

# Symbols and functions from today's session

## R

### Naming (assigning a variable)

```
any_name_I_like <- ... #gives "..." the name 'any_name_I_like'
```

For example,

```
any_name_I_like <- 5 #now the value 5 is given the name 'any_name_I_like'  
any_name_I_like + any_name_I_like #the same as 5+5
```

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

```
another_name <- c(172,175,185) #"another_name" corresponds to a collection of three values  
sum(another_name) #the sum of the values that go by the name "another_name"
```

```
## [1] 532
```

### Mean

```
mean(...) #computes the mean of "..."
```

For example,

```
mean(c(172,175,185)) #the mean of the collection of values 172, 175, 185
```

```
## [1] 177.3333
```

```
mean(another_name) #the mean of the values assigned to "another_name"
```

```
## [1] 177.3333
```

### Median

```
median(...) #computes the median of "..."
```

For example,

```
median(c(172,175,185)) #the median of the collection of values 172, 175, 185
```

```
## [1] 175
```

```
median(another_name) #the median of the values assigned to "another_name"
```

```
## [1] 175
```

## Variance

```
var(...) #computes the variance of "..."
```

For example,

```
var(c(172,175,185)) #the variance of the collection of values 172, 175, 185
```

```
## [1] 46.33333
```

```
var(another_name) #the variance of the values assigned to "another_name"
```

```
## [1] 46.33333
```

## Standard deviation

```
sd(...) #computes the standard deviation of "..."
```

For example,

```
sd(c(172,175,185)) #the standard deviation of the collection of values 172, 175, 185
```

```
## [1] 6.806859
```

```
sd(another_name) #the standard deviation of the values assigned to "another_name"
```

```
## [1] 6.806859
```

## Rounding

```
round(..., digits = n) #round the value of "... by n-digits after the comma
```

For example,

```
round(123.4578, digits = 3) #rounds 123.4578 to the third place after the comma
```

```
## [1] 123.458
```

```
round(123.4578, digits = 1) #rounds 123.4578 to the first place after the comma
```

```
## [1] 123.5
```

## Mathematics

Capital sigma ( $\sum$ ) is the *summation sign*. It's a convenient way to say that you will sum over all the values to the right of the sign. For instance,

$$\sum_i x_i$$

means “sum over all the values in  $x$ ”;  $x_i$  refers to the observation  $i$  in  $x$ . In other words,

$$\sum_i x_i = x_1 + \dots + x_n$$

,

where  $x_1$  is the first element in  $x$  and  $x_n$  is the last. For example, if you have the values 172, 175 and 178 then your  $x$  is a list of these values.

$$\sum_i x_i = 172 + 175 + 178$$

In R, this is the same as:

```
x <- c(172, 175, 178) #I call my list of three observations x
sum(x)                #I sum the elements in x
```

```
## [1] 525
```

which is the same as:

```
172 + 175 + 178
```

```
## [1] 525
```

Now what does, e.g.,

$$\sum_i x_i^2$$

mean?

It means that it is the sum of the elements of  $x$  but squared. So  $172^2 + 175^2 + 178^2$ . In other words, apply everything that happens to the right of  $\sum$  to each element of  $x$  and then sum them up.

In R:

```
x_squared <- x**2 #square all the elements in x and call them "x_squared"
sum(x_squared)   #the sum of the elements in "x_squared"
```

```
## [1] 91893
```

```
## which is the same as:
172**2 + 175**2 + 178**2
```

```
## [1] 91893
```

As a final example,

$$\sum_i x_i + 1$$

takes each element in  $x$ , sums 1 to it, and then adds them all up; so  $(172 + 1) + (175 + 1) + (178 + 1)$

In R:

```
x_plus_one <- x + 1 #add the value "1" to all elements in R
sum(x_plus_one)    #the sum of all elements in "x_plusone"
```

```
## [1] 528
```

```
## which is the same as:
(172 + 1) + (175 + 1) + (178 + 1)
```

```
## [1] 528
```