# Python 2.5 Reference Card

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Information taken liberally from the python documentation and various other sources.


## 1 Variable Types

### 1.1 Numbers

| | |
|---|---|
| `42 052 0x2A 42L 052L 0x2AL` | 42 (dec, oct, hex, short/long) |
| `0.2  .8  4.  1.e10  1.0e-7` | floating point value |
| `z = 5.0 - 2.0J;` | complex number |
| `z = complex(real, imag)` | complex number |
| `z.real; z.imag` | real and imag part of `z` |
| `True; False` | constants for boolean values |
| `abs(n)` | absolute value of `n` |
| `divmod(x, y)` | `(x/y, x%y)` |
| `hex(n)` | create hex string |
| `oct(n)` | create octal string |
| `ord(c)` | unicode code point of char |
| `round(x,n)` | round `x` to `n` decimal places |
| `cmp(x,y)` | `x<y`: -1, `x==y`: 0, `x>y`: 1 |
| `coerce(x, y)` | `(x,y)`, make same type |
| `pow(x,y,z)` | `(x**y) % z` |
| `float("3.14")` | `float from string` |
| `int("42", base)` | `int from string` |
| `import math; import cmath` | more math functions |
| `import random;` | random number generators |

### 1.2 Sequences (lists are mutable, tuples and strings are immutable)

| | |
|---|---|
| `s=l=[1, "bla", [1+2J, 1.4], 4]` | list creation |
| `s=t=(1, "bla", [1+2J, 1.4], 4)` | tuple creation |
| `l=list(t); t=tuple(l)` | list/tuple conversion |
| `l=range(1000)` | list of integers (0-999) |
| `s=xrange(1000)` | immut. xrange-sequence |
| `i=iter(s); i.next()` | iterator from sequence |
| `s[2][0]` | get list element (1+2J) |
| `s[-2][-1]` | get list element (1.4) |
| `s1+s1` | sequence concat |
| `n*s1` | repeat `s1` `n` times |
| `s[i:j]; s[i:]; s[:j]` | slicing (`i` incl., `j` excl.) |
| `s[i:j:k]` | slice with stride `k` |
| `s[::2]; s[::-1]` | every 2nd Element / reverse `s` |
| `x in s; x not in s` | is `x` a member of `s`? |
| `len(s)` | number of elements |
| `min(s); max(s)` | min/max |
| `l[i:j]=['a','b','c','d']` | replace slice |
| `l[i:i]=['a','b']` | insert before position `i` |
| `l.count(x)` | number of occurances of `x` |
| `l.index(x)` | first index of `x`, or error |
| `l.append(x)` | append `x` at end of `l` |
| `x=l.pop()` | pop off last element |
| `l.extend(l2)` | append `l2` at end of `l` |
| `l.insert(i,x)` | instert `x` at pos. `i` |
| `l.remove(x)` | delete first `x` |
| `l.reverse()` | reverse `l` |
| `l.sort(f)` | sort using `f` (default `f=cmp`) |
| `zip(s,t,...)` | `[(s[0],t[0],...),..]` |

### 1.3 Dictionaries (Mappings)

| | |
|---|---|
| `d={'x':42, 'y':3.14, 'z':7}` | dict creation |
| `d['x']` | get entry for 'x' |
| `len(d)` | number of keys |
| `del(d['x'])` | delete entry from dict |
| `d.copy()` | create shallow copy |
| `d.has_key(k)` | does key exist? |
| `d.items()` | list of all items |
| `d.keys()` | list of all keys |
| `d.values()` | list of all values |
| `i=d.iteritems(); i.next()` | iterator over items |
| `i=d.iterkeys(); i.next()` | iterator over keys |
| `i=d.itervalues(); i.next()` | iterator over values |
| `d.get(k,x)` | get entry for k, or return x |
| `d.clear()` | remove all items |
| `d.setdefault(k,x)` | return d[k] or set d[k]=x |
| `d.popitem()` | return and delete an item |

