Data Structures in R: Lists

Stat 133 by Gaston Sanchez

Lists

single data type *multiple data types*

dimensions

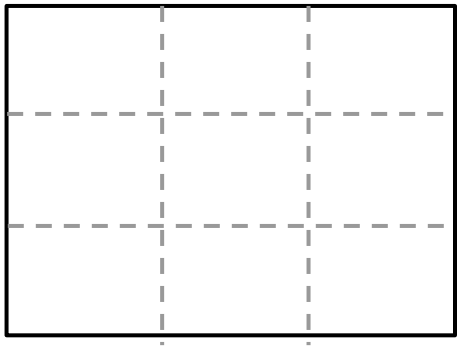
1D

Vector

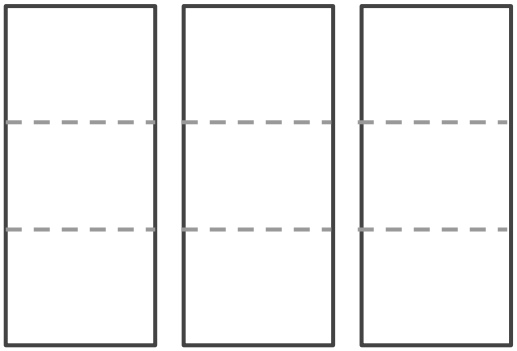
List

2D

Matrix



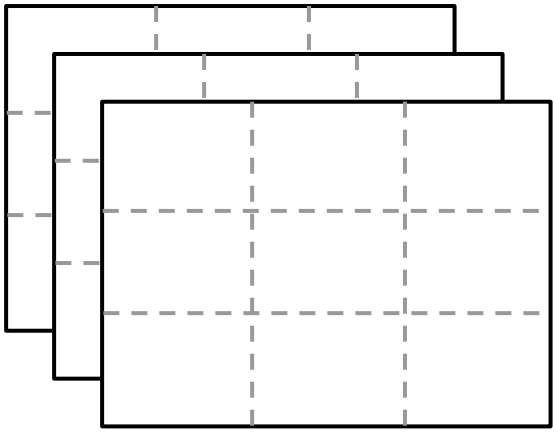
Data Frame



non-atomic structures

nD

Array



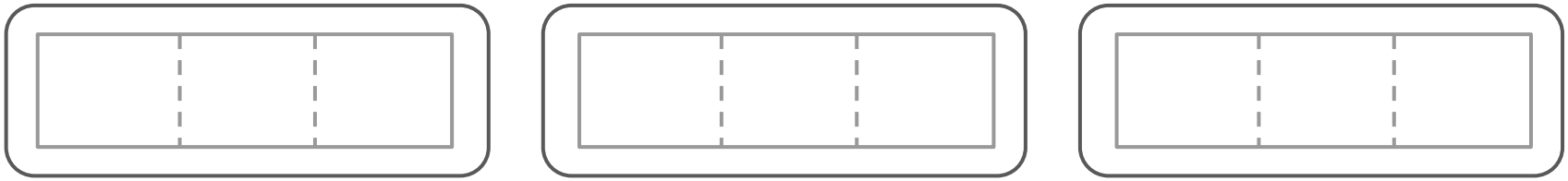
R lists

A list is the most general data structure in R

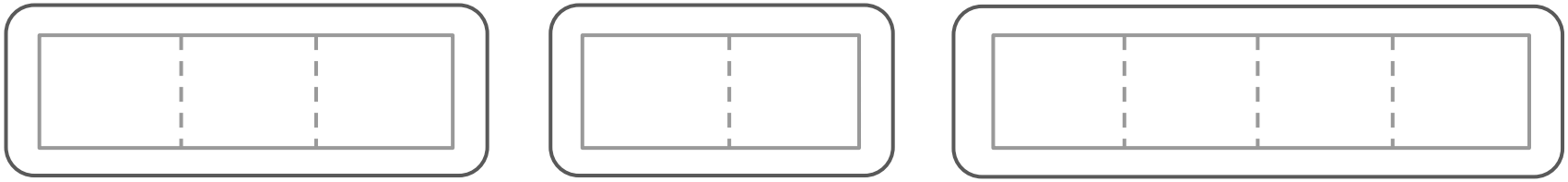
Lists can contain any other type of data structure

Lists can even contain other lists

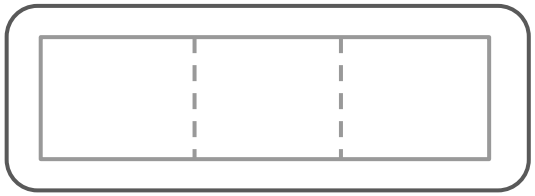
List of Vectors (of equal length)



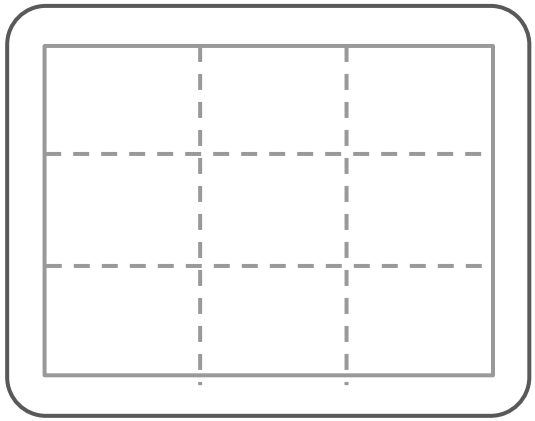
List of Vectors (of different length)



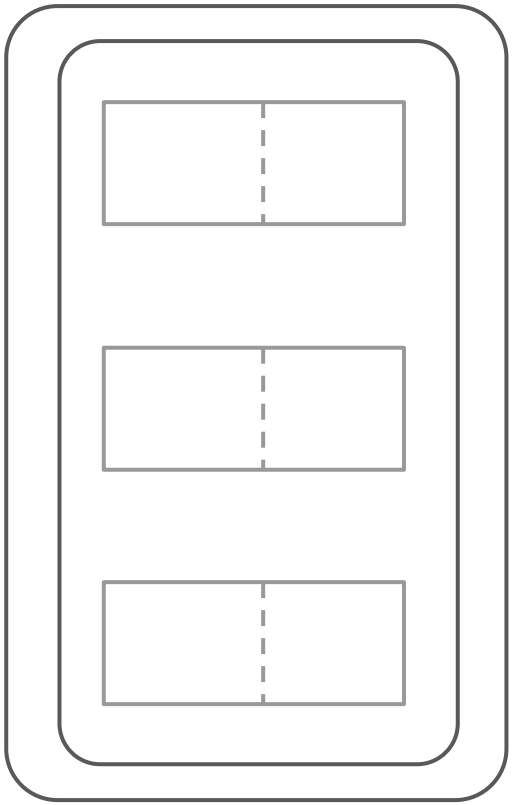
List of various objects



vector



matrix



Other lists

R lists

Lists are a special type of vector

```
lst <- vector(mode = "list")
```

Lists are vectors in the sense of being a one-dimensional object

Lists are NOT atomic structures

Subsetting and Indexing

Bracket Notation System

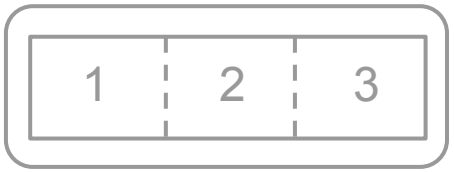
To extract values from R objects use brackets: [ ]

Inside the brackets specify vector(s) of indices

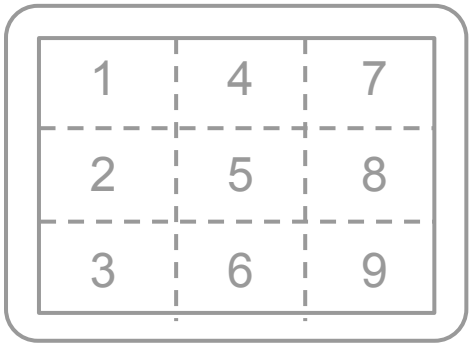
Use as many indices, separated by commas, as dimensions in the object

