Appendix A: Introduction to Python

Dynamic Typing

```
x = 123
```

```
x = 'hello'
```

```
int x, y;
```

Multi-line Statements

```
x = (1 + 2      # parenthesized expression still open at newline
     3)         # so stmt continues to this line
```

Code Blocks

```
     if x == 5:        # test if x is equal to 5
        print(1)       # first stmt in block
        print(2)
        print(3)       # last stmt in block
     print(4)
```

```
print('hello')
```

Arithmetic Operations

```
print(5 + 2)   # addition: displays 7
print(5 - 2)   # subtraction: displays 3
print(5 * 2)   # multiplication: displays 10
print(5 ** 2)  # exponentiation: displays 25
print(5 / 2)   # floating-point division: displays 2.5
print(5 // 2)  # integer division: displays 2
print(5 % 2)   # remainder: displays 1
```

Strings

```
print('hello')     # displays hello
print("hello")     # displays hello
print("it's")      # displays it's
print('it\'s')     # displays it's
print('A\\B')      # displays A\B

if s.startswith('.t'):
   print('it does')

s = 'x'*5

i = 30
t = ' '*i       # t is assigned string consisting of 30 spaces
print(t + '^')  # position of caret determined by value in i at run time
```

Concatenation

```
print(3 + 2)          # addition: displays 5
print('3' + '2')      # concatenation: displays 32
```

Assignment Operator

```
x = 1
x = x + 1
x += 1
```

Functions

```python
def sample():       # this is the start of the function definition
   print('morning')
   print('bye')     # end of function definition
print('good')
sample()            # this stmt "calls" sample()
```

```
good
morning
bye
```

```
def f():
   print('hello')
   g()            # forward reference ok here

def g():
   print('bye')
f()               # this call must follow the definition of f()
```

```
def g(x, y):      # x and y are parameters
   print(x + y)   # displays 75
z = 20
def f():
   g(z + 5, 50)    # z + 5 and 50 are arguments
f()
```

```
def addorconcat(x, y):
    result = x + y
    return result


y = addorconcat(3, 2)        # y is assigned 5
y = addorconcat('3', '2')    # y is assigned '32'
```

```
y = 5

y = '32'
```

```
def r():
   print('hello')
   r()                 # r() calls itself
r()
```

```
def countdown(n)
   if n > 0:                # recurse only if n is positive
      print(n)
      countdown(n - 1)   # next n is one less the current n
countdown(10)
```

Global and Local Variables

```
x = 1         # x is global here
y = 2         # y is global here
z = 3         # z is global here
def f():
   global x   # makes x global in this function
   x = y      # x and y are global variables here
   z = 20     # z is a local variable here
f()
print(x)      # displays 2
print(y)      # displays 2
print(z)      # displays 3
```

```python
def f():
   x = 1      # this is the local variable x in f()
   g()
   print(x)   # displays 1
def g():
   x = 7      # does not change local variable x in f()
f()
```

```
tempcount = 0



def gettemp():
    global tempcount
    ...
    tempcount += 1  # increment tempcount for next call of cg_gettemp()
```

print Statement

```
     print()          # nothing displayed, goes to next line
     print(1)         # displays 1, goes to next line
     print(1, 2)      # displays 1 2 then goes to the next line
     print(1, 2,)     # displays 1 2 then goes to the next line

     print(1, 2, end = '')   # does not move cursor to next line
     print(3)
```

```
     print('x = %5d y = %d' % (x, y))

x =     2 y = 3
```

```
     print('%50s' % 'hello')

                                             hello
```

input() Function

```
    x = input('enter integer')
```

```
enter integer
```

if Statement

true/false expression

```
if x == 5:
   print('hello')
```

true/false expression

```
if x == 5:
   print('hello')
else:
   print('bye')
```

```
x = 1
if x:                      # 1 is treated as True
   print('hello')          # hello is displayed
```

Relational operator	Meaning
`==`	equal
`!=`	not equal
`<`	less than
`<=`	less than or equal
`>`	greater than
`>=`	greater than or equal

```
if grade >= 90:
   print('A')
elif grade >= 80:   # elif means else if
   print('B')
elif grade >= 70:
   print('C')
elif grade >= 65:
   print('D')
else:
   print('F')
```

```
if x == 1 or y == 2:
   print('got 1 or 2 or both')

if not(x == 1 or y == 2):
   print('x not 1 and y not 2')
```

while Statement

exit-test expression

```
i = 1
while i <= 10:    # loop body executed while i <= 10 is True
   print(i)
   i += 1
```

```
i = 1
while i <= 10:
   print(i)
   if i == 5:
      break     # causes a break out of the loop
   i += 1
```

```
while True:
   ⋮                        # stmts before the exit test
  if exit-test_expression:  # this is the exit test
    break
   ⋮                        # stmts after the exit test
```

```
sum = 0
while True:
   x = int(input('enter integer: '))  # prompt user
   if x < 0:                          # check for a neg number
      break                           # exit loop
   sum += x                           # add x to sum
print('sum = ' + str(sum))            # display final sum
```

```
enter integer: 5
enter integer: 3
enter integer: -1
sum = 8
```

