Sequences: Lists of Values

String

- s = 'abc d'

0	1	2	3	4
a	b	c		d

- Put characters in quotes
  - Use \' for quote character
- Access characters with []
  - s[0] is 'a'
  - s[5] causes an error
  - s[0:2] is 'ab' (excludes c)
  - s[2:] is 'c d'

List

- x = [5, 6, 5, 9, 15, 23]

0	1	2	3	4	5
5	6	5	9	15	23

- Put values inside [ ]
  - Separate by commas
- Access **values** with []
  - x[0] is 5
  - x[6] causes an error
  - x[0:2] is [5, 6] (excludes 2nd 5)
  - x[3:] is [9, 15, 23]

Lists Have Methods Similar to String

x = [5, 6, 5, 9, 15, 23]

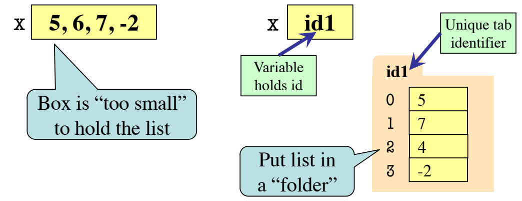
- index(value)
  - Return position of the value
  - **ERROR** if value is not there
  - x.index(9) evaluates to 3
- count(value)
  - Returns number of times value appears in list
  - x.count(5) evaluates to 2

But you get length of a list with a regular function, not method:
len(x)

Representing Lists

Wrong

Correct

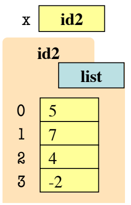


x = [5, 7, 4,-2]

Lists vs. Class Objects

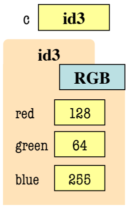
List

- Attributes are indexed
  - Example: x[2]



RGB

- Attributes are named
  - Example: c.red



When Do We Need to Draw a Folder?

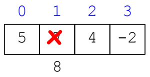
- When the value **contains** other values
  - This is essentially want we mean by ‘object’
- When the value is **mutable**

Type	Container?	Mutable?
int	No	No
float	No	No
str	Yes*	No
Point	Yes	Yes
RGB	Yes	Yes
list	Yes	Yes

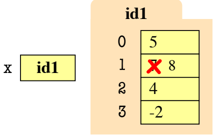
Lists are Mutable

- **List assignment**:
  <var>[<index>] = <value>
  - Reassign at index
  - Affects folder contents
  - Variable is unchanged
- Strings cannot do this
  - s = 'Hello World!'
  - s[0] = 'J' **ERROR**
  - String are **immutable**

- x = [5, 7,4,-2]



- x[1] = 8



List Methods Can Alter the List

x = [5, 6, 5, 9]

See Python API for more

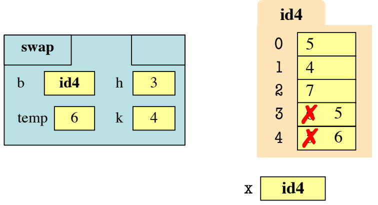
- append(value)
  - A **procedure method**, not a fruitful method
  - Adds a new value to the end of list
  - x.append(-1) *changes* the list to [5, 6, 5, 9, -1]
- insert(index, value)
  - Put the value into list at index; shift rest of list right
  - x.insert(2,-1) changes the list to [5, 6, -1, 5, 9,]
- sort() What do you think this does?

Lists and Functions: Swap

```
def swap(b, h, k):
    """Procedure swaps b[h] and b[k] in b
      Precondition: b is a mutable list, h
      and k are valid positions in the list"""
    temp= b[h]
    b[h]= b[k]
    b[k]= temp
```

Swaps b[h] and b[k], because parameter b contains name of list.

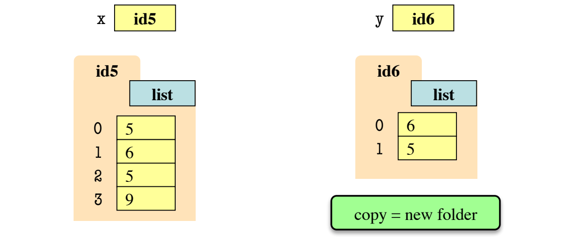
swap(x, 3, 4)



List Slices Make Copies

x = [5, 6, 5, 9]

y = x[1:3]



copy = new folder

Exercise Time

- Execute the following:

```
>>> x = [5, 6, 5, 9, 10]
>>> x[3] = -1
>>> x.insert(1,2)
```

- What is x[4]?

- Execute the following:

```
>>> x = [5, 6, 5, 9, 10]
>>> y = x[1:]
>>> y[0] = 7
```

- What is x[1]?

Lists and Expressions

- List brackets [] can contain expressions
- This is a list **expression**
  - Python must evaluate it
  - Evaluates each expression
  - Puts the value in the list
- Example:

```
>>> a = [1+2,3+4,5+6]
>>> a
[3, 7, 11]
```

- Execute the following:

```
>>> a = 5
>>> b = 7
>>> x = [a, b, a+b]
```

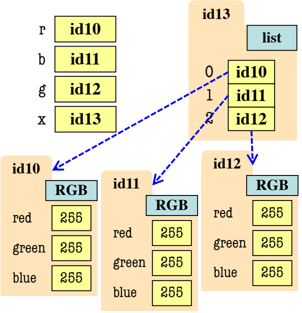
- What is x[2]?

A: 'a+b'
B: 12
C: 57
D: **ERROR**
E: I don't know

Lists of Objects

- List positions are variables
  - Can store base types
  - But cannot store folders
  - Can store folder identifiers
- Folders linking to folders
  - Top folder for the list
  - Other folders for contents
- Example:

```
>>> r = cornell.RED
>>> b = cornell.BLUE
>>> g = cornell.GREEN
>>> x = [r,b,g]
```


r id10
b id11
g id12
x id13
id13
list
0 id10
1 id11
2 id12
id10
RGB
red 255
green 255
blue 255
id11
RGB
red 255
green 255
blue 255
id12
RGB
red 255
green 255
blue 255