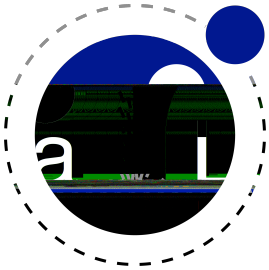
Lua 5.1
A Short Reference



Why Lua?

Lua has been selected as the scripting language of choice because of its speed, compactness, ease of embedding and most of all its gentle learning curve. These characteristics allow the user to create simple scripts right through to advanced programming solutions that a computing science graduate would relish. In other words, Lua has all the depth and sophistication of a modern language, yet remains very accessible to the non-programmer.
Lua originated in Brazil and has a very active and helpful forum. While originally conceived as a scientific data description language, its greatest single application area has been computer gaming. The characteristics that make it a popular for gaming closely match those required for data acquisition - an efficient scripting machine controlling a fast acquisition engine written in “C”.

Acknowledgments

Lua 5.1 Short Reference is a reformatted and updated version of Enrico Colombini’s “Lua 5.0 Short Reference (draft 2)” in which he acknowledged others “I am grateful to all people that contributed with notes and suggestions, including John Belmonte, Albert-Jan Brouwer, Tiago Dionizio, Marius Gheorghe, Asko Kauppi, Philippe Lhoste, Virgil Smith, Ando Sonenblick, Nick Trout and of course Roberto Ierusalimschy, whose ‘Lua 5.0 Reference Manual’ and ‘Programming in Lua’ have been my main sources of Lua lore”. This Lua 5.1 update further acknowledges and thanks Enrico Colombini’s for his Lua 5.0 Short Reference (draft 2), Roberto Ierusalimschy’s ‘Lua 5.1 Reference Manual’ and ‘Programming in Lua, 2nd Edition’ and more recently “Lua Programming Gems” edited by Luiz Henrique de Figueiredo et al.

This Short Reference update was initially done as a means of becoming familiar with Lua, so it has been edited, clarified and extended from the perspective of a new-comer to Lua. Thanks also to Matthias Seifert for some recent clarifying comments.

Graham Henstridge
Monday, 16 November 2009

Lua 5.1 Short Reference

Lua Core Language

Reserved words

and	**break**	**do**	**else**	**elseif**	**end**	**false**	**for**
function		**if**	**in**	**local**	**nil**	**not**	**or**
repeat	**return**	**then**	**true**	**until**	**while**		

_A... A system variable, where **A** any uppercase letter.

Other reserved strings

+ - * / % ^ # == ~= <= >= < > = ( )
{ } [ ] ; : , ...

Identifiers

Any string of letters, digits and underscores not starting with a digit and not a reserved word. Identifiers starting with underscore and uppercase letter are reserved.

Comments

--	Comment to end of line.
--[[... **]]**	Multi-line comment (commonly --[[to --]])
#!	At start of first line for Linux executable.

Strings and escape sequences

' ' " " [[ ]] [=[ ]=]
string delimiters; **[[ ]]** can be multi-line, escape sequences ignored. If **[=[ ]=]** number of **=**'s must balance.

\a - bell	**\b** - backspace	**\f** - form feed
\n - newline	**\r** - return	**\t** - tab
\v - vert. tab	**** - backslash	**\"** - double quote
\' - single quote	**\[** - square bracket	**\]** - square bracket

\ddd (character represented decimal number).

Types

Type belongs to the value, NOT the variable:

boolean	**nil** and **false** count as **false**, all other **true** including **0** and null string. Use **type(*x*)** to discover type of ***x***.
number	64 bit IEEE floating point
string	Can include zero, internally hashed.
table	Index by numbers, strings
function	Can return multiple values
thread	A cooperative coroutine.
userdata	C pointer to a C object. Can be assigned a metatable to allow use like a table or function
nil	A special value meaning “nothing”.

