Some data structures and arithmetic operators

With flipbookr and xaringan

Gina Reynolds, March 2020

```
1 + 1
```

```
[1] 2
```

```r
1 + 1
```

```
[1] 2
```

```r
5 * 8
```

```
[1] 40
```

```
1 + 1
```

```
[1] 2
```

```
5 * 8
```

```
[1] 40
```

```
(4 + 2)^2
```

```
[1] 36
```

```r
1 + 1
```

```
[1] 2
```

```r
5 * 8
```

```
[1] 40
```

```r
(4 + 2)^2
```

```
[1] 36
```

```r
3 / (3 + 6)
```

```
[1] 0.3333333
```

```
3:10
```

```
 [1]  3  4  5  6  7  8  9 10
```

```
3:10
```

```
[1]  3  4  5  6  7  8  9 10
```

```
1:6 * 2
```

```
[1]  2  4  6  8 10 12
```

```r
3:10
```

```
[1]  3  4  5  6  7  8  9 10
```

```r
1:6 * 2
```

```
[1]  2  4  6  8 10 12
```

```r
c(1, 2, 6, 10)
```

```
[1]  1  2  6 10
```

```
3:10
```

```
[1]  3  4  5  6  7  8  9 10
```

```
1:6 * 2
```

```
[1]  2  4  6  8 10 12
```

```
c(1, 2, 6, 10)
```

```
[1]  1  2  6 10
```

```
1:4 + 0:3
```

```
[1] 1 3 5 7
```

```r
3:10
```

```
[1]  3  4  5  6  7  8  9 10
```

```r
1:6 * 2
```

```
[1]  2  4  6  8 10 12
```

```r
c(1, 2, 6, 10)
```

```
[1]  1  2  6 10
```

```r
1:4 + 0:3
```

```
[1] 1 3 5 7
```

```r
TRUE
```

```
[1] TRUE
```

```r
3:10
```

```
[1]  3  4  5  6  7  8  9 10
```

```r
1:6 * 2
```

```
[1]  2  4  6  8 10 12
```

```r
c(1, 2, 6, 10)
```

```
[1]  1  2  6 10
```

```r
1:4 + 0:3
```

```
[1] 1 3 5 7
```

```r
TRUE
```

```
[1] TRUE
```

```r
c(T, T, F, F)
```

```
[1]  TRUE  TRUE FALSE FALSE
```

```r
3:10
```

```
[1]  3  4  5  6  7  8  9 10
```

```r
1:6 * 2
```

```
[1]  2  4  6  8 10 12
```

```r
c(1, 2, 6, 10)
```

```
[1]  1  2  6 10
```

```r
1:4 + 0:3
```

```
[1] 1 3 5 7
```

```r
TRUE
```

```
[1] TRUE
```

```r
c(T, T, F, F)
```

```
[1]  TRUE  TRUE FALSE FALSE
```

```r
"hello world"
```

```
[1] "hello world"
```

```r
3:10
```

```
[1]  3  4  5  6  7  8  9 10
```

```r
1:6 * 2
```

```
[1]  2  4  6  8 10 12
```

```r
c(1, 2, 6, 10)
```

```
[1]  1  2  6 10
```

```r
1:4 + 0:3
```

```
[1] 1 3 5 7
```

```r
TRUE
```

```
[1] TRUE
```

```r
c(T, T, F, F)
```

```
[1]  TRUE  TRUE FALSE FALSE
```

```r
"hello world"
```

```
[1] "hello world"
```

```r
c("hello", "hi", "bye", "bye-bye")
```

```
[1] "hello"   "hi"      "bye"     "bye-bye"
```

```r
3:10
```

```
[1]  3  4  5  6  7  8  9 10
```

```r
1:6 * 2
```

```
[1]  2  4  6  8 10 12
```

```r
c(1, 2, 6, 10)
```

```
[1]  1  2  6 10
```

```r
1:4 + 0:3
```

```
[1] 1 3 5 7
```

```r
TRUE
```

```
[1] TRUE
```

```r
c(T, T, F, F)
```

```
[1]  TRUE  TRUE FALSE FALSE
```

```r
"hello world"
```

```
[1] "hello world"
```

```r
c("hello", "hi", "bye", "bye-bye")
```

```
[1] "hello"   "hi"      "bye"     "bye-bye"
```

```r
NULL
```

```
NULL
```

```r
3:10
```

```
[1]  3  4  5  6  7  8  9 10
```

```r
1:6 * 2
```

```
