

1.(a)

```
rep(0:4, each=5) + 1:5 # 1 2 3 4 5 2 3 4 5 6 3 4 5 6 7 4 5 6 7 8 5 6 7 8 9
```

1.(b)

```
rep(1:5, 5) # 1 2 3 4 5 1 2 3 4 5 1 2 3 4 5 1 2 3 4 5 1 2 3 4 5
```

1.(c)

```
rep(0:4, each=5) # 0 0 0 0 0 1 1 1 1 1 2 2 2 2 2 3 3 3 3 3 4 4 4 4 4
```

1.(d)

```
more.colors <- c("red", "yellow", "blue", "green", "magenta", "cyan")
```

```
loc <- rep(0:3, each=3) + 1:3
```

```
color.vec <- more.colors[loc]
```

```
color.vec # "red"      "yellow"  "blue"    "yellow"
          # "blue"    "green"    "blue"    "green"
          # "magenta" "green"   "magenta" "cyan"
```

1.(e)

```
length(unique(color.vec)) # 6
```

1.(f)

```
table(color.vec) # blue   cyan   green   magenta   red   yellow
                #    3     1       3       2     1     2
```

1.(g)

```
sort(color.vec, decreasing = T) # "yellow" "yellow" "red"      "magenta"
                                # "magenta" "green"   "green"    "green"
                                # "cyan"    "blue"    "blue"     "blue"
```

```
#=====
```

2.(a)

```
n <- seq(200,800,200) # c(200, 400, 600, 800)
```

```
a <- sum(seq(1,n[1])**2) # 2686700
```

```
b <- sum(seq(1,n[2])**2) # 21413400
```

```
c <- sum(seq(1,n[3])**2) # 72180100
```

```
d <- sum(seq(1,n[4])**2) # 170986800
```

```
Q2.a <- c(a, b, c, d)
```

```
Q2.a # 2686700 21413400 72180100 170986800
```

2.(b)

```
Q2.b <- n*(n+1)*(2*n+1)/6
```

```
Q2.b          # 2686700  21413400  72180100 170986800
```

2.(c)

```
identical(Q2.a, Q2.b)  # TRUE
```

```
#=====
```

3.(a)

```
score0 <- c(81.2, 89.6, 64.2, 91.3, 77.4, 84.5, NA, 91.7, 63.5, 84.8, NA,  
            87.8, 87.9, 80.9, 74.8, 64.3, 78.7, 91.3, 76.9, 74.9, 87.6, 88.4)
```

```
mean(score0)  # NA
```

```
max(score0)   # NA
```

3.(b)

```
mean(score0, na.rm = T)  # 81.805
```

```
max(score0, na.rm = T)   # 91.7
```

3.(c)

```
score1 <- score0[!is.na(score0)]
```

```
mean(score1)          # 81.085
```

```
max(score1)           # 91.7
```

```
mean(score0, na.rm = T) == mean(score1) # TRUE
```

```
max(score0, na.rm = T) == max(score1)   # TRUE
```

3.(d)

```
score2 <- score0
```

```
score2[score2 %in% NA] <- c(67.2, 89.5)
```

```
# score2[is.na(score2)] <- c(67.2, 89.5) will work as well.
```

```
score2          # 81.2 89.6 64.2 91.3 77.4 84.5 67.2 91.7 63.5 84.8 89.5
```

```
                # 87.8 87.9 80.9 74.8 64.3 78.7 91.3 76.9 74.9 87.6 88.4
```

3.(e)

```
mean(score2)  # 80.83636
```

```
max(score2)   # 91.7
```