Operators in precedence order

^	(right-associative, math lib required)
not	**#** (length) **–** (unary negative)(unary positive illegal)
*****	**/** **%**
+	**–**
..	(string concatenation, right-associative)
<	**>** **<=** **>=** **~=** **==**
and	(stops on **false** or **nil,** returns last evaluated value)
or	(stops on **true** (not **false** or **nil**), returns last evaluated value)

Assignment and coercion examples

a = 5	Simple assignment.
a = “hi”	Variables are not typed, they can hold different types.
a, b, c = 1, 2, 3	Multiple assignment.
a, b = b, a	Swap values, because right side values evaluated before assignment.
a, b = 4, 5, 6	Too many values, **6** is discarded.
a, b = “there”	Too few values, **nil** is assigned to **b**.
a = nil	**a**’s prior value will be garbage collected if unreferenced elsewhere.
a = #b	Size of **b.** If table, first index followed by **nil**.
a = z	If z is not defined **a** = **nil**.
a = “3” + “2”	Strings converted to numbers: **a = 5**.
a = 3 .. 2	Numbers are converted to strings: **a = "32"**.

Conditional expression results

False: **false** and **nil** values only
True: anything not false, including 0 and empty strings

Relational and boolean examples

“abc” < “abe”	True: based first different character
“ab” < “abc”	True: missing character is less than any

Scope, blocks and chunks

By default all variables have global scope from first use.

local	Reduces scope from point of definition to end of block. **local** ***var_name*** initialized to **nil**. Locals significantly faster to access
block	Is the body of a control structure, body of a function or a chunk.
chunk	A file or string of script.

Control structures

In following exp and var have local scope
if exp **then** block {**elseif** exp **then** block} [**else** block] **end**
do block **end** (simply a means of forcing local scope)
while exp **do** block **end**
repeat block **until** exp
for var **=** from_exp, to_exp [, step_exp] **do** block **end**
for var(s) **in** iterator **do** block **end** (var(s) local to loop)
break, **return** exits loop, but must be last statement in block

Table constructors

t = {}	New empty table assigned to **t**.
t = {"yes", "no"}	A array, **t[1]** = **yes**, **t[2]** = **no**.
t = {[2] = "no", [1] = "yes"}	Same as line above.
t = {[-900] = 3, [900] = 4}	Sparse array, two elements.
t = {x=5, y=10}	Hash table **t["x"]**, **t["y"]**, **t.x**, **t.y**
t = {x=5, y=10; "yes", "no"}	Mixed fields: **t.x**, **t.y**, **t[1]**, **t[2]**.
t = {"choice", {"yes", "no"}}	Nested table .

See **table.insert()** etc. below for additional info.

Function definition

Functions can return multiple results.
function name **(** ***args*** **)** body [**return** values] **end**
Global function.
local function name **(** ***args*** **)** body [**return** values] **end**
Function local to chunk.
f = function (***args*** **)** body [**return** values] **end**
Anonymous function assigned to variable **f**
function (***...*** **)** body [**return** values] **end**
(***...***) indicates variable args and {***...***} places them in a table accessed as … .
function t.name **(** ***args*** **)** body [**return** values] **end**
Shortcut for t.name = **function** [...]
function obj:name **(** ***args*** **)** body [**return** values] **end**
Object function getting extra ***arg*** **self**.

Function call

f (***args*** **)**	Simple call, returning zero or more values.
f ***arg***	Calling with a single string or table argument
t.f (*args***)**	Calling function stored in field **f** of table **t**.
t:f (*args***)**	Short for **t.f (t,** ***args*****).**
arg**:f**	Short for **f (** ***arg*** **).**

Metatable operations

Base library required. Metatable operations allow redefining and adding of new table behaviours.
setmetatable (***t, mt*** **)**
Sets mt as metatable for ***t***, unless ***t***'s metatable has a **__metatable** field. Returns ***t***
getmetatable (t)
Returns **__metatable** field of ***t***'s metatable, or ***t***'s metatable, or **nil**.
rawget (***t, i*** **)**
Gets ***t[i]*** of a table without invoking metamethods.
rawset (***t, i, v*** **)**
Sets ***t[i]*** = ***v*** on a table without invoking metamethods.

rawequal (*t1*, *t2*)
Returns boolean (*t1* == *t2*) without invoking metamethods.

