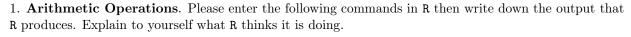
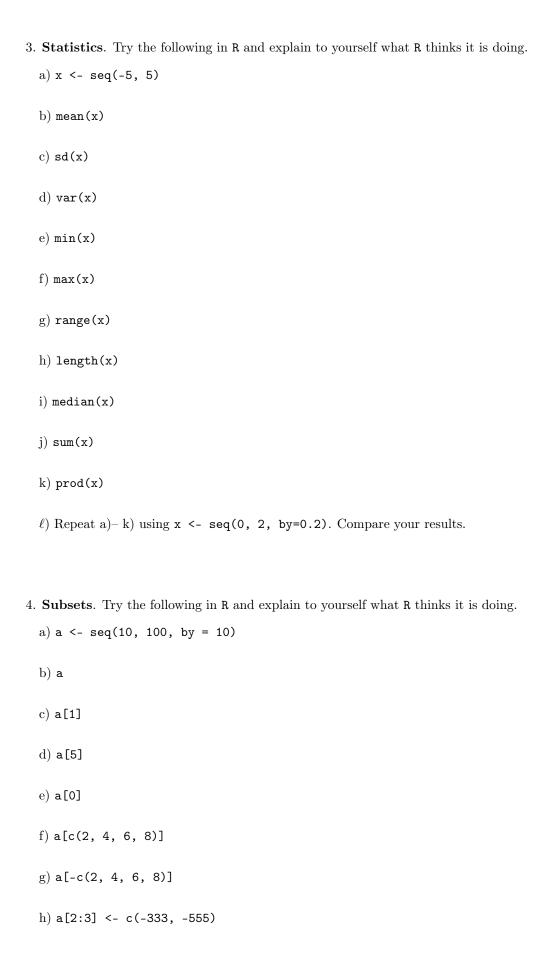


Introductory R Exercises



- a) 2.0 + 3.1
- b) 2.0 * 3.1
- c) 3.0^2
- d) 9.0 $\hat{}$ 0.5
- e) sqrt(9.0)
- f) exp(1)
- $g) \sin(pi)$
- h) cos(pi/2)
- i) tan(pi/2)
- 2. Vector Operations. Try the following in R and explain to yourself what R thinks it is doing.
 - a) x < -c(1, 0, -2)
 - b) x
 - c) y <- c(-1, 4.5, 3)
 - d) x + y
 - e) x + 2
 - f) x*y
 - g) x ^ y
 - $h) \exp(x)$
 - i) 1:10
 - j) seq(1, 21, by=5)



5. Booleans. Try the following in R and explain to yourself what R thinks it is doing.
a) a $<$ - seq(10, 100, by = 10)
b) a > 30
c) a[a > 30]
d) a == 50
e) a[a == 50]
f) a[a != 50]
g) a <= 30
h) a[a <= 30]
i) a[(a >= 50) & (a <= 90)]
j) a[(a < 30) (a > 70)]
k) a[(a <= 30) & !(a < 20)]
6. Missing Values. Try the following in R and explain to yourself what R thinks it is doing.
a) $x < -c(NA, 2, 3)$
b) x
c) x + 8
d) $x < 5$
e) is.na(x)
f) mean(x)
g) mean(x, na.rm = TRUE)
h) x[is.na(x)] = 0
i) x
j) mean(x)

7. Experiments

- a) Enter sample(10, 4) several times. What is R doing?
- b) Repeat a) using different values in place of 10 and 4. What happens if you enter sample(10, 11)?
- c) Enter sample(c("H", "T"), 5, replace=TRUE). What is R doing?
- d) Use R to simulate flipping a coin 100 times. 1000 times.

8. Graphics

a) Enter the following and sketch the result.

```
x \leftarrow seq(-4,4,by=0.1)
plot(x, dnorm(x), type="1", cex.lab=1.5, cex.axis=1.5, xlim=c(-4,4), ylim=c(0,0.5))
```

- b) Explain what the xlim and ylim parts of the command above mean.
- c) Experiment to try to figure out what the cex.lab and cex.axis parts of the command do.
- 9. Graphics II. Do the following in R.

```
install.packages("ggplot2")  # You only need to install this once.
library(ggplot2)  # Do this every time you want to use the package.

?mpg
head(mpg)
summary(mpg)

p <- ggplot(mpg, aes(x = displ, y = hwy))
p <- p + geom_point() # add a plot layer with points
print(p)

p <- ggplot(mpg, aes(x = displ, y = hwy))
p <- p + geom_point(aes(colour = class))
print(p)

p <- ggplot(mpg, aes(x = displ, y = hwy))
p <- p + geom_point(aes(colour = class, size = cyl, shape = drv))
print(p)</pre>
```