

Week 1 Exercises

Vectors

1. Create a vector `u` that has values -10, -9, -8, . . . ,0. How many different ways can you use?

```
u <- c(-10, -9, -8, -7, -6, -5, -4, -3, -2, -1, 0)
u <- c(-10:0)
u <- seq(-10,0, by=1)
print(u)
```

```
## [1] -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0
```

2. Create another vector `v` that has values -0.1, 0.4, 0.9, 1.4, ., and there are 11 numbers (aka terms) in `v`. How many different ways can you use?

```
v <- seq(-0.1, by=0.5, length.out=11)
print(v)
```

```
## [1] -0.1 0.4 0.9 1.4 1.9 2.4 2.9 3.4 3.9 4.4 4.9
```

3. Calculate the vector of `u+v` and `u*v`.

```
u_v <- u+v
u.v <- u/v
print(u_v)
```

```
## [1] -10.1 -8.6 -7.1 -5.6 -4.1 -2.6 -1.1 0.4 1.9 3.4 4.9
```

```
print(u.v)
```

```
## [1] 100.0000000 -22.5000000 -8.8888889 -5.0000000 -3.1578947 -2.0833333
## [7] -1.3793103 -0.8823529 -0.5128205 -0.2272727 0.0000000
```

4. Increase all terms in `u` by 1, and then take away 20% from all terms in `v`.

```
u_plus <- u+1
v_20 <- v-0.2
print(u_plus)
```

```
## [1] -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1
```

```
print(v_20)
```

```
## [1] -0.3 0.2 0.7 1.2 1.7 2.2 2.7 3.2 3.7 4.2 4.7
```

5. Create a vector `w` that contains all the numbers from `u` and then `v`. Report the length of `w`.

```
w <- c(u,v)
print(w)
```

```
## [1] -10.0 -9.0 -8.0 -7.0 -6.0 -5.0 -4.0 -3.0 -2.0 -1.0 0.0 -0.1
## [13] 0.4 0.9 1.4 1.9 2.4 2.9 3.4 3.9 4.4 4.9
```

6. Use a command to return the 14th, 15th and 16th value of `w`. What about the 2nd, the 5th, 9th and 21st value of `w`? What is the 23rd value?

```
w.5 <- w[5]
w.9 <- w[9]
w.14 <- w[14]
w.15 <- w[15]
w.16 <- w[16]
w.21 <- w[21]
w.23 <- w[23]
print(w.5)
```

```
## [1] -6
```

```
print(w.9)
```

```
## [1] -2
```

```
print(w.14)
```

```
## [1] 0.9
```

```
print(w.15)
```

```
## [1] 1.4
```

```
print(w.16)
```

```
## [1] 1.9
```

```
print(w.21)
```

```
## [1] 4.4
```

```
print(w.23)
```

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

7. Sort w in the descending order.

```
sort(w, decreasing = T)
```

```
## [1] 4.9 4.4 3.9 3.4 2.9 2.4 1.9 1.4 0.9 0.4 0.0 -0.1
## [13] -1.0 -2.0 -3.0 -4.0 -5.0 -6.0 -7.0 -8.0 -9.0 -10.0
```

Matrices

1. Create the following matrix and assign it to the variable b_matrix. Extract a sub-matrix from b_matrix named subB.

```
b_matrix <- matrix(seq(1,39, by=2), 4,5,
                    byrow = T,
                    dimnames = list(c("A", "B", "C", "D"),
                                     c("a", "b", "c", "d", "e")))
b_matrix
```

```
##   a  b  c  d  e
## A  1  3  5  7  9
## B 11 13 15 17 19
## C 21 23 25 27 29
## D 31 33 35 37 39
```

```
subB <- b_matrix[c(1,2,4),c(2,3)]
subB
```

```
##   b  c
## A  3  5
## B 13 15
## D 33 35
```

```
## a b c d e
## A 1 3 5 7 9
## B 11 13 15 17 19
## C 21 23 25 27 29
## D 31 33 35 37 39
```

2. Create three vectors x,y,z with integers and each vector has 3 elements. Combine the

```
x <- c(1,2,3)
y <- c(4,5,6)
z <- c(7,8,9)
x
```

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

```
y
```

```
## [1] 4 5 6
```

```
z
```

```
## [1] 7 8 9
```

three vectors to become a 3×3 matrix **A** where each column represents a vector. Change the row names to a,b,c.

```
A <- cbind(x,y,z)
rownames(A) <- c("a", "b", "c")
colnames(A) <- c("A", "B", "C")
A
```

```
##   A B C
## a 1 4 7
## b 2 5 8
## c 3 6 9
```

```
B <- cbind(x,y,z)
rownames(B) <- c("a", "b", "c")
colnames(B) <- c("A", "B", "C")
B
```

```
##   A B C
## a 1 4 7
## b 2 5 8
## c 3 6 9
```

```
1
```