Metatable fields for tables and userdata

__add	Sets handler **h (*a*, *b*)** for '**+**'.
__sub	Sets handler **h (*a*, *b*)** for binary '**-**'.
__mul	Sets handler **h (*a*, *b*)** for '*****'.
__div	Sets handler **h (*a*, *b*)** for '**/**'.
__pow	Sets handler **h (*a*, *b*)** for '**^**'.
__unm	Sets handler **h (*a*)** for unary '**-**'.
__concat	Sets handler **h (*a*, *b*)** for '**..**'.
__eq	Sets handler **h (*a*, *b*)** for '**==**', '**~=**'.
__lt	Sets handler **h (*a*, *b*)** for '**<**', '**>**' and '**<=**', '**>=**' if no **__le**
__le	Sets handler **h (*a*, *b*)** for '**<=**', '**>=**'.
__index	Sets handler **h (*t*, *k*)** for non-existing field access.
__newindex	Sets handler **h (*t*, *k*)** for assignment to non-existing field.
__call	Sets handler **h (*f*, *...*)** for function call,using the object as a function.
__tostring	Sets handler **h (*a*)** to convert to string, e.g. for **print ( )**.
__gc	Set finalizer **h (*ud*)** for userdata (can be set from the C side only).
__mode	Table mode: '**k**' = weak keys, '**v**' = weak values, '**kv**' = both.
__metatable	Set value returned by **getmetatable ( )**.

The Basic Library

The Basic Library provides many standard functions and does not require a prefix as with add-on libraries.

Environment and global variables

getfenv ([*f*])
If *f* a function, returns its environment; if *f* a number, returns the environment of function at level *f* (1 = current [default], 0 = global); if the environment has a field **__fenv**, that is returned.

setfenv (*f*, *t*)
Sets environment for function *f* or function at level *f* (0 = current thread); Returns *f* or nothing if *f*=0 ; if the original environment has a field **__fenv**, raises an error.

_G	Variable whose value = global environment.
_VERSION	Variable with interpreter's version.

Loading and executing

require (*module*)
Loads *module* and returns final value of **package.loaded [*module*]** or raises error. In order, checks if already loaded, for Lua module, for C library.

module (*name* [, *...*])
Creates a module. If a table in package.loaded[*name*] this is the module, else if a global table **t** of *name*, that table is the module, else creates new table **t** assigned to *name*. Initializes **t._NAME** to *name*, **t._M** to **t** and **t._PACKAGE** with package *name*. Optional functions passed to be applied over module

dofile ([*filename*])
Loads and executes the contents of *filename* [default: standard input]. Returns file's returned values.

load (*function* [, *name*])
Loads a chunk using *function* to get its pieces. Each *function* call to return a string (last = **nil**) that is concatenated. Returns compiled chunk as a function or **nil** and error message. Optional chunk *name* for debugging.

loadfile (*filename*)
Loads contents of *filename*, without executing. Returns compiled chunk as function, or **nil** and error message.

loadstring (*string* [, *name*])
Returns compiled *string* chunk as function, or **nil** and error message. Sets chunk *name* for debugging.

loadlib (*library*, *func*)
Links to dynamic *library* (*.so* or *.dll*). Returns function named *func*, or **nil** and error message.

pcall (*function* [, *args*])
Calls *function* in protected mode; returns **true** and results or **false** and error message.

xpcall (*function*, *handler*)
As **pcall ()** but passes error *handler* instead of extra args; returns as **pcall ()** but with the result of *handler ()* as error message, (use **debug.traceback ()** for extended error info).

Simple output and error feedback

print (*args*)
Prints each of passed *args* to **stdout** using **tostring**.

error (*msg* [, *n*])
Terminates the program or the last protected call (e.g. **pcall ()**) with error message *msg* quoting level *n* [default: 1, current function].

assert (*v* [, *msg*])
Calls error (*msg*) if *v* is **nil** or false [default *msg*: "**assertion failed!**"].

Information and conversion

select (*i*, *...*)
For numeric index *i*, returns the *i*'th argument from the *...* argument list. For *i* = string **"#"** (including quotes) returns total number of arguments including **nil**'s.

type (*x*)
Returns type of *x* as string e.g. "**nil**", "**string**", "**number**".

tostring (*x*)
Converts *x* to a string, using table's metatable's **__tostring** if available.

tonumber (*x* [, *b*])
Converts string *x* representing a number in base *b* [2..36, default: 10] to a number, or **nil** if invalid; for base 10 accepts full format (e.g. "1.5e6").

unpack (*t*)
Returns *t* **[1]..***t* **[n]** as separate values, where **n** = **#***t*.