Vector(s) of indices can be numbers, logicals, and sometimes names

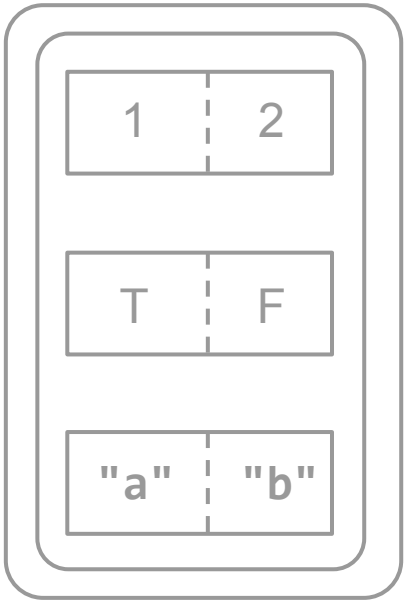
```
lst <- list(
  c(1, 2, 3),
  matrix(1:9, nrow = 3, ncol = 3),
  list(1:2, c(TRUE, FALSE), c("a", "b"))
)
```



vector



matrix

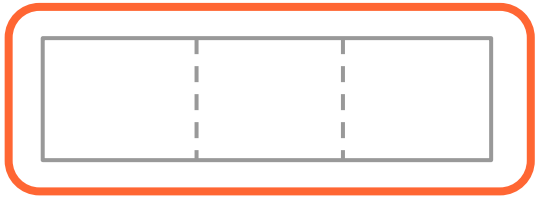


list of vectors

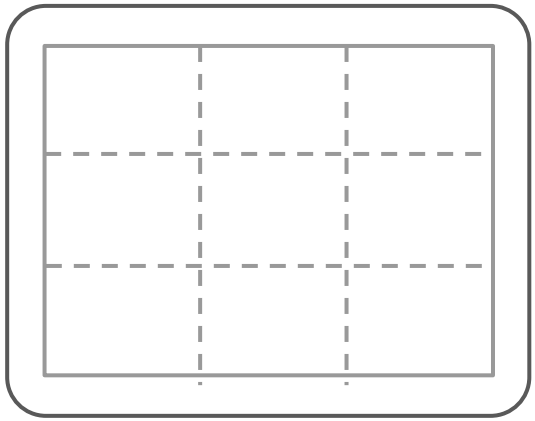
access list element(s)

```
list[elem]
```

