 = r3 + (i^4)/(3+j)
  }
}
print(r3)
```

```
## [1] 25222.42
```

Without Loops

```r
x = 5:23
r1 = outer(x,1, function(x,y){return((x^2)+(3*(x^0.5)))})
print(sum(r1))
```

```
## [1] 4502.766
```

```r
x = 1:18
r2 = outer(x,1,function(x,y){return((1.3^x)/x)})
print(sum(r2))
```

```
## [1] 37.23156
```

```
x = 1:10
y = 1:6
r3 = outer(x,y,function(x,y){return((x^4)/(3+y))})
print(sum(r3))
```

```
## [1] 25222.42
```

Exercise 3

```
set.seed(75)
M = matrix(sample(1:10, size=60, replace=TRUE), nrow=6, ncol=10)
print(M)
```

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

a.) It creates a matrix of 6x10 (rows x columns) of random numbers between 1 and 10.

b.)

```
apply(M, 1, function(x){
  MT = sapply(x,  function(y){
      return(ifelse(y>4, 1,0))
    })
  return(sum(MT))
})
```

```
## [1] 8 7 8 7 4 3
```

c.)

```
M[,3] = M[,3] + M[,2]
print(M)
```

```
##      [,1] [,2] [,3] [,4] [,5] [,6] [,7] [,8] [,9] [,10]
## [1,]    8    8   16    7    7    5    2    2    6     5
## [2,]    9    5    7    6    6    1    6    6    3     7
## [3,]    5    1   11    2    5    6    8    9   10     8
## [4,]    9    3    4    1    6   10   10    7    9    10
## [5,]    7    3    6    3    6    4    4    6   10     2
## [6,]    9    3    6    4    1    2    1   10    6     1
```

#Exercise 4

```
M2 = matrix(sample(1:10, size=9, replace=TRUE), nrow=3, ncol=3)
print(M2)
```

```
##      [,1] [,2] [,3]
## [1,]    2    1    8
## [2,]    8    9    8
## [3,]    3    2    1
```

```r
double_odd <- function(mat){
  V = sapply(mat, function(x){
    ifelse(x%%2 == 1, x*2, x)
  })
  return(matrix(V, nrow = nrow(mat), ncol = ncol(mat)))
}

print(double_odd(M2))
```

```
##      [,1] [,2] [,3]
## [1,]    2    2    8
## [2,]    8   18    8
## [3,]    6    2    2
```