Julia Fast scientific language

CONCEPTS

Julia compiles each method on first call, so the first run is slow and later calls are fast. Keep one REPL open.

Generic function name: area
↓ call with args
Dispatch all argument types
↓ first call
Method specialized, compiled
↓ cached
Fast native code reused after

Functions have many methods; the one chosen depends on the types of all arguments (multiple dispatch).

Arrays are 1-indexed, column-major, and a function ending in ! mutates its first argument.

COMMAND LINE

julia
Start the interactive REPL

julia *<file.jl> <args>*
Run a script; args land in ARGS

julia -e '*<expr>***'**
Evaluate an expression and exit

julia -E '*<expr>***'**
Evaluate and print the result

julia --project=*<dir>*
Activate the environment in a folder

julia -t *<n|auto>*
Set the number of threads

julia -p *<n|auto>*
Add local worker processes

julia -i *<file.jl>*
Run a file, then stay in the REPL

REPL

?
Help mode: docs for a name

]
Package mode

;
Shell mode: run a shell command

Backspace
Leave a special mode

Ctrl+D / exit()
Quit Julia

REPL (cont.)

Ctrl+C
Interrupt running code

@time *<expr>*
Time an expression and show allocations

include("*<file.jl>***")**
Evaluate a file in this session

using *<Pkg>*
Load a package's exports

PACKAGES

add *<pkg>*
Add a package to the environment

rm *<pkg>*
Remove a package

status
Show the environment (alias st)

up
Update packages

activate *<dir>*
Switch to the environment in a folder

instantiate
Install what Manifest.toml lists

test
Run the project's tests

BASICS

x = 3; y = x^2
Assign and exponentiate

println("x = $x")
Print with interpolation

if a < b ... elseif ... else ... end
Conditional

for i in 1:10 ... end
Loop over a range

function f(x, y=2; k=1) ... end
Function with default and keyword args

f(x) = x^2
Short function form

x → x^2
Anonymous function

Dict("a" ⇒ 1)
Dictionary

ARRAYS

[1, 2, 3]
Vector literal

[1 2; 3 4]
Matrix literal

A[i, j]
Element at row i, column j

A[2:end, :]
Slice; end is the last index

push!(v, x)
Append to a vector

length(v) / size(A)
Element count / dimensions

[f(x) for x in v if *<cond>***]**
Comprehension

f.(v)
Broadcast f over elements

v .+ 1
Elementwise operator

map(f, v) / filter(f, v)
Apply / keep matching

v[v .> 0]
Select by boolean mask

TYPES & DISPATCH

struct P x::Float64; y::Float64 end
Immutable composite type

mutable struct C n::Int end
Mutable composite type

area(s::Circle) = pi * s.r^2
Method for one type

abstract type Shape end
Abstract supertype

struct Circle <: Shape ... end
Declare a subtype

MACROS & TOOLING

@time f(x)
Time and allocation report

@btime f($x)
Accurate benchmark (BenchmarkTools)

HELP

?*<name>*
Docs for a function or type