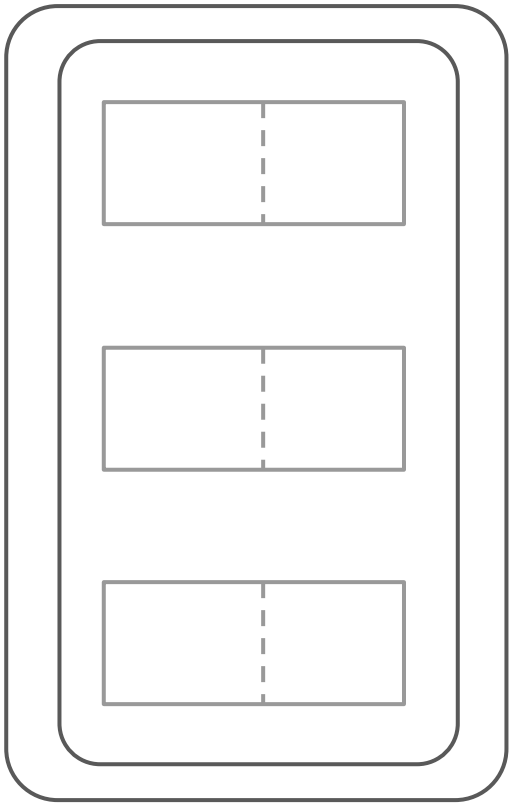
`lst[1]`



vector

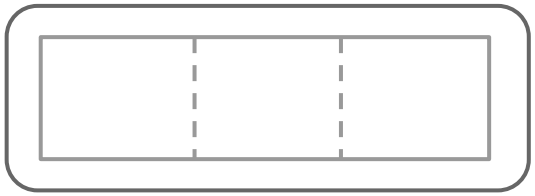


matrix

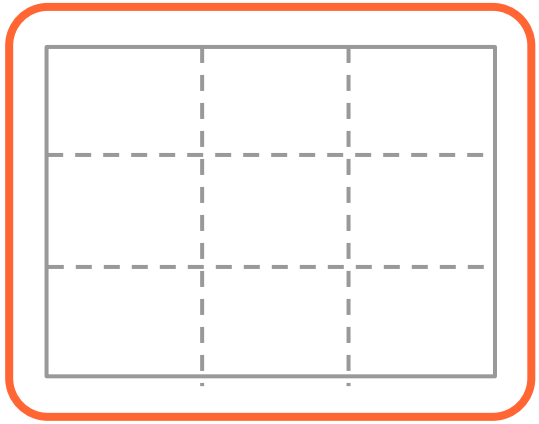


another list

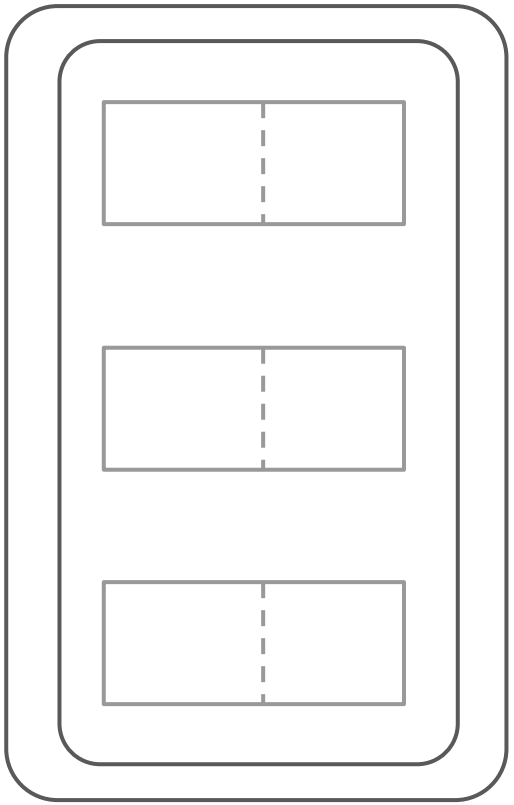
`lst[2]`



vector

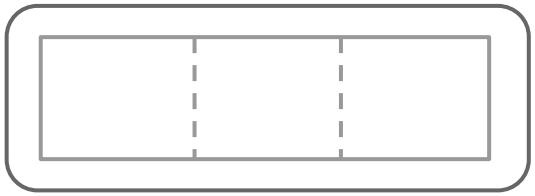


matrix

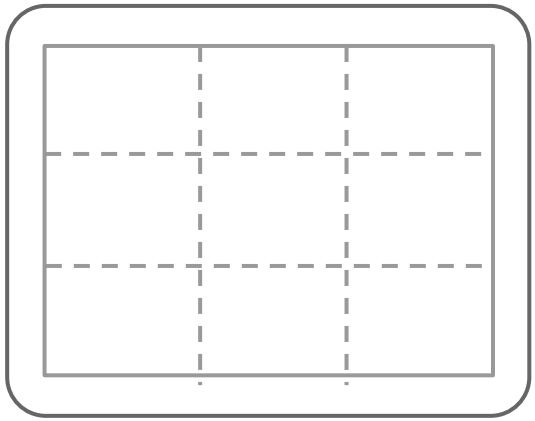


another list

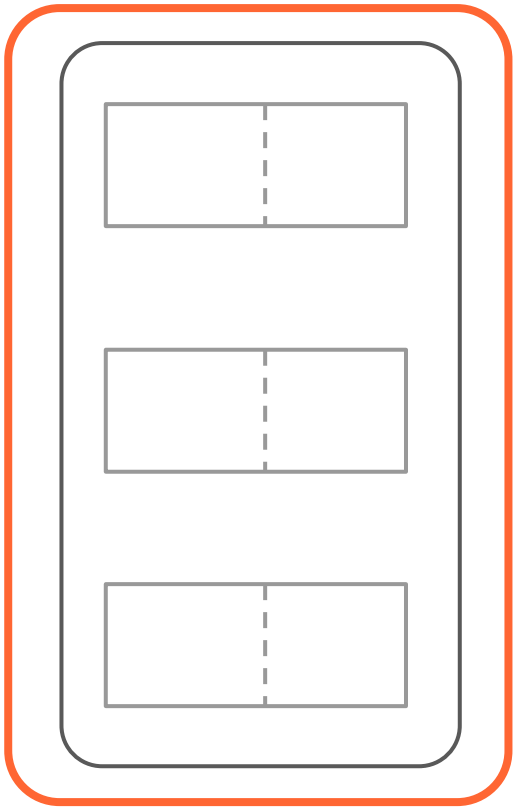
`lst[3]`



vector



matrix

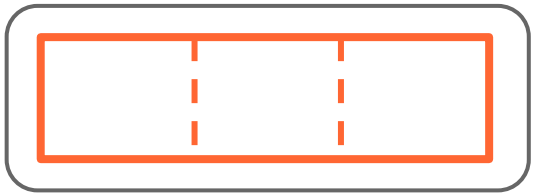


another list

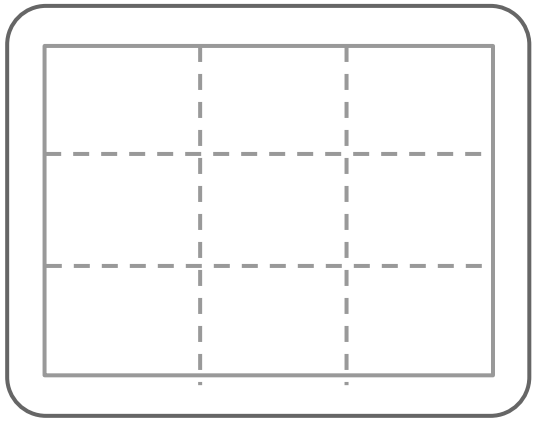
access object of list element

`list[[elem]]`

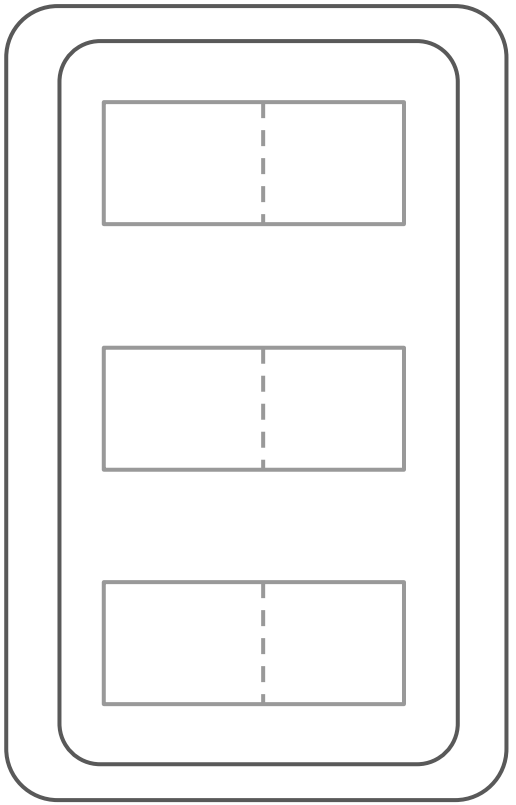
`lst[[1]]`



vector

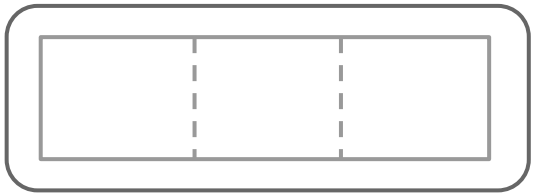


matrix

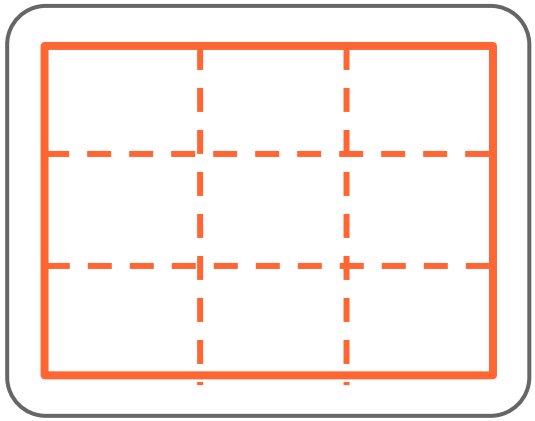


another list

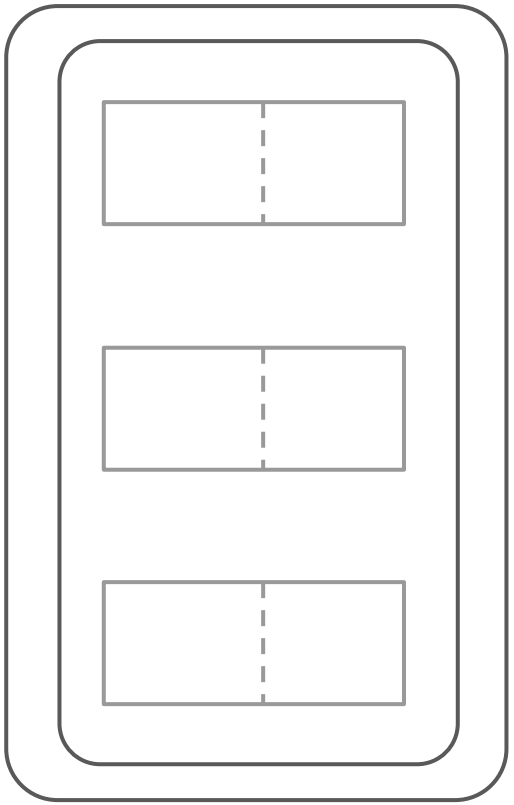
`lst[[2]]`



vector

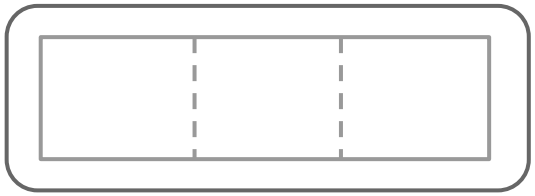


matrix

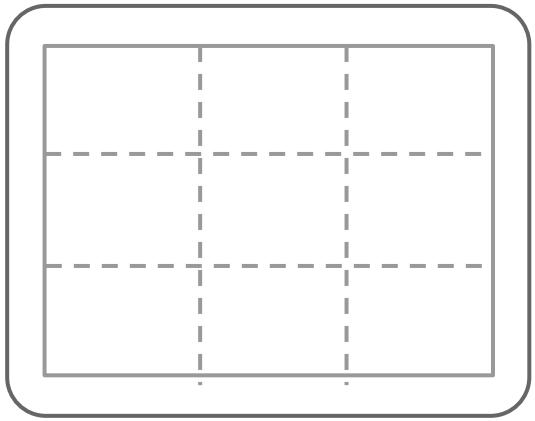


another list

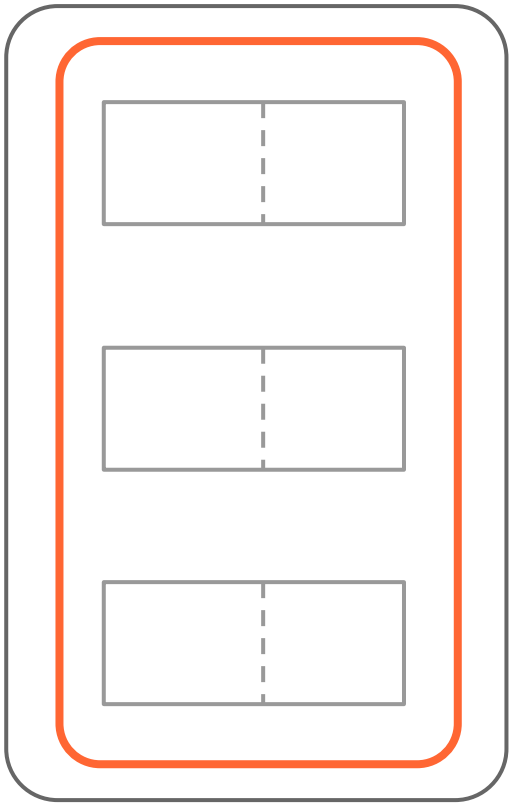
`lst[[3]]`



vector



matrix

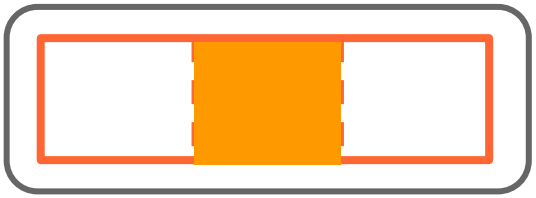


another list

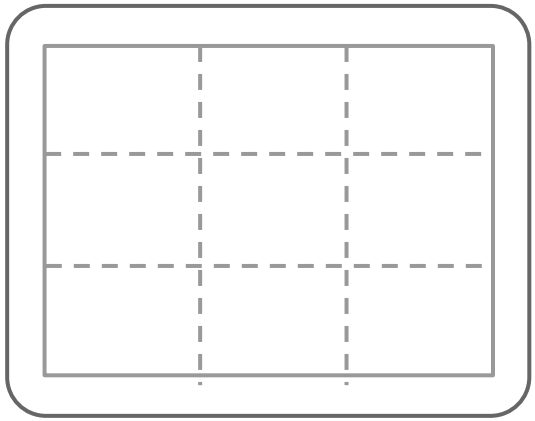
access object's elements,
of list element

```
list[[elem]][obj]
```