Iterators

ipairs (*t*)
Returns an iterator getting index, value pairs of array *t* in numeric order.

pairs (*t*)
Returns an iterator getting key, value pairs of table *t* in no particular order.

next (*t* [, *index*])
Returns next index-value pair (**nil** when finished) from *index* (default **nil**, i.e. beginning) of table *t*.

Garbage collection

collectgarbage (*option* [, *v*])
where *option* can be:

"**stop**"	Stops garbage collection.
"**restart**"	Restart garbage collection.
"**collect**"	Initiates a full garbage collection.
"**count**"	Returns total memory used.
"**step**"	Perform garbage collection step size *v*, returns true if it finished a cycle.
"**setpause**"	Set **pause** (default 2) to *v*/100. Larger values is less aggressive.
"**setstepmul**"	Sets **multiplier** (default 2) to *v*/100. Controls speed of collection relative to memory allocation.

Coroutines

coroutine.create (*function*)
Creates a new coroutine with *function*, and returns it.

coroutine.resume (*coroutine*, *args*)
Starts or continues running *coroutine*, passing *args* to it. Returns **true** (and possibly values) if *coroutine* calls **coroutine.yield ( )** or terminates, or returns **false** and error message.

coroutines.running ( )
Returns current running coroutine or **nil** if main thread.

coroutine.yield (*args*)
Suspends execution of the calling coroutine (not from within C functions, metamethods or iterators), any *args* become extra return values of **coroutine.resume ( )**.

coroutine.status (*co*)
Returns the status of coroutine *co* as a string: either "**running**", "**suspended**" or "**dead**".
coroutine.wrap (*function*)
Creates coroutine with *function* as body and returns a function that acts as **coroutine.resume ( )** without first arg and first return value, propagating errors.

Modules and the Package Library

A package is a collection of modules. A module is library that defines a global name containing a table that contains everything the module makes available after being **require()**'d
module (*module*, ...)
Creates *module* which is a table in package.loaded[*module*], a global table named *module* or a new global table is created
package.path, package.cpath
Variable used by **require ( )** for a Lua or C loader. Set at startup to environment variables LUA_PATH or LUA_CPATH. (see Path Formats below).
package.loaded
Table of packages already loaded. Used by **require ( )**
package.loadlib (*library*, *function*)
Dynamically links to *library*, which must include path. Looks for *function* and returns it,or **0** and error message.
package.preload
A table to store loaders for specific modules (see **require**).
package.seeall (*module*)
Sets a metatable for *module* with **_index** field referring to global environment.

Path Formats

A path is a sequence of path templates separated by semicolons. For each template, **require (*filename*)** will substitute each "?" by *filename*, in which each dot replaced by a "directory separator" ("/" in Linux); then it will try to load the resulting file name. Example:
require (*dog.cat*) with path **/usr/share/lua/?.lua;lua/?.lua** will attempt to load ***cat*.lua** from **/usr/share/lua/*dog*/** or **lua/*dog*/**

The Table Library

Tables as arrays (lists)

table.insert (*table*, [*i*,] *v*)
Inserts *v* at numerical index *i* [default: after the end] in *table*, increments table size.
table.remove (*table* [, *i*])
Removes element at numerical index *i* [default: last element] from *table*, decrements table size, returns removed element.
table.maxn (*table*)
Returns largest positive numeric index of *table*. Slow.
table.sort (*table* [, *cf*])
Sorts (in-place) elements from *table*[1] to *table*[#*t*], using compare function *cf* (*e1*, *e2*) [default: '<']. May swap equals.
table.concat (*table* [, *string* [, *i* [, *j*]]])
Returns a single string made by concatenating table elements *table*[*i*] to *table*[*j*] (default: *i* =1, *j* = table length)separated by *string* (default = *nil*). Returns empty string if no given elements or *i* > *j*

Iterating on table contents

Use the **pairs** or **ipairs** iterators in a **for** loop. Example:
for *k*, *v* in pairs(*table*) do print (*k*, *v*) end
will print the key (*k*) and value (*v*) of all the *table*'s content.

