

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]

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Lists Have Methods Similar to String

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

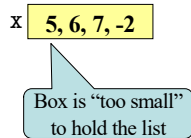
- `index(value)`
 - Return position of the value
 - **ERROR** if value is not there
 - `x.index(9)` evaluates to 3
- `count(value)`
 - Returns number of times value appears in list
 - `x.count(5)` evaluates to 2

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

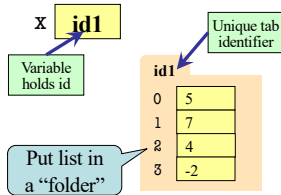
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Representing Lists

Wrong



Correct



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

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Lists vs. Class Objects

List

- Attributes are indexed
 - Example: `x[2]`
-

RGB

- Attributes are named
 - Example: `c.red`
-

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When Do We Need to Draw a Folder?

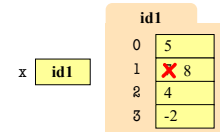
- When the value **contains** other values
 - This is essentially what we mean by 'object'
- When the value is **mutable**

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

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Lists are Mutable

- **List assignment:**
 - `<var>[<index>] = <value>`
 - Reassign at index
 - Affects folder contents
 - Variable is unchanged
- `x = [5, 7, 4, -2]`
 - 0 1 2 3
 - 5 7 4 -2
 - 8
- `x[1] = 8`
- Strings cannot do this
 - `s = 'Hello World!'`
 - `s[0] = 'J'` **ERROR**
 - Strings are **immutable**



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List Methods Can Alter the List

```
x = [5, 6, 5, 9]
```

- **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()**

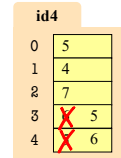
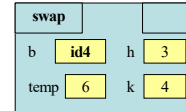
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Lists and Functions: Swap

```
1. def swap(b, h, k):
2.     """ Swaps b[h] and b[k] in b
3.     Precond: b is a mutable list,
4.     h, k are valid positions"""
5.     temp = b[h]
6.     b[h] = b[k]
7.     b[k] = temp
```

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

```
swap(x, 3, 4)
```



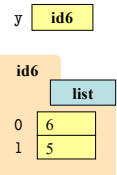
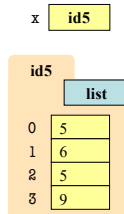
x id4

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List Slices Make Copies

```
x = [5, 6, 5, 9]
```

```
y = x[1:3]
```



copy = new folder

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Exercise Time

- Execute the following:


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


```
>>> x = [5, 6, 5, 9, 10]
>>> y = x[1:]
>>> y[0] = 7
```
- What is `x[4]`?
- What is `x[1]`?

A: 10
B: 9
C: -1
D: **ERROR**
E: I don't know

A: 7
B: 5
C: 6
D: **ERROR**
E: I don't know

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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]`?

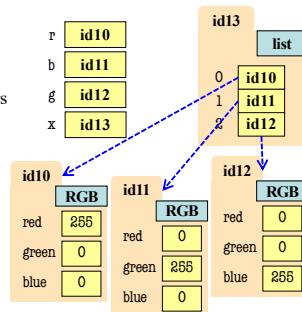
A: 'a+b'
B: 12
C: 57
D: **ERROR**
E: I don't know

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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 = introcs.RGB(255,0,0)
>>> g = introcs.RGB(0,255,0)
>>> b = introcs.RGB(0,0,255)
>>> x = [r,g,b]
```



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