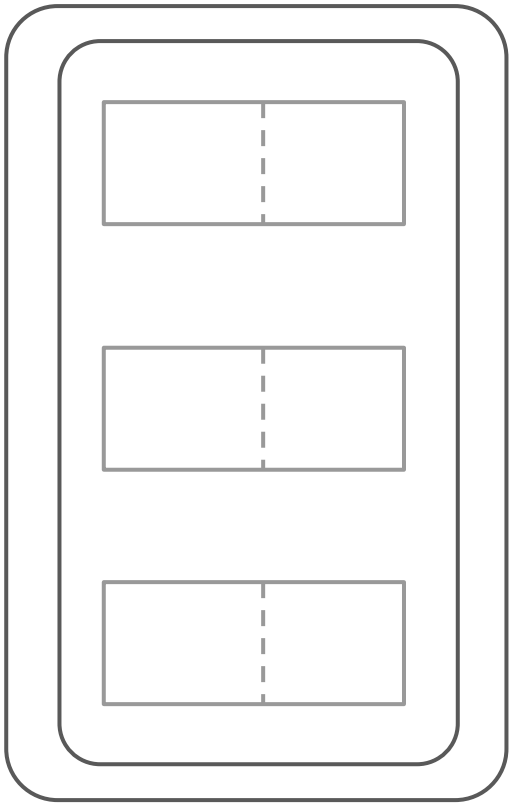
```
lst[[1]][2]
```



vector

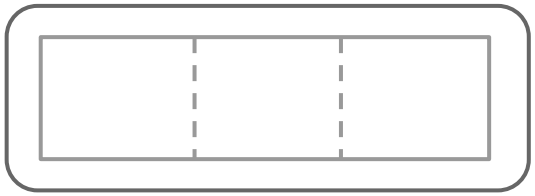


matrix

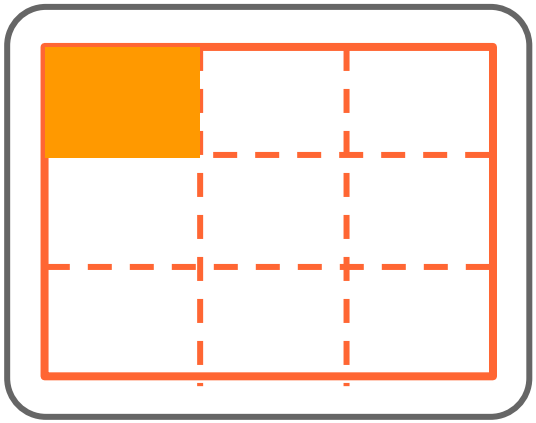


another list

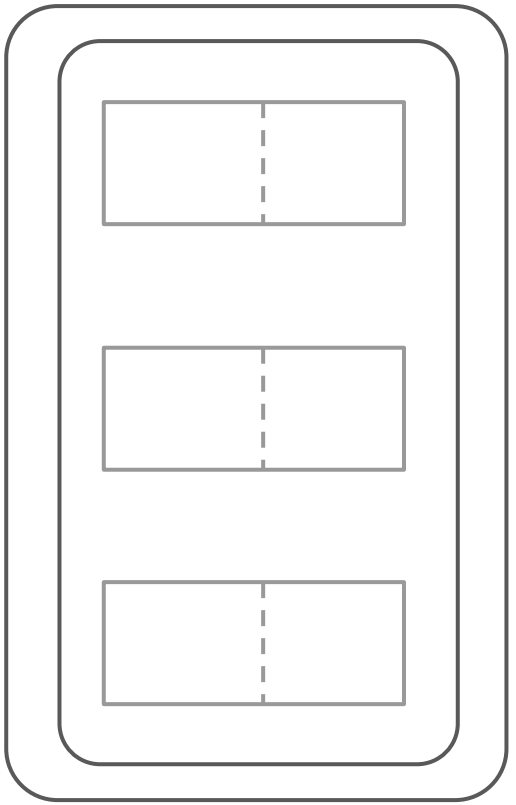
```
lst[[2]][1,1]
```



vector

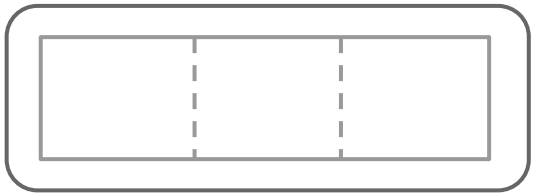


matrix

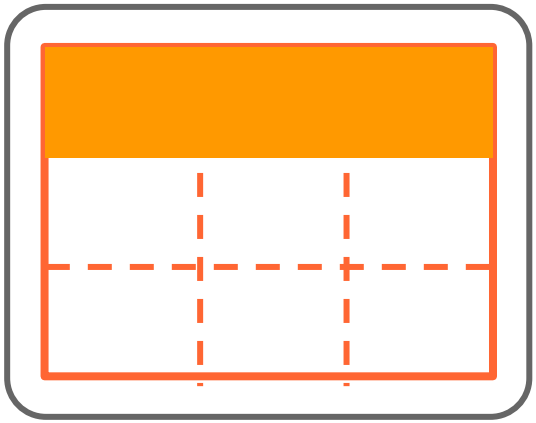


another list

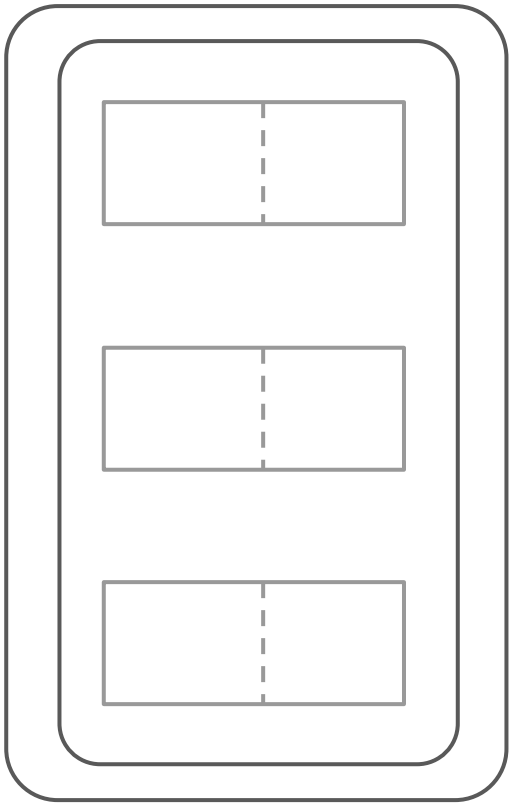
```
lst[[2]][1, ]
```



vector

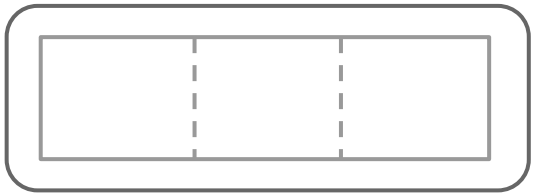


matrix

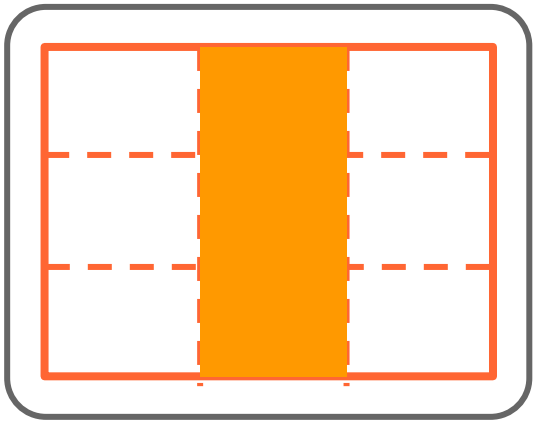


another list

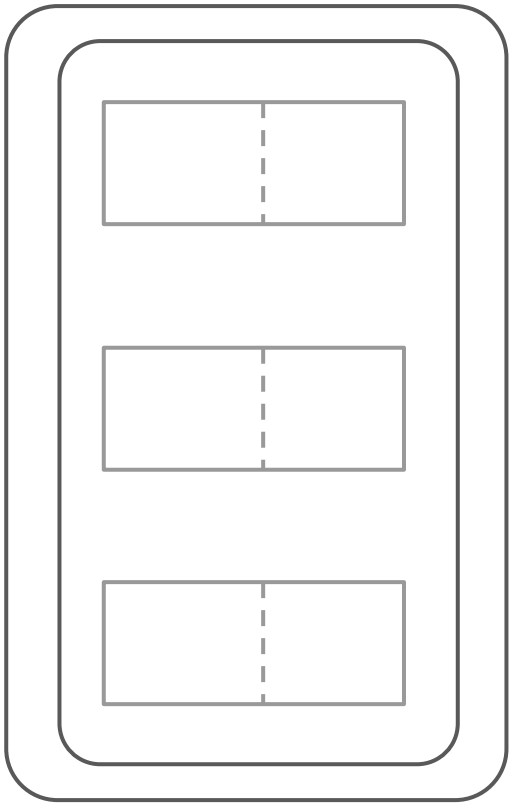
```
lst[[2]][ ,2]
```



vector

