**# Exercise 1**

# Program a

in the 1st case breaks are strict and 8 goes between 1st and 2nd boarders (6 < x <= 8)

par(mai = c(1, 1, 1, 1), omi = c(0, 0, 0, 0))

xx <- c(9.20, 6.00, 6.00, 11.25, 11.00, 7.25, 9.7, 13.25, 14.00, 8.00)

hist(xx, breaks = c(6, 8, 10, 12, 14))

in this case function right = F allows only (6 < x < 8) so this is why 8 goes between 8 and 10

# Program b

par(mai = c(1, 1, 1, 1), omi = c(0, 0, 0, 0))

xx <- c(9.20, 6.00, 6.00, 11.25, 11.00, 7.25, 9.7, 13.25, 14.00, 8.00)

hist(xx, breaks = c(6, 8, 10, 12, 14), right = F)

# Program c

in this case final right boarder is 16 so there are more wide boarders. in all xxh values adds + 0.2 to previous values(6.2, 8.2, 10.2 … 14.2) 14.2 goes between 14 and 16

par(mai = c(1, 1, 1, 1), omi = c(0, 0, 0, 0))

xx <- c(9.20, 6.00, 6.00, 11.25, 11.00, 7.25, 9.7, 13.25, 14.00, 8.00)

br1 <- c(6, 8, 10, 12, 14, 16)

bw1 <- br1[2] - br1[1]

xxh <- floor(xx/bw1) \* bw1 + 0.1 \* bw1

hist(xxh, breaks = br1, right = F)

**# Exercise 2**

# What present chart generated by code below ? Please add title to this chart.

par(mai = c(1, 1, 1, 1), omi = c(0, 0, 0, 0))

xx <- c(1.92, 4.01, 6.51, 1.40, 1.67, 5.27, 1.42, 0.36,

3.18, 3.67, 7.48, 2.65, 7.86, 10.78, 2.30, 1.29, 0.31, 0.93,

2.34, 2.53)

d1 <- density(xx, bw = "Sj-ste")

ex <- d1$x

ey <- d1$y

plot(ex, ey, type = "n", xlab = "x", ylab = "p(x)")

lines(ex, ey)

title("Probability density function of data in the data set")

rug(xx, ticksize = 0.2, lwd = 1)

**# Exercise 3.**

# What present chart generated by code listed below ? Please describe the meaning # of arrows. Please add the title.

# Arrows show standard deviation

# (1) margin of graph

par(mai = c(1, 1, 1, 1), omi = c(0, 0, 0, 0))

# (2) 3 sets with 3 different types of distribution of random numbers

set.seed(591)

xx1 <- rnorm(20, mean = 3, sd = 3.6)

xx2 <- rpois(40, lambda = 3.5)

xx3 <- rchisq(31, df = 5)

# (3)

# 1) vector with a mean of 3 variables; 2) vector with

# standard deviation of 3 variables; 3) list of 3 vars

mean1 <- c(mean(xx1), mean(xx2), mean(xx3))

sd1 <- c(sd(xx1), sd(xx2), sd(xx3))

data1 <- list(xx1, xx2, xx3)

# (4) 1) minimum values of 3 vectors; 2) maximum values of vectors

xmin1 <- min(xx1, xx2, xx3) - 1

xmax1 <- max(xx1, xx2, xx3) + 1

# (5) plotting of datasets on stripchart

stripchart(data1, method = "jitter", jit = 0.3, vert = T,

pch = 1, cex = 0.4, ylim = c(xmin1, xmax1),

group.names = c("Group-1", "Group-2", "Group-3"))

title("Illustration of 3 types of distribution of random numbers")

# (6)

# 1) mean +- sd; angle of arrow head = 45 degrees. length is the length

# of the arrow head

arrows(1:3, mean1 + sd1, 1:3, mean1 - sd1, angle = 45,

code = 3, length = 0.07)

# 2) mean +- 2\*sd; angle of arrow head = 30 degrees

arrows(1:3, mean1 + 2 \* sd1, 1:3, mean1 - 2 \* sd1,

angle = 30, code = 3, length = 0.07)

# 3) mean - sd/10; angle = 90; arrow looks like a straight line

arrows(1:3, mean1 + 0.01 \* sd1, 1:3, mean1 - 0.01 \* sd1,

angle = 90, code = 3, length = 0.12)

**# Exercise 4.** The same as third implemented by box chart.

# What present chart generated using code listed below ? Please add title and # annotations to make chart easier to interpret.

# (1)

par(mai = c(1, 1, 1, 1), omi = c(0, 0, 0, 0))

# (2)

set.seed(591)

# creating 3 variables with random numbers with 3 types of distribution

xx1 <- rnorm(20, mean = 3, sd = 3.6)

xx2 <- rpois(40, lambda = 3.5)

xx3 <- rchisq(31, df = 5, ncp = 0)

# (3)

box1 <- boxplot(xx1, xx2, xx3, names = c("Group-1", "Group-2",

"Group-3"), cex = 0.7)

title("Illustration of 3 types of distribution using box plot")

# (4)

print("box1$stats")

print(box1$stats)

**# Exercise 5**

# What present chart generated using code listed below ? Please

# add title and legend to make chart easier to interpret.

# (1)

par(mai = c(1, 1, 1, 1), omi = c(0, 0, 0, 0))

# (2)

plot(c(-0.1, 2.1), c(0, 2.3), type = "n", xlab = "x",

ylab = "y")

xx <- c(0, 1,2)

yy <- c(2, 0.8, 1.4)

lines(xx, yy)

points(xx, yy, pch = 0)

# (3)

text(xx, yy + 0.2, labels = as.character(yy))

title("strip chart")

legend(0.75, 2, c("y", "y\_2"), pch = c(0, 16))

# (4)

par(new = T)

# (5)

plot(c(-0.1, 2.1), c(100, 250), type = "n", xlab = "",

ylab = "", axes = F)

# (6)

axis(4)

mtext("y\_2", side = 4, line = 2)

# (7)

xx <- c(0, 1, 2)

yy <- c(110, 130, 165)

lines(xx, yy)

points(xx, yy, pch = 16)

# (8)

text(xx, yy + 10, labels = as.character(yy))

**# Exercise 6**

# Please analyse code listed below. Please describe meaning of particular sections

# (1) set parameters of overall plot

par(mai = c(1, 1, 1, 1), omi = c(0, 0, 0, 0))

# (2) creating vector

yy <- c(50,30,40)

# (3) name every value in the vector

name1 <- c("data-a", "data-b", "data-c")

# (4) creating piechart from the vector

pie(yy, labels = name1, col = c("red","green","skyblue"))

# (5) adds new parameter to existing pie chart

par(new = T)

# (6) setting the parameters of new section

par(mai=c(2, 2, 2, 2))

# (7) adding new vector

yy2 <- c(50, 20, 10, 20, 20)

# (8) adding name to every value of vector

name2 <- c("data-a1", "data-b1", "data-b2", "data-c1",

"data-c2")

# (9) creating one more pie chart from yy2 vector

pie(yy2, labels = name2, col = c("pink", "gold", "blue",

"gold", "blue"))