CSC 231- The ArrayList Data Structure

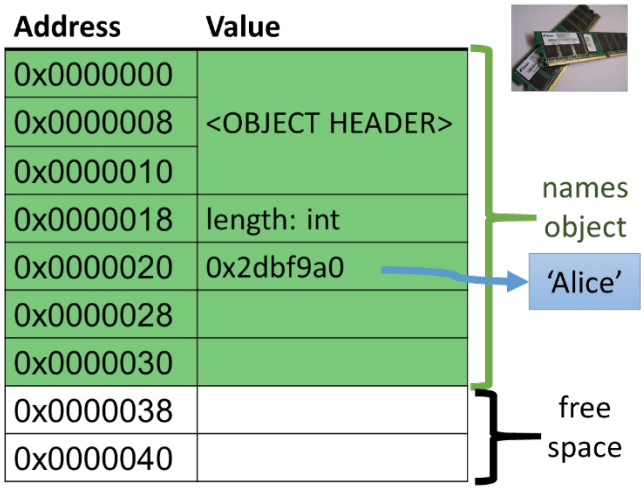
The Python list[] type implements an ArrayList data structure.

An *array* is a contiguous block of computer memory.

- HEADER is 24 bytes
- length is 8 bytes - returned when you call `len(list)`.
- Each object reference (values in the list) is 8 bytes
- The sizes depend on your computer, but will be *constant*

The main benefit of an array-based list is that we can *access* any element *by index* in *O(1)* time by using arithmetic computations.

Python *pre-allocates* a larger block of memory for the list in anticipation you will add data to it



read by index

```
x = list[2]
```

length = 6	
index	*value*
0	'Alice'
1	'Bob'
2	'Fran'
3	'John'
4	12345
5	10.0

write to index

```
list[2] = 'Eugene'
```

length = 6	
index	*value*
0	'Alice'
1	'Bob'
2	'Fran'
3	'John'
4	12345
5	10.0

list.append(value)

```
list.append('Bart')
```

length = 6	
index	*value*
0	'Alice'
1	'Bob'
2	'Fran'
3	'John'
4	12345
5	10.0

list.pop()

```
list.pop()
```

length = 6	
index	*value*
0	'Alice'
1	'Bob'
2	'Fran'
3	'John'
4	12345
5	10.0

list.insert(index, value)

```
list.insert(0, 'Paris')
```

length = 6	
index	*value*
0	'Alice'
1	'Bob'
2	'Fran'
3	'John'
4	12345
5	10.0

list.pop(index)

```
list.pop(0)
```

length = 6	
index	*value*
0	'Alice'
1	'Bob'
2	'Fran'
3	'John'
4	12345
5	10.0

list.remove(value)

```
list.remove('Alice')
```

length = 6	
index	*value*
0	'Alice'
1	'Bob'
2	'Fran'
3	'John'
4	12345
5	10.0

```
list.remove('Horatio')
```

length = 6	
index	*value*
0	'Alice'
1	'Bob'
2	'Fran'
3	'John'
4	12345
5	10.0

list.append() and list.insert(index, value) – revisited

```
list.append('Bart')
```