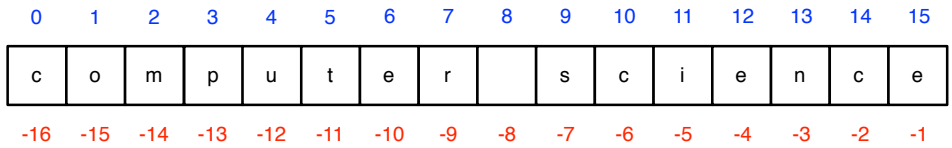
1 String slicing, ord and chr, and methods

A slice is a substring from the start index up to but not including the end index.




```
>>> s = 'computer science'
>>> s[9:16]
'science'
>>> s[9:len(s)]
'science'
>>> s[9:]    # default end
'science'
>>> s[:7]    # default start
'compute'
>>> s[:]     # makes a copy
'computer science'
>>> s[9:12]
'sci'
>>> s[9:-4] # negative slicing
'sci'
>>> s[-7:-4]
'sci'
>>> s[:6] + 'ing' + s[8:]
'computing science'
>>> s[0:len(s):3]  # every 3rd char
'cs'
>>>
```

The `ord` and `chr` *functions* translate characters to numbers and back. The encoding is based on ASCII (`http://en.wikipedia.org/wiki/ASCII`), an encoding developed at the advent of computing. Example: `ord('A')` returns 65, which happens to be the ASCII encoding of 'A'; `chr(65)` returns `'A'`.

String Method	Arguments	Description
`lower`	none	Returns a lowercase copy
`upper`	none	Returns an uppercase copy
`capitalize`	none	Returns a copy with first letter capitalized
`isalpha`	none	Returns `True` if all characters are alphabetic
`isdigit`	none	Returns `True` if all characters are digits
`endswith`	`sub`	Returns `True` if string ends with `sub`
`startswith`	`sub`	Returns `True` if string starts with `sub`
`find`	`sub`, `start`, `end`	Returns the lowest index where substring `sub` occurs or -1 if no occurrences. The start and end parameters are *optional*.
`count`	`sub`, `start`, `end`	Returns the number of non-overlapping occurrences of the substring `sub` in the string. The start and end parameters are *optional*.
`replace`	`old`, `new`	Returns a copy of string with every occurrence of substring `old` replaced with substring `new`.
`strip`	none	Returns a copy with leading and trailing whitespace removed
`split`	`sep`	Returns a list of "words" in string, splitting on whitespace. If *optional* separator `sep` is given, it splits on that instead.
`join`	list of strings	Returns a string that consists of the strings in list joined together with this string separating them.

A table of string *methods* followed by examples. For a complete list of methods, type `dir(str)` into the IDLE shell and then use help to get more information, as in `help(str.join)`. Remember: strings are immutable so none of these methods *change* the string: they return *copies*.

```
>>> s = 'banana!'
>>> s.find('!')
6
>>> s.find('!', 3, 6)  # up to but not including end
-1
>>> 'banana!'.count('a')
3
>>> s.count('ana') # non-overlapping
1
>>> s.replace('an', 'wah')
'bwahwaha!'
>>> s = '    spacey   banana     '
>>> s.strip()
'spacey   banana'
>>> s = 'hello          jello         fellow'
>>> s.split()
['hello', 'jello', 'fellow']
>>> some_data = "Joe Student;12/17/1995;Ithaca,NY;3.6"
>>> some_data.split(';')
['Joe Student', '12/17/1995', 'Ithaca,NY', '3.6']
>>> ', '.join(['apple', 'lemon', 'pear'])
'apple, lemon, pear'
```

2 Exercises

Solutions are presented in class and also included in the moodle version of this handout.

1. Assume variable `s` is a string that refers to someone's full name, as in `'Tom Brady'`. Write a **single expression** that produces the name with the first name abbreviated, as in `'T. Brady'`. Hint: Use the `find` and slicing.

   Solution:

   ```
   s = 'Tom Brady'
   print s[0] + '. ' + s[s.find(' ')+1:]

   s = 'Peyton Manning'
   print s[0] + '. ' + s[s.find(' ')+1:]
   ```

2. Assume variables `s1` and `s2` refer to strings. Write a **single expression** that produces the index of the *second* occurrence of `s2` in `s1`. If `s2` does not occur twice in `s1`, the expression should

produce -1. For example, if `s1` is `"banana"` and `s2` is `"ana"`, your expression should return 3. You cannot use indexing nor slicing; you can use `find` and arithmetic. Hint: call `find` twice.

Solution:

```
s1 = 'banana'
s2 = 'ana'
print s1.find(s2, s1.find(s2) + 1)

s1 = 'apple'
s2 = 'p'
print s1.find(s2, s1.find(s2) + 1)
```

3. Write a function `acronym` that takes a string representing a phrase or name and returns the equivalent acronym, upper-cased. Example: if the input is `'computer science investigation'`, it should return `'C.S.I.'`. Hint: use a **`for`** loop and the `split` and `join` and `upper` methods.

Solution:

```
def acronym(s):
    '''(str) -> str
    Expects s to be a string of several words.
    Returns the corresponding acronym consisting
    of initial of each word in uppercase, separated
    by periods.
    >>> acronym('computer science investigation')
    'C.S.I.'
    >>> acronym('abbreviated coded rendition of name yielding meaning')
    'A.C.R.O.N.Y.M.'
    '''
    words = s.split()
    initials = []
    for word in words:
        initials += [word[0]]
    return '.'.join(initials).upper() + '.'
```

4. Write a function `mycount` that takes two strings `s` and `sub` and returns the number of *nonoverlapping* occurrences of `sub` in `s`. You cannot use the `count` method. Hint: use a **`while`** loop and the `find` method, making use of the optional `start` parameter of `find`.

Solution:

```
# version 1: uses a loop and a half
def mycount(s, sub):
    '''(str, str) -> int
    Returns the number of non-overlapping occurrences
    of sub in s.
    >>> mycount('apple', 'p')
    2
    >>> mycount('apple', 'P')
    0
    >>> mycount('banana', 'ana')
    1
    >>> mycount('aaa', 'aa')
    1
    >>> mycount('late for a date with a mate', 'ate')
    3
    '''
    count = 0
    idx = s.find(sub)  # half a loop
    while idx > -1:
        count += 1
        idx = s.find(sub, idx+len(sub))
    return count

# version 2: uses an infinite loop with break
def mycount2(s, sub):
    '''(str, str) -> int
    Returns the number of non-overlapping occurrences
    of sub in s.
    >>> mycount2('apple', 'p')
    2
    >>> mycount2('apple', 'P')
    0
    >>> mycount2('banana', 'ana')
    1
    >>> mycount2('aaa', 'aa')
    1
    >>> mycount2('late for a date with a mate', 'ate')
    3
    '''
    count = 0
    idx = 0
    while True:
```

```
        idx = s.find(sub, idx)
        if idx == -1:
            break
        count += 1
        idx += len(sub)
    return count
```

Some material adapted from Campbell and Gries.