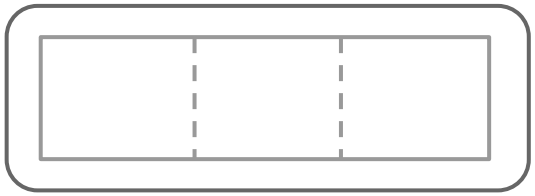


matrix

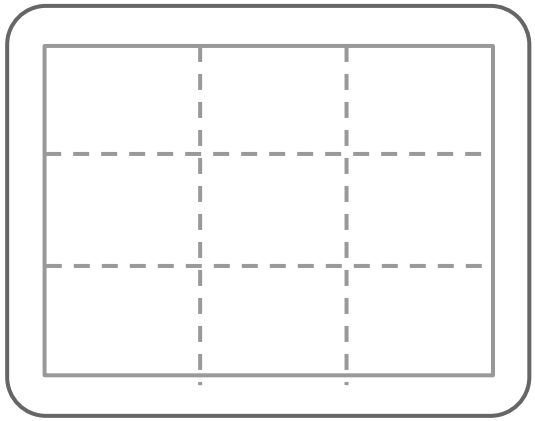


another list

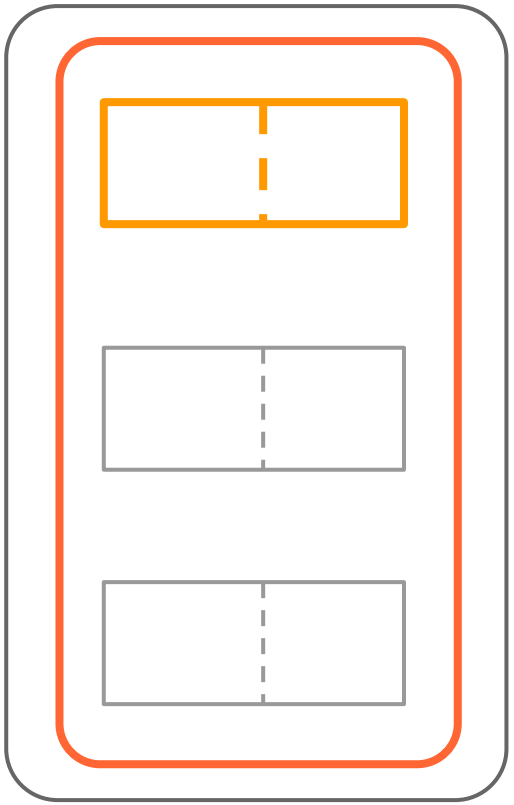
```
lst[[3]][1]
```



vector



matrix

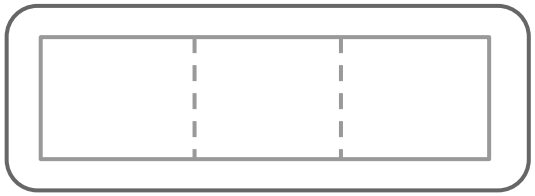


another list

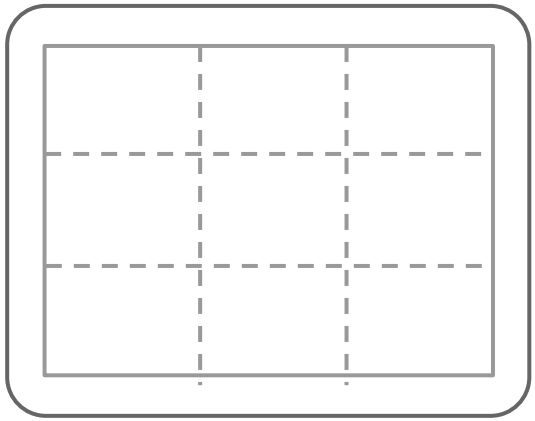
access object's elements,
of list element

```
list[[elem]][[obj]]
```

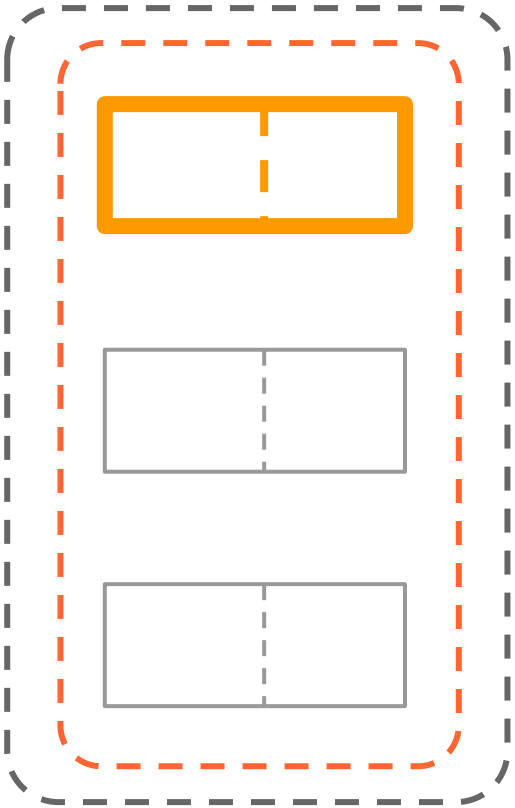
`lst[[3]][[1]]`



vector



matrix

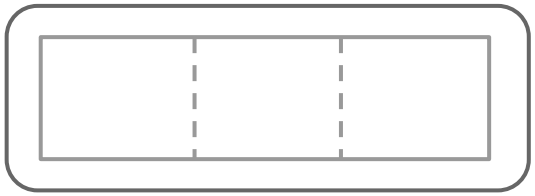


another list

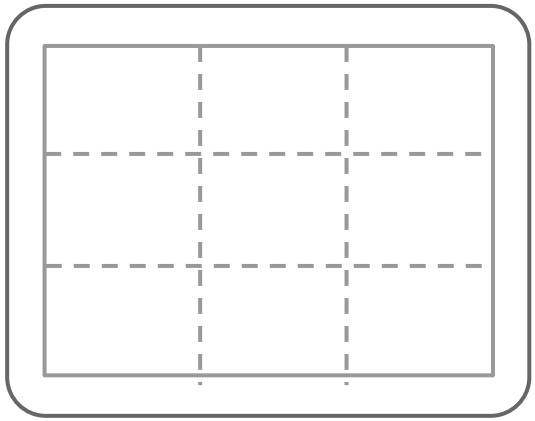
access element of object's elements, of list element

```
list[[elem]][[obj]][ind]
```