### 1.4 Sets

| | |
|---|---|
| `s=set(s); fs=frozenset(s)` | create set |
| `fs.issubset(t); s<=t` | all `s` in `t`? |
| `fs.issuperset(t); s>=t` | all `t` in `s`? |
| `fs.union(t); s\|t` | all elements from `s` and `t` |
| `fs.intersection(t); s&t` | elements both in `s` and `t` |
| `fs.difference(t); s-t` | all `s` not in `t` |
| `fs.symmetric_difference(t);s^t` | all either `s` or `t` |
| `fs.copy()` | shallow copy of `s` |
| `s.update(t); s\|=t` | add elements of `t` |
| `s.intersection_update(t); s&=t` | keep only what is also in `t` |
| `s.difference_update(t); s-=t` | remove elements of `t` |
| `s.symmetric_differ...(t); s^=t` | keep only symm. difference |
| `s.add(x)` | add `x` to `fs` |
| `s.remove(x); fs.discard(x);` | remove `x` (/ with exception) |
| `s.pop();` | return and remove any elem. |
| `s.clear();` | remove all elements |

### 1.5 Strings and Regular Expressions

| | |
|---|---|
| `"bla"; 'hello "world"'` | string (of bytes) |
| `"""bla""", '''bla'''` | triple quotes for multiline |
| `\  \\  \0` | cont., backslash, null char |
| `\N{id} \uhhhh \Uhhhhhhhh` | unicode char |
| `\xhh \ooo` | hex, octal byte |
| `u"Ünic\u00F8de"; u"\xF8"` | unicode string (of characters) |
| `r"C:\new\text.dat"; ur"\\Ü"` | raw string (unicode) |
| `str(3.14); str(42)` | string conversion |
| `"%s-%s-%s" % (42,3.14,[1,2,3])` | string formatting |
| `'\t'.join(seq)` | join sequences with separator |
| `s.decode('utf-8')` | latin-1 string to unicode string |
| `u.encode('utf-8')` | unicode string to utf-8 string |
| `chr(i), unichr(i)` | char from code point |
| `str(x)` | string from number/object |

**Other String Methods:**

*search and replace:* `find(s,b,e), rfind(s,b,e), index(s,b,e), rindex(s,b,e), count(s,b,e), endswith(s,b,e), startswith(s,b,e), replace(o,n,m)`

*formatting:* `capitalize, lower, upper, swapcase, title`

*splitting:* `partition(s), rpartition(s), split(s,m), rsplit(s,m), splitlines(ke)`

*padding:* `center(w,c), ljust(w,c), lstrip(cs), rjust(w,c), rstrip(cs), strip(cs), zfill(w), expandtabs(ts)`

*checking:* `isalnum, isalpha, isdigit, islower, isspace, istitle, isupper`

**String Constants:** `import string`
`digits, hexdigits, letters, lowercase, octdigits, printable, punctuation, uppercase, whitespace`

**Regexes:** `import re`

| | |
|---|---|
| `r=re.compile(r'rx',re.ILMSUX)` | comile 'rx' as regex |
| `(?P<id>...)` | named group |
| `m=r.match(s,b,e)` | full match |
| `re.match(r'(?iLmsux)rx',s)` | direct regex usage |
| `m=r.search(s,b,e)` | partial match |
| `l=r.split(s,ms)` | split and return list |
| `l=r.findall(string)` | list of all matched groups |
| `s=r.sub(s,r,c)` | replace c counts of s with r |
| `(s,n)=r.subn(s,r,c)` | n is number of replacements |
| `s=re.escape(s)` | escape all non-alphanumerics |
| `m.start(g);m.span(g);m.end(g)` | group-match delimiters |
| `m.expand(s)` | replace \1 etc. with matches |
| `m.group(g); m.group("name")` | matched group no. g |
| `m.groups()` | list of groups |
| `m.groupdict()` | dict of named groups |