The Math Library

Basic operations

math.abs (*x*) Returns the absolute value of *x*.
math.fmod (*x*, *y*) Returns the remainder of *x* / *y* as a rounded-down integer, for *y* **~= 0**.
math.floor (*x*) Returns *x* rounded down to integer.
math.ceil (*x*) Returns *x* rounded up to the nearest integer.
math.min(*args*) Returns minimum value from *args*.
math.max(*args*) Returns maximum value from *args*.
math.huge Returns largest represented number
math.modf (*x*) Returns integer AND fractional parts of *x*

Exponential and logarithmic

math.sqrt (*x*) Returns square root of *x*, for *x* >= 0.
math.pow (*x*, *y*) Returns x raised to the power of y, i.e. ***x*^*y***; if *x* < 0, *y* must be integer.
math.exp (*x*) Returns **e** to the power of *x*, i.e. **e^*x***.
math.log (*x*) Returns natural logarithm of *x*, for *x* >= 0.
math.log10 (*x*) Returns base-10 log of *x*, for *x* **>= 0**.
math.frexp (*x*) If *x* = m**2**^{e}, returns **m** (0, 0.5-1) and integer **e**
math.ldexp (*x*, *y*) Returns *x***2**^{y} with *y* an integer.

Trigonometrical

math.deg (*a*) Converts angle *a* from radians to degrees.
math.rad (*a*) Converts angle *a* from degrees to radians.
math.pi Constant containing the value of **Pi**.
math.sin (*a*) Sine of angle *a* in radians.
math.cos (*a*) Cosine of angle *a* in radians.
math.tan (*a*) Tangent of angle *a* in radians.
math.asin (*x*) Arc sine of *x* in radians, for *x* in [-1, 1].
math.acos (*x*) Arc cosine of *x* in radians, for *x* in [-1, 1].
math.atan (*x*) Arc tangent of *x* in radians.

Pseudo-random numbers

math.random ([*n* [, *m*])
Pseudo-random number in range [0, 1], [1, *n*] or [*n*, *m*].
math.randomseed (*n*)
Sets a seed *n* for random sequence. Same seed, same sequence.

The String Library

Basic operations

String indices start from 1. Negative indices from end of string so -1 is last element of string. String element values 0-255.
string.len (*string*)
Returns length of *string*, including embedded zeros.
string.sub (*string*, *i* [, *j*])
Returns substring of *string* from position *i* to *j* [default: -1 which is to end].
string.rep (*string*, *n*)
Returns a string of *n* concatenated copies of *string*.
string.upper (*string*)
Returns a copy of *string* converted to uppercase.
string.lower (*string*)
Returns a copy of *string* converted to lowercase.
string.reverse (*string*)
Returns a string that is the reverse of *string*.

Character codes

string.byte (*string* [, *i*])
Numeric ascii code of character at position *i* [default: **1**] in *string*, or **nil** if invalid *i*.
string.char (*args*)
Returns a string from ascii codes passed as *args*.

Formatting

string.format (*string* [, *args*])
Returns a copy of *string* where formatting directives beginning with '**%**' are replaced by the value of [, *args*]:
% [flags] [field_width] [.precision] type

Types

%d Decimal integer.
%o Octal integer.

%x	**%X**	Hexadecimal integer lowercase, uppercase.
%f		Floating-point in the form [-]nnnn.nnnn.
%e	**%E**	Floating-point in exp. form [-]n.nnnn e [+|-]nnn, uppercase if **%E**.
%g	**%G**	Floating-point as **%e** if exp. < -4 or >= precision, else as **%f**; uppercase if **%G**.
%c		Character having the code passed as integer.
%s		String with no embedded zeros.
%q		String between double quotes, with special characters escaped.
%%		The '**%**' character (escaped)

Flags

-	Left-justifies, default is right-justify.
+	Prepends sign (applies to numbers).
(space)	Prepends sign if negative, else space.
#	Adds "**0x**" before **%x**, force decimal point; for **%e**, **%f**, leaves trailing zeros for **%g**.

Field width and precision

n	Puts at least **n** characters, pad with blanks.
0n	Puts at least **n** characters, left-pad with zeros
.n	Use at least **n** digits for integers, rounds to **n** decimals for floating-point or no more than **n** chars. for strings.