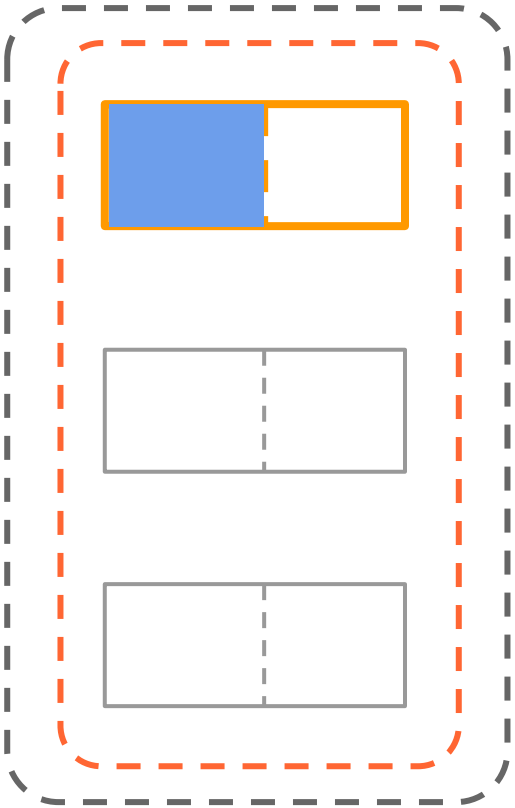
```
lst[[3]][[1]][1]
```



vector

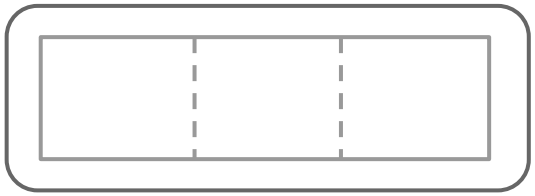


matrix

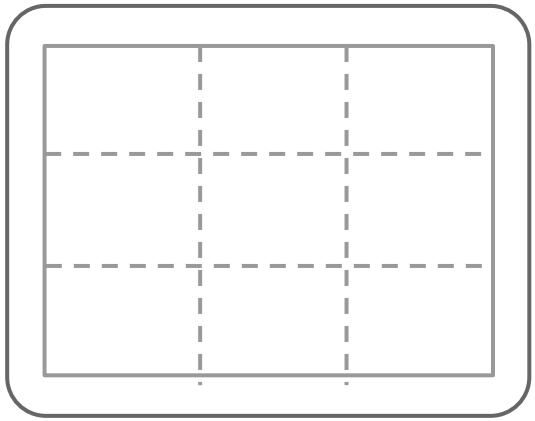


another list

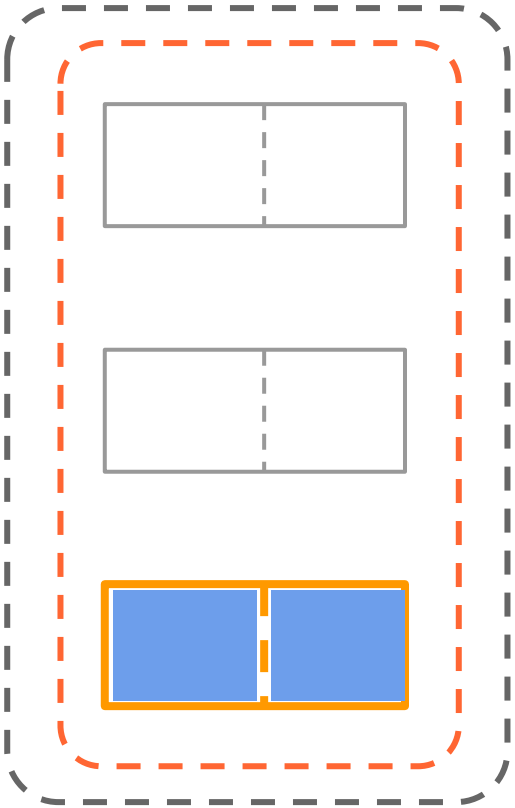
```
lst[[3]][[3]][c(1,2)]
```



vector



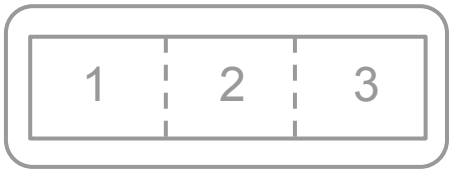
matrix



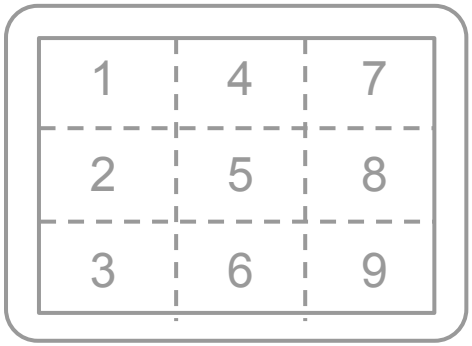
another list

Dollar Notation

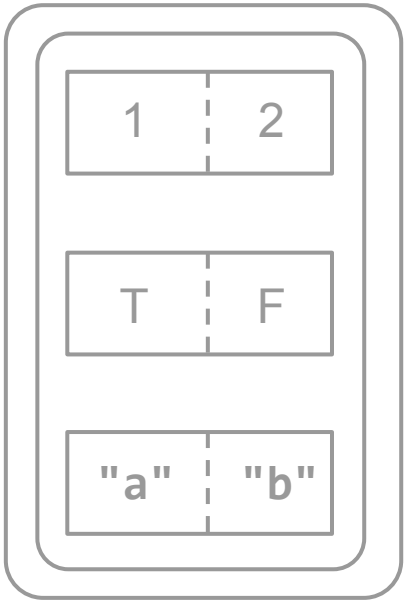
```
lst <- list(
  vec = c(1, 2, 3),
  mat = matrix(1:9, nrow = 3, ncol = 3),
  lis = list(1:2, c(TRUE, FALSE), c("a", "b"))
)
```



"vec"



"mat"

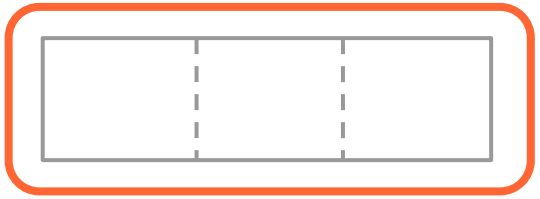


"lis"

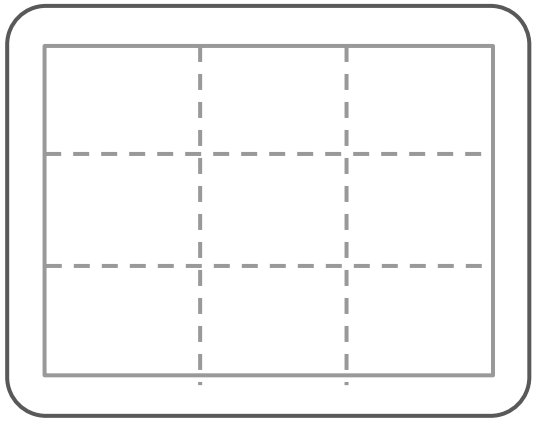
access list named element(s)

```
list$name
```

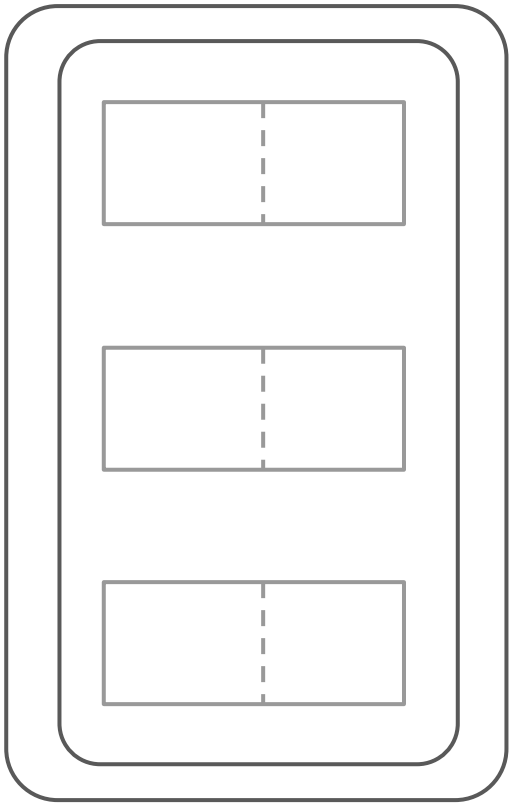
lst$vec



"vec"