[1]  2  4  6  8 10 12
```

```r
c(1, 2, 6, 10)
```

```
[1]  1  2  6 10
```

```r
1:4 + 0:3
```

```
[1] 1 3 5 7
```

```r
TRUE
```

```
[1] TRUE
```

```r
c(T, T, F, F)
```

```
[1]  TRUE  TRUE FALSE FALSE
```

```r
"hello world"
```

```
[1] "hello world"
```

```r
c("hello", "hi", "bye", "bye-bye")
```

```
[1] "hello"   "hi"      "bye"     "bye-bye"
```

```r
NULL
```

```
NULL
```

```r
factor(c("hello", "hi", "bye", "bye"))
```

```
[1] hello hi    bye   bye
Levels: bye hello hi
```

```r
3:10
```

```
[1]  3  4  5  6  7  8  9 10
```

```r
1:6 * 2
```

```
[1]  2  4  6  8 10 12
```

```r
c(1, 2, 6, 10)
```

```
[1]  1  2  6 10
```

```r
1:4 + 0:3
```

```
[1] 1 3 5 7
```

```r
TRUE
```

```
[1] TRUE
```

```r
c(T, T, F, F)
```

```
[1]  TRUE  TRUE FALSE FALSE
```

```r
"hello world"
```

```
[1] "hello world"
```

```r
c("hello", "hi", "bye", "bye-bye")
```

```
[1] "hello"   "hi"      "bye"     "bye-bye"
```

```r
NULL
```

```
NULL
```

```r
factor(c("hello", "hi", "bye", "bye"))
```

```
[1] hello hi    bye   bye
Levels: bye hello hi
```

```r
factor(c("hello", "hi", "bye", "bye"),
       levels = c("hi", "hello", "bye", "bye-b
```

```
[1] hello hi    bye   bye
Levels: hi hello bye bye-bye
```

```
str(3)
```

```
num 3
```

```
str(3)

str("hello")
```

```
num 3

chr "hello"
```

```
str(3)

str("hello")

str(1.1)
```

```
num 3

chr "hello"

num 1.1
```

```r
str(3)

str("hello")

str(1.1)

str(1:8)
```

```
num 3

chr "hello"

num 1.1

int [1:8] 1 2 3 4 5 6 7 8
```

```
str(3)

str("hello")

str(1.1)

str(1:8)

str(2L)
```

```
num 3

chr "hello"

num 1.1

int [1:8] 1 2 3 4 5 6 7 8

int 2
```

```r
str(3)

str("hello")

str(1.1)

str(1:8)

str(2L)

str(c(2, 5, 8))
```

```
num 3

chr "hello"

num 1.1

int [1:8] 1 2 3 4 5 6 7 8

int 2

num [1:3] 2 5 8
```

```r
str(3)

str("hello")

str(1.1)

str(1:8)

str(2L)

str(c(2, 5, 8))

str(c(2L, 5L, 8L))
```

```
num 3

chr "hello"

num 1.1

int [1:8] 1 2 3 4 5 6 7 8

int 2

num [1:3] 2 5 8

int [1:3] 2 5 8
```

```r
str(3)

str("hello")

str(1.1)

str(1:8)

str(2L)

str(c(2, 5, 8))

str(c(2L, 5L, 8L))

str(c(1,3))
```

```
num 3

chr "hello"

num 1.1

int [1:8] 1 2 3 4 5 6 7 8

int 2

num [1:3] 2 5 8

int [1:3] 2 5 8

num [1:2] 1 3
```

```r
str(3)

str("hello")

str(1.1)

str(1:8)

str(2L)

str(c(2, 5, 8))

str(c(2L, 5L, 8L))

str(c(1,3))

str(factor(c("hello", "bye")))
```

```
num 3

chr "hello"

num 1.1

int [1:8] 1 2 3 4 5 6 7 8

int 2

num [1:3] 2 5 8

int [1:3] 2 5 8

num [1:2] 1 3

Factor w/ 2 levels "bye","hello": 2 1
```

```r
str(3)

str("hello")

str(1.1)

str(1:8)

str(2L)

str(c(2, 5, 8))

str(c(2L, 5L, 8L))

str(c(1,3))

str(factor(c("hello", "bye")))

str(factor(c("hello", "bye"),
           levels = c("hi", "hello", "bye")))
```

```
num 3