Formatting examples

string.format ("dog: %d, %d",7,27)	dog: 7, 27
string.format ("<%5d>", 13)	< 13>
string.format ("<%-5d>", 13)	<13 >
string.format ("<%05d>", 13)	<00013>
string.format ("<%06.3d>", 13)	< 013>
string.format ("<%f>", math.pi)	<3.141593>
string.format ("<%e>", math.pi)	<3.141593e+00>
string.format ("<%.4f>", math.pi)	<3.1416>
string.format ("<%9.4f>", math.pi)	< 3.1416>
string.format ("<%c>", 64)	<@>
string.format ("<%6.4s>", "goodbye")	< good>
string.format("%q",[[she said "hi"]])	"she said "hi""

Finding, replacing, iterating

string.find (*string*, *pattern* [, *i* [, *d*]])
Returns first and last position of *pattern* in *string*, or **nil** if not found, starting search at position *i* [default: 1]; returns parenthesized 'captures' as extra results. If *d* is true, treat pattern as plain string. (see Patterns below)

string.gmatch (*string*, *pattern*)
Returns an iterator getting next occurrence of *pattern* (or its captures) in *string* as substring(s) matching the *pattern*. (see Patterns below)

string.match (*string*, *pattern*)
Returns the first capture matching *pattern* (see Patterns below) or **nil** if not found.

string.gsub (*string*, *pattern*, *r* [, *n*])
Returns copy of *string* with up to *n* [default: **1**] occurrences of *pattern* (or its captures) replaced by *r*. If *r* is a string (*r* can include references to captures of form **%n**). If *r* is table, first capture is key. If *r* is function, it is passed all captured substrings, and should return replacement string, alternatively with a **nil** or **false** return, original match is retained. Returns second result number of substitutions (see Patterns below).

Patterns and pattern items

General pattern format: pattern_item [pattern_items]

cc	Matches a single character in the class **cc** (see Pattern character classes below).
cc*	Matches zero or more characters in the class **cc**; matches longest sequence.
cc-	Matches zero or more characters in the class **cc**; matches shortest sequence.
cc+	Matches one or more characters in the class **cc**; matches longest sequence.
cc?	Matches zero or one character in the class cc.
%n	(n = 1..9) Matches **n**-th captured string.
%bxy	Matches balanced string from character **x** to character **y** (e.g. nested parenthesis).
^	Anchor pattern to string start, must be first in pattern.
$	Anchor pattern to string end, must be last in pattern.

Pattern captures

(sub_pattern)	Stores substring matching sub_pattern as capture **%1**..**%9**, in order.
()	Stores current string position as capture **%1**..**%9**, in order.

Pattern character classes (cc's)

.	Any character.
%symbol	The symbol itself.
x	If **x** not **^$()%.[]*+-** or **?** the character itself.
[set **]**	Any character in any of the given classes, can also be a range [c1-c2].
[^set **]**	Any character not in set.

For all classes represented by single letters (%a, %c, etc.), the corresponding uppercase letter represents the complement of the class. For instance, %S represents all non-space characters.

%a	Any letter character
%c	Any control character.
%d	Any digit.
%l	Any lowercase letter.
%p	Any punctuation character
%s	Any whitespace character.
%u	Any uppercase letter.
%w	Any alphanumeric character.
%x	Any hexadecimal digit.
%z	The character with representation 0.

examples

string.find("Lua is great!", "is")
> 5 6

string.find("Lua is great!", "%s")
> 4 4

string.gsub("Lua is great!", "%s", "-")
> Lua-is-great! 2

string.gsub("Lua is great!", "[%s%l]", "*")
> L**********! 11

string.gsub("Lua is great!", "%a+", "*")
> * * *! 3

string.gsub("Lua is great!", "(.)", "%1%1")
> LLuuaa iiss ggrreeaatt!! 13

string.gsub("Lua is great!", "%but", "")
> L! 1

string.gsub("Lua is great!", "^.-a", "LUA")
> LUA is great! 1

string.gsub("Lua is great!", "^.-a", function (s)
return string.upper(s) end)
> LUA is great! 1

Function storage

string.dump (*function*)
Returns binary representation of Lua *function* with no upvalues. Use with **loadstring ( )**.

Note: String indexes go from 1 to **string.len** (s), from end of string if negative (index -1 refers to the last character).

The I/O Library

The I/O functions return **nil** and a message on failure unless otherwise stated; passing a closed file handle raises an error.