## 2 Basic Syntax

| | |
|---|---|
| `if expr: statements` | conditional |
| `elif expr: statements` | |
| `else: statements` | |
| `if a is b : ...` | object identity |
| `if a == 1` | value identity |
| `while expr: statements` | while loop |
| `else: statements` | run else on normal exit |
| `while True: ... if cond: break` | do... while equivalent |
| `for target in iter: statements` | for loop |
| `else: statements` | |
| `for key,value in d.items():...` | multiple identifiers |
| `break, continue` | end loop / jump to next |
| `print "hello world",` | print without newline |
| `[ expr for x in seq lc ]` | list comprehension |
| `  lc = for x in seq / if expr` | with lc-clauses |
| `pass` | empty statement |
| `def f(params): statements` | function definition |
| `def f(x, y=0): return x+y` | optional parameter |
| `def f(*a1, **a2): statements` | additional list of unnamed, dict of named paramters |
| `def f(): f.variable = 1 ...` | function attribute |
| `return expression` | return from function |
| `yield expression` | make function a generator |
| `f(1,1), f(2), f(y=3, x=4)` | function calls |
| `global v` | bind to global variable |
| `def make_adder_2(a):`<br>`  def add(b): return a+b`<br>`  return add` | closure |
| `lambda x: x+a` | lambda expression |
| `compile(string,filename,kind)` | compile string into code object |

```
eval(expr,globals,locals)          evaluate expression
exec code in gldict, lcdict        compile and execute code
execfile(file,globals,locals)      execute file
raw_input(prompt)                  input from stdin
input(prompt)                      input and evaluate
```

## 3 Object Orientation and Modules

```
import module as alias             import module
from module import name1,name2     load attr. into own namespace
from __future__ import *           activate all new features
reload module                      reinitialize module
module.__all__                     exported attributes
module.__name__                    module name / "__main__"
module.__dict__                    module namespace
__import__("name",glb,loc,fl)      import module by name
class name (superclass,...):       class definition
    data = value                   shared class data
    def method(self,...): ...      methods
    def __init__(self, x):         constructor
        Super.__init__(self)       call superclass constructor
        self.member = x            per-instance data
    def __del__(self): ...         destructor
__str__, __len__, __cmp__,__       some operator overloaders
__iter__(self): return self        use next method for iterator
__call__                           call interceptor
__dict__                           instance-attribute dictionary
__getattr__(self, name),           get an unknown attribute
__setattr__(self, name, value)     set any attribute
callable(object)                   1 if callable, 0 otherwise
delattr(object, "name")            delete name-attr. from object
del(object)                        unreference object/var
dir(object)                        list of attr. assoc. with object
getattr(object, "name", def)       get name-attr. from object
hasattr(object, "name")            check if object has attr.
hash(object)                       return hash for object
id(object)                         unique integer (mem address)
isinstance(object,                 check for type
classOrType)
issubclass(class1, class2)         class2 subclass of class1?
iter(object, sentinel)             return iterator for object
locals()                           dict of local vars of caller
repr(object), str(object)          return string-representation
vars(object)                       return __dict__
None                               the NULL object
if __name__ == "__main__":         make modul executable
```

## 4 Exception Handling

```
try: ...                           Try-block
except ExceptionName:              catch exception
except (Ex1, ...), data:           multiple, with data
    print data                     exception handling
    raise                          pass up (re-raise) exception
else: ...                          if no exception occurred
finally: ...                       in any case
assert expression                  debug assertion
class MyExcept(Exception): ...     define user exception
raise MyExcept , data              raise user exception
```

## 5 System Interaction

```
sys.path                           module search path
sys.platform                       operating system
sys.stdout, stdin, stderr          standard input/output/error
sys.argv[1:]                       command line parameters
os.system(cmd)                     system call
os.startfile(f)                    open file with assoc. program
os.popen(cmd, r|w, bufsize)        open pipe (file object)
os.popen2(cmd, bufsize, b|t)       (stdin, stdout) fileobjects
os.popen3(cmd, bufsize, b|t)       (stdin, stdout,stderr)
os.environ['VAR']; os.putenv[]     read/write environment vars
glob.glob('*.txt')                 wildcard search
```

**Filesystem Operations**

**os module:** `access, chdir, chmod, chroot, getcwd, getenv, listdir, mkdir, remove, unlink, removedirs, rename, rmdir, pipe, ...`

**shutil module:** `copy, copy2, copyfile, copyfileobj, copymode, copystat, copytree, rmtree`

**os.path module:** `abspath, altsep, basename, commonprefix, curdir, defpath, dirname, exists, expanduser, expandvar, extsep, get[acm]time, getsize, isabs, isdir, isfile, islink, ismout, join, lexists, normcase, normpath, pardir, pathsep, realpath, samefile, sameopenfile, samestat, sep, split, splitdrive, splitext, stat, walk`