chr "hello"

num 1.1

int [1:8] 1 2 3 4 5 6 7 8

int 2

num [1:3] 2 5 8

int [1:3] 2 5 8

num [1:2] 1 3

Factor w/ 2 levels "bye","hello": 2 1

Factor w/ 3 levels "hi","hello","bye": 2 3
```

```r
str(3)

str("hello")

str(1.1)

str(1:8)

str(2L)

str(c(2, 5, 8))

str(c(2L, 5L, 8L))

str(c(1,3))

str(factor(c("hello", "bye")))

str(factor(c("hello", "bye"),
           levels = c("hi", "hello", "bye")))

str(Sys.time())
```

```
num 3

chr "hello"

num 1.1

int [1:8] 1 2 3 4 5 6 7 8

int 2

num [1:3] 2 5 8

int [1:3] 2 5 8

num [1:2] 1 3

Factor w/ 2 levels "bye","hello": 2 1

Factor w/ 3 levels "hi","hello","bye": 2 3

POSIXct[1:1], format: "2020-07-03 23:46:13"
```

```r
str(3)

str("hello")

str(1.1)

str(1:8)

str(2L)

str(c(2, 5, 8))

str(c(2L, 5L, 8L))

str(c(1,3))

str(factor(c("hello", "bye")))

str(factor(c("hello", "bye"),
           levels = c("hi", "hello", "bye")))

str(Sys.time())

str(Sys.Date())
```

```
num 3

chr "hello"

num 1.1

int [1:8] 1 2 3 4 5 6 7 8

int 2

num [1:3] 2 5 8

int [1:3] 2 5 8

num [1:2] 1 3

Factor w/ 2 levels "bye","hello": 2 1

Factor w/ 3 levels "hi","hello","bye": 2 3

POSIXct[1:1], format: "2020-07-03 23:46:13"

Date[1:1], format: "2020-07-03"
```

```r
matrix(1:10, nrow = 5)
```

```
     [,1] [,2]
[1,]    1    6
[2,]    2    7
[3,]    3    8
[4,]    4    9
[5,]    5   10
```

```r
matrix(1:10, nrow = 5)

matrix(1:10, ncol = 3)
```

```
     [,1] [,2]
[1,]    1    6
[2,]    2    7
[3,]    3    8
[4,]    4    9
[5,]    5   10
```

```
     [,1] [,2] [,3]
[1,]    1    5    9
[2,]    2    6   10
[3,]    3    7    1
[4,]    4    8    2
```

```r
matrix(1:10, nrow = 5)

matrix(1:10, ncol = 3)
```

```
     [,1] [,2]
[1,]    1    6
[2,]    2    7
[3,]    3    8
[4,]    4    9
[5,]    5   10
```

```r
matrix(c(1,2,3,4),
       nrow = 2) * 2
```

```
     [,1] [,2] [,3]
[1,]    1    5    9
[2,]    2    6   10
[3,]    3    7    1
[4,]    4    8    2
```

```
     [,1] [,2]
[1,]    2    6
[2,]    4    8
```

```r
matrix(1:10, nrow = 5)
```

```
     [,1] [,2]
[1,]    1    6
[2,]    2    7
[3,]    3    8
[4,]    4    9
[5,]    5   10
```

```r
matrix(1:10, ncol = 3)
```

```
     [,1] [,2] [,3]
[1,]    1    5    9
[2,]    2    6   10
[3,]    3    7    1
[4,]    4    8    2
```

```r
matrix(c(1,2,3,4),
       nrow = 2) * 2
```

```
     [,1] [,2]
[1,]    2    6
[2,]    4    8
```

```r
(matrix(c(1,2,3,4),
        nrow = 2) *
    matrix(c(1,2,3,4),
       nrow = 2) )
```

```
     [,1] [,2]
[1,]    1    9
[2,]    4   16
```

```r
matrix(1:10, nrow = 5)
```

```
     [,1] [,2]
[1,]    1    6
[2,]    2    7
[3,]    3    8
[4,]    4    9
[5,]    5   10
```

```r
matrix(1:10, ncol = 3)
```

```
     [,1] [,2] [,3]
[1,]    1    5    9
[2,]    2    6   10
[3,]    3    7    1
