STATS380: Statistical Computing
2017 Exam
AceNighJohn

Question 1

Question 1a

```r
1 + 1:2
```

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

Question 1b

```r
TRUE & FALSE | NA
```

```
## [1] NA
```

Question 1c

```r
(1:10)[10:9]
```

```
## [1] 10  9
```

Question 1d

```r
cumsum(diff(1:5))
```

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

Question 1e

```r
{s = 100; for(i in 5:4) s = s / i; s}
```

```
## [1] 5
```

Question 1f

```r
colSums(outer(1:5, 1:2, ">="))
```

```
## [1] 5 4
```

Question 1g

```r
paste(substring("iris", 1:2, 2), collapse = "")
```

```
## [1] "irr"
```

Question 1h

```r
levels(factor(c("virginica", "versicolor", "setosa")))[1]
```

```
## [1] "setosa"
```

Question 2

Question 2a

```r
seq(1, 19, by = 2)
```

Question 2b

```r
rep(1:6, rep(3:1, 2))
```

Question 2c

```r
rep(1:4, 3) * rep(10^(0:2), each = 4)
```

Question 3

```r
triplet123 = function(x){
  N = length(x)
  {vec1 = x[1:(N-2)]; vec2 = x[2:(N-1)]; vec3=  x[3:N]}
  sum(vec1 == 1 & vec2 == 2 & vec3 == 3)
}
```

Question 4

```r
n2c = function(x){
  sample.mean = colMeans(x)
  d = sqrt(rowSums(sweep(x, 2, sample.mean)^2))
  x[which.min(d),]
}
```

Question 5

Question 5a

```r
plot.new()
plot.window(xlim = c(0, 27), ylim = c(0, 19))

cols = hcl(seq(0, 300, length = 10))
xb = rep(c(1, 14), each = 5)
xt = xb + 12
yb = rep(rev(seq(1, by = 3.5, length = 5)), 2)
yt = yb + 3

rect(xb, yb, xt, yt, col= cols)
text((xb+xt)/2, (yb+yt)/2, 1:10)
```

Question 5b

```r
mat = rbind(rep(4, 5),
            c(0, 2, 0, 3, 0),
            c(0, 1, 1, 1, 0),
            rep(0, 5))

layout(mat, widths = c(lcm(1), 1, lcm(1), 1, lcm(1)), heights = c(1, 1.5, 8, lcm(1)))
```

Question 6

Question 6a

```r
x = list(1:3,4:6)
lapply(x,max)
```

```
## [[1]]
## [1] 3
##
## [[2]]
## [1] 6
```

Question 6b

```r
text = c("roses are red",
         "violets are blue",
         "blah blah blahs",
         "and so are you")
grep("s( |$)", text)
```

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

Question 6c

```r
text = c("Smith, 20, (+64) 9 2343 3434",
         "Ali, 21, (+64) 9 1111 2332",
         "Richard, 25, (+852) 2344 4344",
         "John, 32, (+64) 344 4344")
valid = grep("\\([+]\\d{2}\\) \\d \\d{4} \\d{4}",text)
data = do.call("rbind",strsplit(text[valid],","))
data = as.data.frame(data)
colnames(data) = c("name","age","phone")
data
```

```
##    name age            phone
## 1 Smith  20  (+64) 9 2343 3434
## 2   Ali  21  (+64) 9 1111 2332
```

Question 6d

```r
text = "Marvels.Agents.of.S.H.I.E.L.D"
gsubout = gsub("(\\w{2,})[.]","\\1,",text)
strsplit(gsubout,",")
```

```
## [[1]]
## [1] "Marvels"      "Agents"      "of"          "S.H.I.E.L.D"
```

Question 6e

```
text = c("Population size of the city in 2015 was 1200000",
         "The price of the book is 23.4USD",
         "The speed of the light is 3e8 meters per second",
         "The absolute zero is negative 273.15 centigrade")
patt = "([0-9]+[.]?[0-9]*|[.][0-9]+)([eE][0-9]+)?"
regmatches(text,gregexpr(patt,text))
```

```
## [[1]]
## [1] "2015"    "1200000"
##
## [[2]]
## [1] "23.4"
##
## [[3]]
## [1] "3e8"
##
## [[4]]
## [1] "273.15"
```

Question 6f

```
cat(sprintf("Month number %2d is %9s", 1:3, month.name[1:3]), sep="\n")
```

```
## Month number  1 is    January
## Month number  2 is   February
## Month number  3 is      March
```

Question 7

```
avg.all = mean(data$quantity)
subset(data, quantity > avg.all)
```

Question 8

Question 8a

```
suicideLong = melt(suicide, id = "year")
head(suicideLong)
```

Question 8b

```
result = aggregate(value ~ year, data = suicideLong, FUN = sum)
result
```

Question 8c

```r
max.suicide = max(result$value)
subset(result, value == max.suicide)
```