Complete I/O

io.open (*filename* [, *mode*])
Opens *filename fn* in *mode*: "**r**" read [default], "**w**" write, "**a**" append, "**r+**" update-preserve, "**w+**" update-erase, "**a+**" update-append (add trailing "**b**" for binary mode on some systems), returns a **file** handle.

file:close ( )
Closes **file**.

file:read (*formats*)
Returns a value from **file** for each of the passed *formats*: "***n***" reads a number, "***a***" reads whole **file** as a string from current position ("" at end of **file**), "***l***" reads a line (**nil** at end of **file**) [default], **n** = reads a string of up to **n** characters (**nil** at end of **file**).

file:lines ( )
Returns an iterator function reading line-by-line from **file**; the iterator does not close the **file** when finished.
file:write (*values*)
Write each of *values* (strings or numbers) to **file**, with no added separators. Numbers are written as text, strings can contain binary data (may need binary mode read).
file:seek ([*p*] [, *offset*])
Sets current position in **file** relative to *p* ("**set**" start of **file** [default], "**cur**" current, "**end**" end of file) adding *offset* [default: zero]. Returns new position in **file**.
file:flush ( )
Writes to **file** any data still held in memory buffers.

Simple I/O

io.input ([*file*])
Sets *file* as default input file; *file* can be either an open file object or a file name; in the latter case the *file* is opened for reading in text mode. Returns a file object, the current one if no file given; raises error on failure.
io.output ([*file*])
Sets *file* as default output file (current output file is not closed); *file* can be either an open file object or a file name; in the latter case *file* is opened for writing in text mode. Returns a file object, the current one if no file given. Raises error on failure.
io.close ([*file*])
Closes file object *file*. Default: closes default output file.
io.read (*formats*)
Reads from default input file, same as **file:read ( )**.
io.lines ([*fn*])
Opens file name *fn* for reading. Returns an iterator function reading from it line-by-line. Iterator closes file when finished. If no *fn*, returns iterator reading lines from default input file.
io.write (*values*)
Writes to the default output file, same as **file:write ( )**.
io.flush ( )
Writes to default output file any data in buffers.

Standard files and utility functions

io.stdin Predefined input file object.
io.stdout Predefined output file object.
io.stderr Predefined error output file object.
io.type (*x*)
Returns string "**file**" if *x* is an open file, "**closed file**" if *x* is a closed file, **nil** if *x* is not a file object.
io.tmpfile ( )
Returns file object for temporary file (deleted when program ends).

The OS Library

Many characteristics of this library are determined by operating system support. Unix and Unix like systems are assumed.

Date/time

Time and date accessed via time-table *tt* = {**year** = 1970-2135 , **month** = 1-12, **day** = 1-31, [**hour** = 0-23,] [**min** = 0-59,] [**sec** = 0-59,] [**isdst** = **true**-**false**,] }
os.time ([*tt*])
Returns date/time, in seconds since epoch, described by table *tt* [default: current]. **Hour**, **min**, **sec**, **isdst** fields optional.
os.difftime (*t2*, *t1*)
Returns difference *t2* - *t1* between two **os.time ( )** values.
os.date ([*fmt* [, *t*]])
Returns a table or string describing date/time *t* (that should be a value returned by **os.time**), according to the format string *fmt*:

!	A leading "**!**" requests UTC time
***t**	Returns a table similar to time-table

while the following format a string representation:

%a	**%A**	Abbreviated, full weekday name.
%b	**%B**	Abbreviated, full month name.
%c		Date/time (default)
%d		Day of month (01..31).
%H	**%I**	Hour (00..23), (01..12).
%M		Minute (00..59).
%m		Month (01..12).
%p		Either "am" or "pm".
%S		Second (00..61).
%w		Weekday (0..6), 0 is Sunday.
%x	**%X**	Date only, time only.
%y	**%Y**	Year (nn), (nnnn).
%Z		Time zone name if any

os.clock ( )
Returns the approx. CPU seconds used by program.