[4,]    4    8    2
```

```r
matrix(c(1,2,3,4),
       nrow = 2) * 2
```

```
     [,1] [,2]
[1,]    2    6
[2,]    4    8
```

```r
(matrix(c(1,2,3,4),
        nrow = 2) *
    matrix(c(1,2,3,4),
       nrow = 2) )
```

```
     [,1] [,2]
[1,]    1    9
[2,]    4   16
```

```r
(matrix(c(1,2,3,4),
       nrow = 2) %*%
    matrix(c(1,2,3,4),
       nrow = 2) )
```

```
     [,1] [,2]
[1,]    7   15
[2,]   10   22
```

constructing data in r

```r
data.frame(id = 1:6,
           greet = c("hi", "bye",
                     "hello", "chao",
                     "adios", "tchuss"),
           nums = c(2.3, 4.1, 3.5,
                    3.2, 5.6, 8.9))
```

```
  id  greet nums
1  1     hi  2.3
2  2    bye  4.1
3  3  hello  3.5
4  4   chao  3.2
5  5  adios  5.6
6  6 tchuss  8.9
```

```
data.frame(id = 1:6,
           greet = c("hi", "bye",
                     "hello", "chao",
                     "adios", "tchuss"),
           nums = c(2.3, 4.1, 3.5,
                    3.2, 5.6, 8.9))

library(tibble)  # also a part of the tidyvers
```

```
  id  greet nums
1  1     hi  2.3
2  2    bye  4.1
3  3  hello  3.5
4  4   chao  3.2
5  5  adios  5.6
6  6 tchuss  8.9
```

```r
data.frame(id = 1:6,
           greet = c("hi", "bye",
                     "hello", "chao",
                     "adios", "tchuss"),
           nums = c(2.3, 4.1, 3.5,
                    3.2, 5.6, 8.9))

library(tibble)  # also a part of the tidyverse
# tribble helps build small data sets
tribble(
  ~"id", ~"greet", ~"nums",  # column heads
  1,        "hi",       2.3,
  2,        "bye",      3.5,
  3,        "adios",    4.2
  )
```

```
  id  greet nums
1  1     hi  2.3
2  2    bye  4.1
3  3  hello  3.5
4  4   chao  3.2
5  5  adios  5.6
6  6 tchuss  8.9

# A tibble: 3 x 3
     id greet  nums
  <dbl> <chr> <dbl>
1     1 hi      2.3
2     2 bye     3.5
3     3 adios   4.2
```

```r
mean(1:5)
```

```
[1] 3
```

```
mean(1:5)
```

```
[1] 3
```

```
mean(1:100^2)
```

```
[1] 5000.5
```

```r
mean(1:5)
```

```
[1] 3
```

```r
mean(1:100^2)
```

```
[1] 5000.5
```

```r
sd(1:10)
```

```
[1] 3.02765
```

```r
mean(1:5)
```

```
[1] 3
```

```r
mean(1:100^2)
```

```
[1] 5000.5
```

```r
sd(1:10)
```

```
[1] 3.02765
```

```r
mean(c(1, 4, 6, 7))
```

```
[1] 4.5
```

```r
mean(1:5)
```

```
[1] 3
```

```r
mean(1:100^2)
```

```
[1] 5000.5
```

```r
sd(1:10)
```

```
[1] 3.02765
```

```r
mean(c(1, 4, 6, 7))
```

```
[1] 4.5
```

```r
mean(c(1, 4, 6, 7, NA))
```

```
[1] NA
```

```r
mean(1:5)
```

```
[1] 3
```

```r
mean(1:100^2)
```

```
[1] 5000.5
```

```r
sd(1:10)
```

```
[1] 3.02765
```

```r
mean(c(1, 4, 6, 7))
```

```
[1] 4.5
```

```r
mean(c(1, 4, 6, 7, NA))
```

```
[1] NA
```

```r
mean(c(1, 4, 6, 7, NA), na.rm = T)
```

```
[1] 4.5