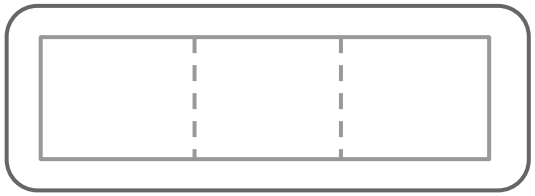


"mat"

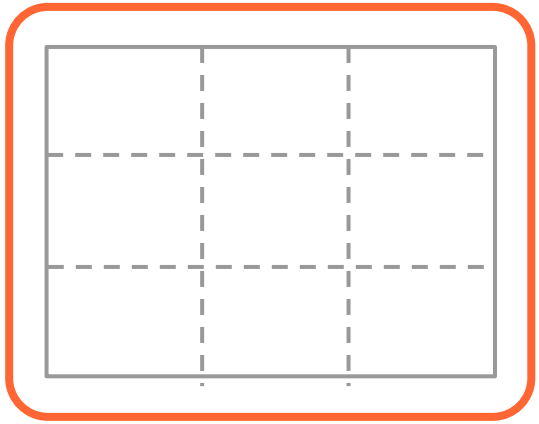


"lis"

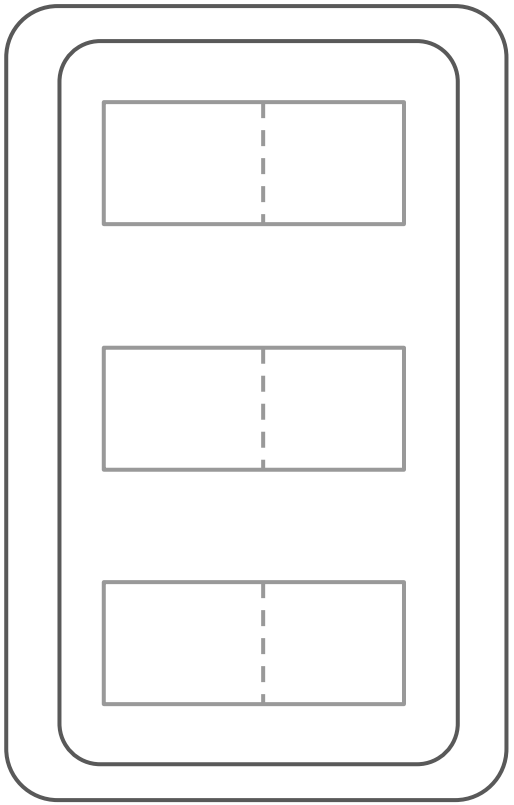
lst$mat



"vec"

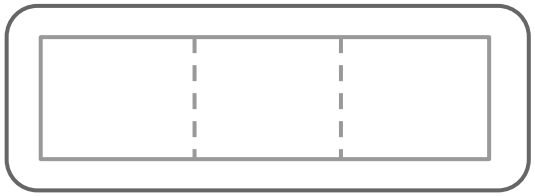


"mat"

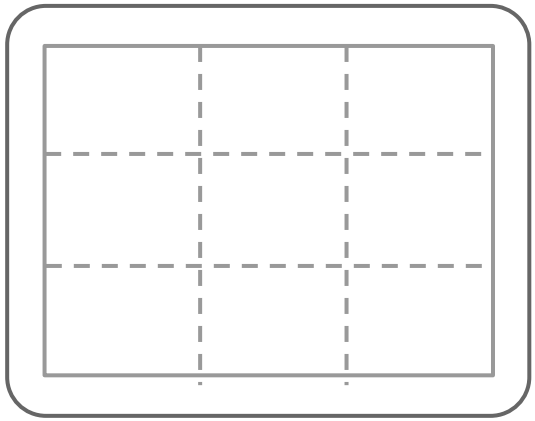


"lis"

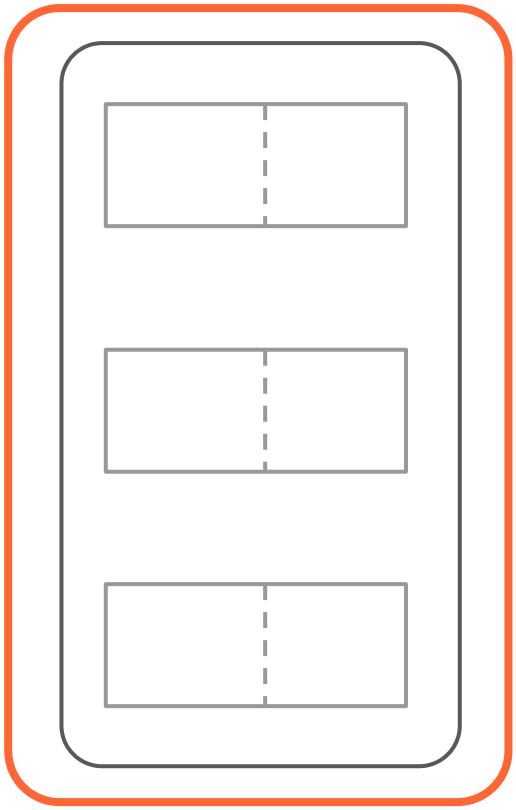
lst$lis



"vec"



"mat"

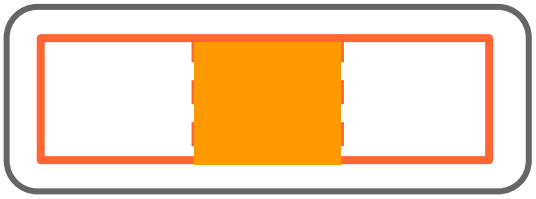


"lis"

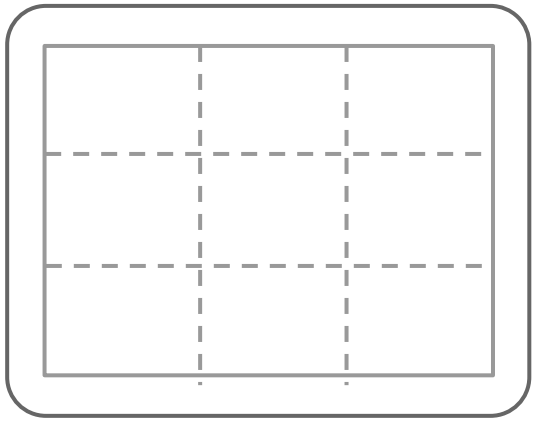
access list named element(s)

```
list$name[ind]
```

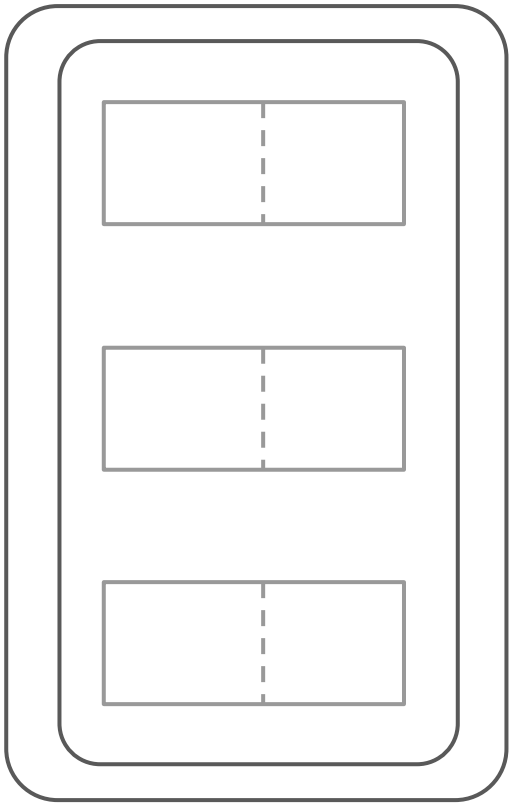
```
lst$vec[2]
```



"vec"

