

The R Project for Statistical Computing



R Language Data Objects 物件



R: An Introduction Accessing data.

Data formats



Data types

Data structures

Data types



Numeric-(integer, single, double) Character Logical Complex

• • •

Data structures



Vector Matrix/Array Data frame List Others... (Date/POSIXct/POSIXIt/ts)

Vector

- -1+numbers in a 1D array
- -All same data type
- -R basic data object

Matrix

- -Two dimensions
- -Same length
- -Same data class
- -Columns not named (index number)

Array

-Identical to a matrix But 3+dimensions

Data frame

- -Can have vectors of multiple data types
- -All same length
- -Closest R analogue to spreadsheet
- -Special functions

List

- -Most flexible
- -Ordered collection of elements
- -Any class, length, or structure
- -Can include lists

- A and a are different
- All alphanumeric symbols are allowed (A-Z, a-z, 0-9) . _
- Name must start with . or a letter

Be meaningful



Wrong

3x

3_x

3-x

3.X

.3variable

Correct

 x_3

x3

x.3

taipei.x3

.variable

Function name

GOOD: CalculateAvg

BAD: calculate_avg

BAD: calculateAvg

Variable name

GOOD: avg.clicks

OK: avgClicks

BAD: avg_Clicks



Use "<-" to assign values to a variable

Use "#" to be
Prompt symbol

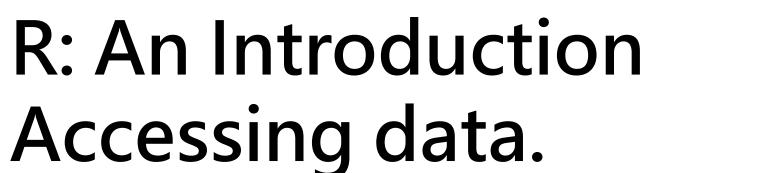


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Objects

```
objects(), ls(), rm(), object.size()
print(object.size(), units = "b")
```

TRY it in R





R_data_objects_a.R



R: An Introduction Accessing data. Coercing

Table 2.4. Functions for testing (is) the attributes of different categories of object (arrays, lists, etc.) and for coercing (as) the attributes of an object into a specified form. Neither operation changes the attributes of the object.

Туре	Testing	Coercing
Array	is.array	as.array
Character	is.character	as.character
Complex	is.complex	as.complex
Dataframe	is.data.frame	as.data.frame
Double	is.double	as.double
Factor	is.factor	as.factor
List	is.list	as.list
Logical	is.logical	as.logical
Matrix	is.matrix	as.matrix
Numeric	is.numeric	as.numeric
Raw	is.raw	as.raw
Time series (ts)	is.ts	as.ts
Vector	is.vector	as.vector

Coercing Types



as.integer as.numeric as.data.frame

TRY it in R

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R_data_objects_b.R



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Factors



An "attribute" of a vector that specifies the possible values and their order

TRY it in R





R_data_objects_c.R



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Special Functions for Vector

which



Return location index when the logical is True

Vector Arithmetic



```
+ - * / ^
%%餘數
%/% 整數商
log(x) logb(x,b)
pi exp(x)
sin cos tan
abs(x) sqrt(x)
length(x)
prod(x) 所有數列乘積
factorial(x) 階乘
sqrt()
```

Sort function (排序函數)



sort()-對向量進行從小到大的排序(內建)

rank()-顯示排序後元素的<u>名次</u>、內建<u>最小值</u>為 第一名

order()-顯示排序後元素的位置、內建最小值為 第一名

Character vector



Single(')/Double(") quotes

paste()

Logical vector



TRUE FALSE T, F

- ! =
- &: and
- | : or (pipe)

length



Number of elements

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R_data_objects_d.R



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Special Functions for Matrix

Matrix



dim diag A*B A %*% t(B)

Matrix



Some matrix functions		
t	Transpose	
diag	Diagonal	
%*%	Inner (dot) product of two vectors $x^t y$, matrix multiplication	
%0%	Outer product of two vectors xy ^t	
crossprod, tcrossprod	Cross products x^ty and xy^t of matrices	
det	Determinant	
solve	Inverse	
eigen	Eigenvalues and eigenvectors	
svd	Singular value decomposition	
qr	QR decomposition	
chol	Choleski decomposition	

TRY it in R





R_data_objects_e.R



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Rounding of Numbers

Rounding of Numbers



ceiling-不可小於x中元素的最小整數 floor-不可大於x中元素的最大整數 trunc-去掉小數位 round-可控制保留小數位數 getOption('digits' options(digits = 3)

TRY it in R





R_data_objects_f.R

課堂練習1: 學號-姓名-objects.R

有一班級80位學生之數學成績如下 (假設成績已按座號排序)

```
1 set.seed(1)
2 math.score <- sample(0:100, 80, replace = TRUE)
3 math.score
```

- (a)計算座號1-30號同學之成積平均數、標準差
- (b)共有多少人及格? 及格同學的座號為何?
- (c)全班最高分與最低分為何? 對應的同學座號為何?
- (d)計算班上分數排行前十名(由高分至低分)之成積平均數
- 標準差
- (e)屏幕顯示80位同學分數資料的第一個四分位數(Hint: summary())



課堂練習1: 學號-姓名-objects.R

上傳作業須知 #需附上R程式碼 #需以數值及文字描述,回答本次作業(a)~(e)小題答案