```

```r
mean(1:5)

mean(1:100^2)

sd(1:10)

mean(c(1, 4, 6, 7))

mean(c(1, 4, 6, 7, NA))

mean(c(1, 4, 6, 7, NA), na.rm = T)

sd(c(1:10, NA))
```

```
[1] 3

[1] 5000.5

[1] 3.02765

[1] 4.5

[1] NA

[1] 4.5

[1] NA
```

```r
mean(1:5)

mean(1:100^2)

sd(1:10)

mean(c(1, 4, 6, 7))

mean(c(1, 4, 6, 7, NA))

mean(c(1, 4, 6, 7, NA), na.rm = T)

sd(c(1:10, NA))

sd(c(1:10, NA), na.rm = T)
```

```
[1] 3

[1] 5000.5

[1] 3.02765

[1] 4.5

[1] NA

[1] 4.5

[1] NA

[1] 3.02765
```

```
1:10
```

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

```
1:10 ->
  x
```

```
1:10 ->
  x

x * 5
```

```
[1]  5 10 15 20 25 30 35 40 45 50
```

```
1:10 ->
  x

x * 5
x^2
```

```
[1]  5 10 15 20 25 30 35 40 45 50

[1]   1   4   9  16  25  36  49  64  81 100
```

```
1:10 ->
  x

x * 5
x^2

rep(3, 10)
```

```
[1]  5 10 15 20 25 30 35 40 45 50

[1]   1   4   9  16  25  36  49  64  81 100

[1] 3 3 3 3 3 3 3 3 3 3
```

```
1:10 ->
  x

x * 5
x^2

rep(3, 10) ->
  y
```

```
[1]  5 10 15 20 25 30 35 40 45 50

[1]   1   4   9  16  25  36  49  64  81 100
```

```
1:10 ->
  x

x * 5
x^2

rep(3, 10) ->
  y

x + y
```

```
[1]  5 10 15 20 25 30 35 40 45 50

[1]   1   4   9  16  25  36  49  64  81 100

[1]  4  5  6  7  8  9 10 11 12 13
```

```
1:10 ->
  x

x * 5
x^2

rep(3, 10) ->
  y

x + y ->
  z
```

```
[1]  5 10 15 20 25 30 35 40 45 50

[1]   1   4   9  16  25  36  49  64  81 100
```

```
1:10 ->
  x

x * 5
x^2

rep(3, 10) ->
  y

x + y ->
  z

5
```

```
 [1]  5 10 15 20 25 30 35 40 45 50

 [1]   1   4   9  16  25  36  49  64  81 100

[1] 5
```

```
1:10 ->
  x

x * 5
x^2

rep(3, 10) ->
  y

x + y ->
  z

5 ->
  x
```

```
[1]  5 10 15 20 25 30 35 40 45 50

[1]   1   4   9  16  25  36  49  64  81 100
```

```
1:10 ->
  x

x * 5
x^2

rep(3, 10) ->
  y

x + y ->
  z

5 ->
  x

4
```

```
 [1]  5 10 15 20 25 30 35 40 45 50

 [1]   1   4   9  16  25  36  49  64  81 100

[1] 4
```

```
1:10 ->
  x

x * 5
x^2

rep(3, 10) ->
  y

x + y ->
  z

5 ->
  x

4 ->
  y
```

```
[1]  5 10 15 20 25 30 35 40 45 50

[1]   1   4   9  16  25  36  49  64  81 100
```

```
1:10 ->
  x

x * 5
x^2

rep(3, 10) ->
  y

x + y ->
  z

5 ->
  x

4 ->
  y

x + y
```

```
 [1]  5 10 15 20 25 30 35 40 45 50

 [1]   1   4   9  16  25  36  49  64  81 100

[1] 9
```

```
1:10 ->
  x

x * 5
x^2

rep(3, 10) ->
  y

x + y ->
  z

5 ->
  x

4 ->
  y

x + y ->
  z_1
```

```
[1]  5 10 15 20 25 30 35 40 45 50

[1]   1   4   9  16  25  36  49  64  81 100
```

```
1:10 ->
  x

x * 5
x^2

rep(3, 10) ->
  y

x + y ->
  z

5 ->
  x

4 ->
  y

x + y ->
  z_1

z; z_1  # print both objects z and z_1
```

```
 [1]  5 10 15 20 25 30 35 40 45 50

 [1]   1   4   9  16  25  36  49  64  81 100

 [1]  4  5  6  7  8  9 10 11 12 13

[1] 9
```

Some functions all about type...