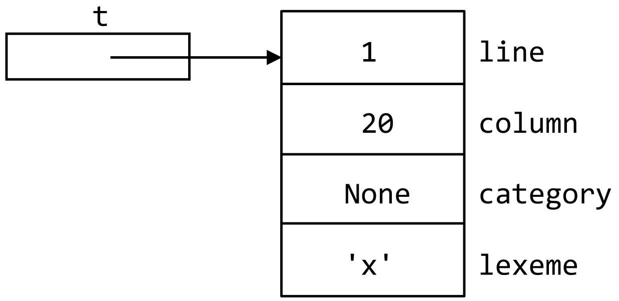
Files

```
infile = open('t.in', 'r')

source = infile.read()

outfile = open('c1.s', 'w')

outfile.write('hello\n')

outfile.close()
```

Classes

```
class Token:
   def __init__(self, line, column, category, lexeme):
      self.line = line         # line number of the token
      self.column = column     # column in which token starts
      self.category = category # category of the token
      self.lexeme = lexeme     # token in string form
```

```
t = Token(1, 20, None, 'x')
```



t

1 line

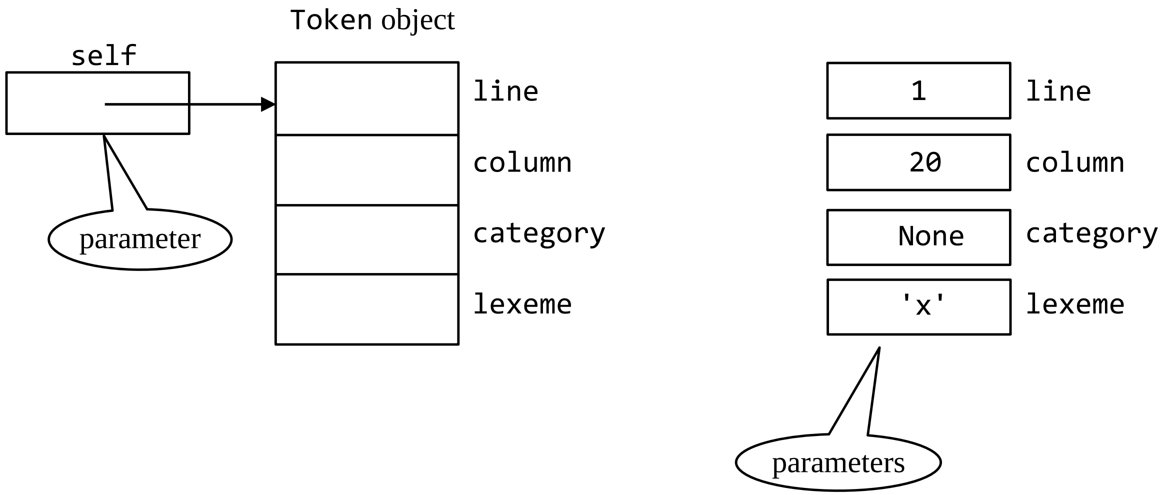
20 column

None category

'x' lexeme

```
t.category = NAME
```

```
t = Token(1, 20, None, 'x')
```



Token object

self

line

column

category

lexeme

parameter

1 line

20 column

None category

'x' lexeme

parameters

Exceptions

```
try
   parser()
except RuntimeError as emsg     # catches RuntimeError exceptions
   print(emsg)                  # displays error message
   sys.exit(1)                  # terminates program
```

```
raise RuntimeError('Illegal operation')

sys.exit(1)
```

```
try:
   infile = open('i1.in', 'r') # opens file for reading
   source = infile.read()      # reads the entire file
except IOError:                # catches IOError exceptions
   print('Cannot read input file i1.in')
   sys.exit(1)                 # terminates the program
```

```
class Returnsignal(Exception)
   pass

     raise Returnsignal()
```

Lists

```
      zlist = []

      zlist.append('hello')
      zlist.append(234)

      print(zlist)

['hello', 234]


      print(zlist[0])  # displays element at index 0
      print(zlist[1])  # displays element at index 1

      x = zlist.pop()

      if 234 in zlist:
         print('it is there')

      index = zlist.index('hello')

      for i in zlist:
         print(i)
```

splitlines() Method

```
infile = open('i1.in', 'r')

source = infile.read()

lines = source.splitlines()
```

Dictionaries

```
d = {}

d['x'] = 'up'
d['y'] = 77

print(d['y'])     # displays 77

if 'y' in d:
   print('it is there')
```

Accessing Command Line Arguments

```
     python cla.py hello 123

import sys
result = int(sys.argv[1]) + int(sys.argv[2])
print(result)

import sys
```

len() Function

```
print(len(zlist))

print(len(sys.argv))
```

isalpha(), isdigit(), isalnum(), and isspace() Methods

```
a = 'hello'
print(a.isalpha())   # displays True
print(a.isdigit())   # displays False
print(a.isalnum())   # displays True
print(a.isspace())   # displays False
```

Time and Date

```
        print(time.strftime('%c'))
```

To use `time.strftime('%c')`, insert the following statement at the beginning of your program:

```
import time
```