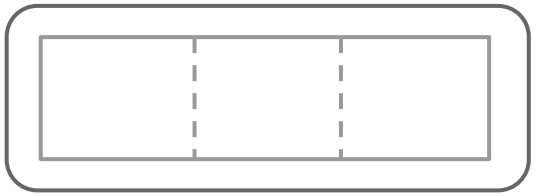


"mat"

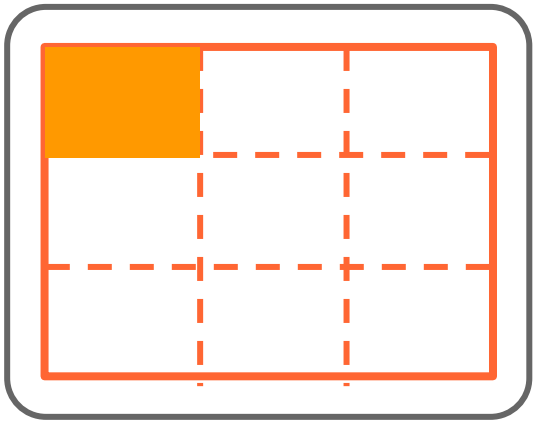


"lis"

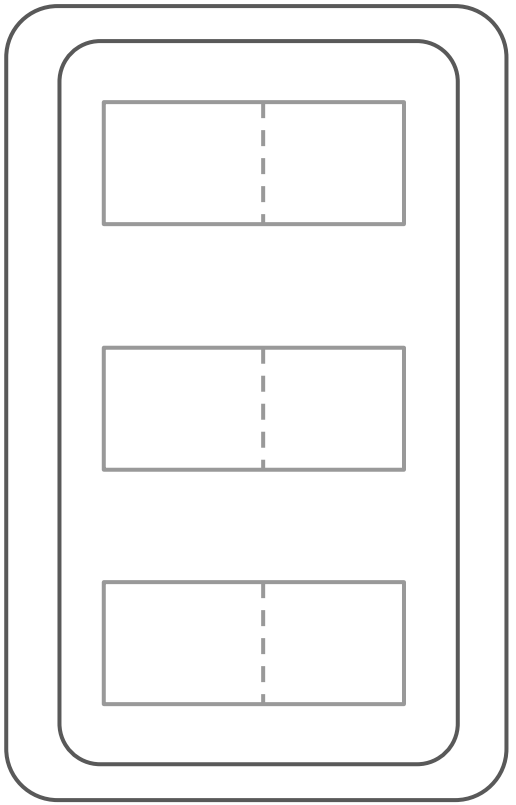
```
lst$mat[1,1]
```



"vec"

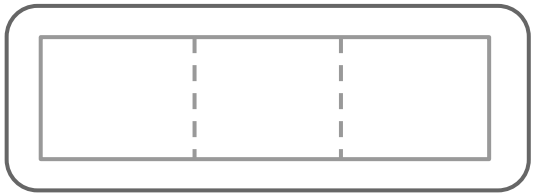


"mat"

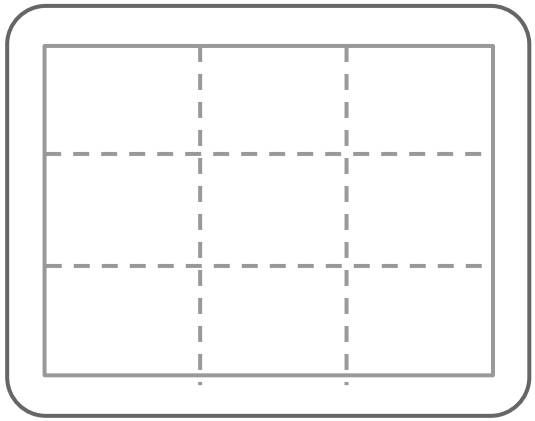


"lis"

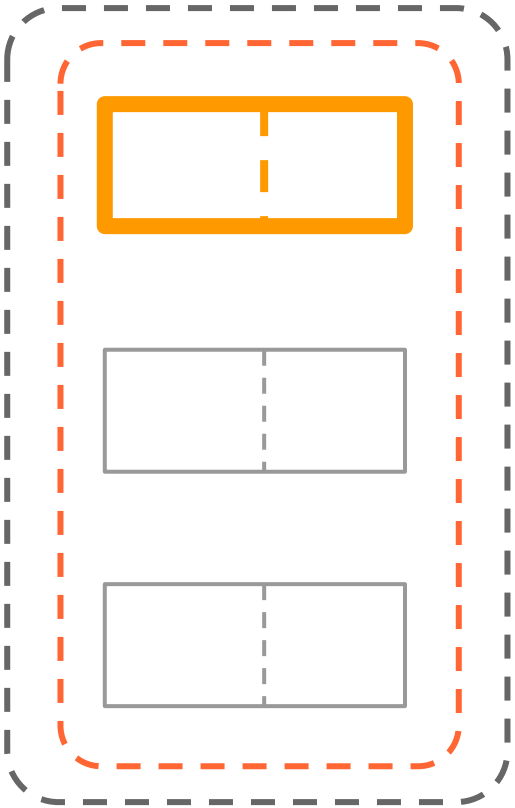
```
lst$lis[[1]]
```



"vec"

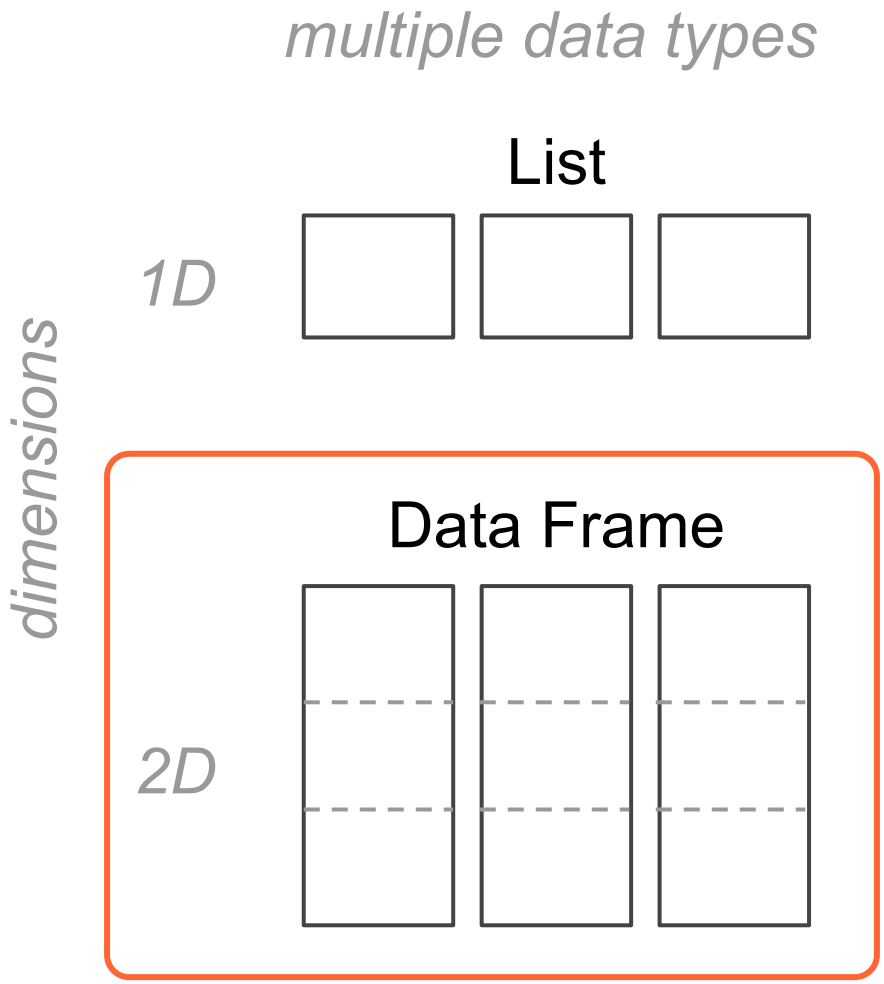


"mat"



"lis"

Special list: Data Frames



We'll talk about data frames later