# Lists in Memory

x = list()

x.append(7)

x.append(4)

x.append('ryan')   ⟵—— cost?

print X[2]   ⟵—— cost?

del X[2]   ⟵—— cost?

'ryan' in X   ⟵—— cost?

| | 0 | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|---|
| | 7 | 4 | 'ryan' | | | | |

## Operation Cost

| | index | append/add | delete | 'in' |
|---|---|---|---|---|
| list | 1 | 1 | n | n |
| set/dict | N/A | 1 | 1 | 1 |

( I'll explain this row on the next page. )

# Sets in memory

```
X = set()
X.add('ryan')
```

hash table:

```
   0   1   2   3    4    5   6   ▨
 [   | 8 |   |'bob'|'ryan'|  |  |  ]
```

$n = 7$

$\hookrightarrow$ hash('ryan') $\Rightarrow$ 4874321

$\hookrightarrow$ 4874321 % 7 $\Rightarrow$ 4

```
X.add('bob')
```

$\hookrightarrow$ hash('bob') $\Rightarrow$ 74392

74392 % 7 $\Rightarrow$ 3

(goes in index 3 above)

```
X.add(8)
```

$\hookrightarrow$ hash(8) $\Rightarrow$ 8

8 % 7 $\Rightarrow$ 1

(goes in index 1 above)

How to delete?
How to query 'in'?   (Now finish the notebook)