```r
is.character("hi")
```

```
[1] TRUE
```

```r
is.character("hi")
```

```
[1] TRUE
```

```r
is.numeric(1)
```

```
[1] TRUE
```

```r
is.character("hi")
```

```
[1] TRUE
```

```r
is.numeric(1)
```

```
[1] TRUE
```

```r
is.integer(2.3)
```

```
[1] FALSE
```

```r
is.character("hi")
```

```
[1] TRUE
```

```r
is.numeric(1)
```

```
[1] TRUE
```

```r
is.integer(2.3)
```

```
[1] FALSE
```

```r
is.double(4L)
```

```
[1] FALSE
```

```r
is.character("hi")
```

```
[1] TRUE
```

```r
is.numeric(1)
```

```
[1] TRUE
```

```r
is.integer(2.3)
```

```
[1] FALSE
```

```r
is.double(4L)
```

```
[1] FALSE
```

```r
is.integer(4)
```

```
[1] FALSE
```

```r
is.character("hi")
```

```
[1] TRUE
```

```r
is.numeric(1)
```

```
[1] TRUE
```

```r
is.integer(2.3)
```

```
[1] FALSE
```

```r
is.double(4L)
```

```
[1] FALSE
```

```r
is.integer(4)
```

```
[1] FALSE
```

```r
is.integer(4L)
```

```
[1] TRUE
```

```r
is.character("hi")

is.numeric(1)

is.integer(2.3)

is.double(4L)

is.integer(4)

is.integer(4L)

is.factor("good")
```

```
[1] TRUE

[1] TRUE

[1] FALSE

[1] FALSE

[1] FALSE

[1] TRUE

[1] FALSE
```

```r
as.numeric("hi")
```

```
[1] NA
```

```r
as.numeric("hi")
```

```
[1] NA
```

```r
as.integer(1)
```

```
[1] 1
```

```r
as.numeric("hi")
```

```
[1] NA
```

```r
as.integer(1)
```

```
[1] 1
```

```r
as.character(2.3)
```

```
[1] "2.3"
```

```r
as.numeric("hi")
```

```
[1] NA
```

```r
as.integer(1)
```

```
[1] 1
```

```r
as.character(2.3)
```

```
[1] "2.3"
```

```r
as.double(4L)
```

```
[1] 4
```

```r
as.numeric("hi")
```

```
[1] NA
```

```r
as.integer(1)
```

```
[1] 1
```

```r
as.character(2.3)
```

```
[1] "2.3"
```

```r
as.double(4L)
```

```
[1] 4
```

```r
is.integer(4)
```

```
[1] FALSE
```

```r
as.numeric("hi")

as.integer(1)

as.character(2.3)

as.double(4L)

is.integer(4)

is.integer(4L)
```

```
[1] NA

[1] 1

[1] "2.3"

[1] 4

[1] FALSE

[1] TRUE
```

```r
as.numeric("hi")

as.integer(1)

as.character(2.3)

as.double(4L)

is.integer(4)

is.integer(4L)

as.factor(c("good", "bad"))
```

```
[1] NA

[1] 1

[1] "2.3"

[1] 4

[1] FALSE

[1] TRUE

[1] good bad
Levels: bad good
```

```r
as.numeric("hi")

as.integer(1)

as.character(2.3)

as.double(4L)

is.integer(4)

is.integer(4L)

as.factor(c("good", "bad"))

matrix(1:4, nrow = 2)    # this is a pipe opera
```

```
[1] NA

[1] 1

[1] "2.3"

[1] 4

[1] FALSE

[1] TRUE

[1] good bad
Levels: bad good

     [,1] [,2]
[1,]    1    3
[2,]    2    4
```

```r
as.numeric("hi")
```

```
[1] NA
```

```r
as.integer(1)
```

```
[1] 1
```

```r
as.character(2.3)
```

```
[1] "2.3"
```

```r
as.double(4L)
```

```
[1] 4
```

```r
is.integer(4)
```

```
[1] FALSE
```

```r
is.integer(4L)
```

```
[1] TRUE
```

```r
as.factor(c("good", "bad"))
```

```
[1] good bad
Levels: bad good
```

```r
matrix(1:4, nrow = 2) %>%  # this is a pipe op
# passes all of what procedes to function that
  as.vector()
```

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

```r
c("50", "80")
```

```
[1] "50" "80"
```

```r
c("50", "80") %>%
  as.factor()
```

```
[1] 50 80
Levels: 50 80
```

```r
c("50", "80") %>%
  as.factor() %>%
  as.numeric()  # maybe surprising
```

```
[1] 1 2
```

```r
c("50", "80") %>%
  as.factor() %>%
  as.numeric()  # maybe surprising
```

```
[1] 1 2
```

```r
c("50", "80")
```

```
[1] "50" "80"
```

```r
c("50", "80") %>%
  as.factor() %>%
  as.numeric()  # maybe surprising

c("50", "80") %>%
  as.factor()
```

```
[1] 1 2

[1] 50 80
Levels: 50 80
```

```r
c("50", "80") %>%
  as.factor() %>%
  as.numeric()  # maybe surprising

c("50", "80") %>%
  as.factor() %>%
  as.character()
```

```
[1] 1 2

[1] "50" "80"
```

```r
c("50", "80") %>%
  as.factor() %>%
  as.numeric()  # maybe surprising

c("50", "80") %>%
  as.factor() %>%
  as.character() %>%
  as.numeric()  # less surprising
```

```
[1] 1 2

[1] 50 80
```