**command line argument parsing:**

```
restlist, opts = \
  getopt.getopt(sys.argv[1:],\
    "s:oh",\
    ["spam=", "other", "help"])
for o, a in opts:
    if o in ("-s", "--lol"): spam = a
    if o in ("-h", "--help"): show_help()
```

## 6 Input/Output

```
f=codecs.open(if,"rb","utf-8")     open file with encoding
file = open(infilename, "wb")      open file without encoding
codecs.EncodedFile(...)            wrap file into encoding
r, w, a, r+                        read, write, append, random
rb, wb, ab, r+b                    modes without eol conversion
file.read(N)                       N bytes ( entire file if no N )
file.readline()                    the next linestring
file.readlines()                   list of linestring
file.write(string)                 write string to file
file.writelines(list)              write list of linestrings
file.close()                       close file
file.tell()                        current file position
file.seek(offset, whence)          jump to file position
os.truncate(size)                  limit output to size
os.tmpfile()                       open anon temporary file
pickle.dump(x, file)               make object persistent
x = pickle.load(file)              load object from file
```

## 7 Standard Library (almost complete)

**String Services:** `string, re, struct, difflib, StringIO, cStringIO, textwrap, codecs, unicodedata, stringprep, fpformat`

**File/Directory Access:** `os.path, fileinput, stat, statvfs, filecmp, tempfile, glob, fnmatch, linecache, shutil, dircache`

**Generic OS services:** `os, time, optparse, getopt, logging, getpass, curses, platform, errno, ctypes`

**Optional OS services:** `select, thread, threading, dummy_thread, dummy_threading, mmap, readline, rlcompleter`

**Data Types:** `datetime, calendar, collections, heapq, bisect, array, sets, sched, mutex, Queue, weakref, UserDict, UserList, UserString, types, new, copy, pprint, repr`

**Numeric and Math Modules:** `math, cmath, decimal, random, itertools, functools, operator`

**Internet Data Handling:** `email, mailcap, mailbox, mhlib, mimetools, mimetypes, MimeWriter, mimify, multifile, rfc822, base64, binhex, binascii, quopri, uu`

**Structured Markup Processing Tools:** `HTMLParser, sgmllib, htmllib, htmlentitydefs, xml.parsers.expat, xml.dom.*, xml.sax.*, xml.etree.ElementTree`

**File Formats:** `csv, ConfigParser, robotparser, netrc, xdrlib`

**Crypto Services:** `hashlib, hmac, md5, sha`

**Compression:** `zlib, gzip, bz2, zipfile, tarfile`

**Persistence:** `pickle, cPickle, copy_reg, shelve, marshal, anydbm, whichdb, dbm, gdbm, dbhash, bsddb, dumbdbm, sqlite3`

**Unix specific:** `posix, pwd, spwd, grp, crypt, dl, termios, tty, pty, fcntl, posixfile, resource, nis, syslog, commands`

**IPC/Networking:** `subprocess, socket, signal, popen2, asyncore, asynchat`

**Internet:** `webbrowser, cgi, scitb, wsgiref, urllib, httplib, ftplib, imaplib, nntplib, ...lib, smtpd, uuid, urlparse, SocketServer, ...Server,, cookielib, Cookie, xmlrpclib`

**Multimedia:** `audioop, imageop, aifc, sunau, wave, chunk, colorsys, rgbimg, imghdr, sndhdr, ossaudiodev`

**Tk:** `Tkinter, Tix, ScrolledText, turtle`

**Internationalization:** `gettext, locale`

**Program Frameworks:** `cmd, shlex`

**Development:** `pydoc, doctest, unittest, test`

**Runtime:** `sys, warnings, contextlib, atexit, traceback, qc, inspect, site, user, fpectl`

**Custom Interpreters:** `code, codeop`

**Restricted Execution:** `rexec, Bastion`

**Importing:** `imp, zipimport, pkgutil, modulefinder, runpy`

**Language:** `parser, symbol, token, keyword, tokenize, tabnanny, pyclbr, py_compile, compileall, dis, pickletools, distutils`

**Windows:** `msilib, msvcrt, _winreq, winsound`

**Misc:** `formatter`