System interaction

os.execute (*string*)
Calls system shell to execute *string*, returning status code.
os.exit ([*code*])
Terminates script, returning *code* [default: success].
os.getenv (*variable*)
Returns a string with the value of the environment *variable*, or **nil** if no *variable* exists.
os.setlocale (*string* [, *category*])
Sets the locale described by *string* for *category*: "**all**" (default), "**collate**", "**ctype**", "**monetary**", "**numeric**" or "**time**". Returns name of new locale, or **nil** if not set.
os.remove (*file*)
Deletes *file*, or returns **nil** and error description.
os.rename (*file1*, *file2*)
Renames *file1* to *file2*, or returns **nil** and error message.
os.tmpname ( )
Returns a string usable as name for a temporary file. Subject to name conflicts - use **io.tmpfile()** instead.

The Stand-alone Interpreter

Command line syntax

lua [*options*] [*script* [*arguments*]]

Options

-	Executes script from standard input, no args allowed
-e stats	Executes Lua statements contained in literal string **stats**, can be used multiple times on same line.
-l filename	Loads and executes **filename** if not already loaded.
-i	Enters interactive mode after execution of script.
-v	Prints version information.
--	Stops parsing options.

Recognized environment variables

LUA_INIT If it contains a string in form @filename, loads and executes filename, else executes the string itself.
_PROMPT Sets the prompt for interactive mode.

Special Lua variables

arg **nil** if no command line arguments, else table containing command line arguments starting from **arg[1]**, **arg.n** is number of arguments, **arg [0]** script name as given on command line and **arg[-1]** and lower indexes contain fields of command line preceding script name.

The Compiler

Command line syntax

luac [*options*] [*scripts*]

Options

-	Compiles from standard input.
-l	Produces a listing of the compiled bytecode.
-o filename	Sends output to **filename** [default: **luac.out**].
-p	Performs syntax and integrity checking only, does not output bytecode.
-s	Strips debug information; line numbers and local names are lost.
-v	Prints version information.
--	Stops parsing options.

Compiled chunks portable on machines with same word size.

The Debug Library

The debug library functions are inefficient and should not be used in normal operation. In addition to debugging they can be useful for profiling.

Basic functions

debug.debug ( )

Enters interactive debugging shell (type "**cont**" to exit); local variables cannot be accessed directly.

debug.getfenv (*object*)

Returns the environment of *object*

debug.getinfo ([*coroutine*,] *function* [, *w*])

Returns table with information for *function* in *coroutine* or for function at level *function* [1 = caller], or **nil** if invalid level. Table keys are:

source	Name of file (prefixed by '@') or string where *function* defined.
short_src	Short version of source, up to 60 chars.
linedefined	Line of source where function was defined.
what	"**Lua**" = Lua function, "**C**" = C function, "**main**" = part of main chunk.
name	Name of function, if available, or reasonable guess if possible.
namewhat	Meaning of name: "**global**", "**local**", "**method**", "**field**" or "".
nups	Number of upvalues of the function.
func	The function itself.

Characters in string **w** select one or more groups of fields (default is all):

- **n** Returns fields name and namewhat.
- **f** Returns field func.
- **S** Returns fields **source**, **short_src**, **what** and **linedefined**.
- **l** Returns field **currentline**.
- **u** Returns field **nup**.

debug.getlocal ([*coroutine*,] *stack_level*, *i*)

Returns name and value of local variable at index *i* (from 1, in order of appearance) of the function at *stack_level* (1= caller) in *coroutine* ; returns **nil** if *i* is out of range, raises error if *n* is out of range.

debug.gethook ([*coroutine*])

Returns current hook function, mask and count set with **debug.sethook ( )** for *coroutine*.

debug.getmetatable (*object*)

Returns metatable of *object* or **nil** if none.

debug.getregistry ( )

Returns registry table that contains static library data.

debug.getupvalue (*function, i*)

Returns name and value of upvalue at index *i* (from 1, in order of appearance) of *function*. If *i* is out of range, returns **nil**.

debug.traceback ([*c*,] [*msg*])

Returns a string with traceback of call stack, prepended by *msg*. Coroutine *c* may be specified.

debug.setfenv (*object*, *t*)

Sets environment of *object* to table *t*. Returns *object*.

debug.sethook ([[*coroutine*,] *hook*, *mask* [, *n*]])

For *coroutine*, sets function *hook* as hook, called for events given in *mask* string: "**c**" = function call, "**r**" = function return, "**l**" = new code line, optionally call *hook* **( )** every *n* instructions. Event type received by *hook* **( )** as first argument: "**call**", "**return**