

List Basics

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Creating, indexing, and basic operators

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["a", "e", "i", "o", "u"]
>>> "t" in vowels
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>>> "t" in vowels
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```
>>> for letter in vowels:
...     print(letter)
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["a", "e", "i", "o", "u"]
>>> "t" in vowels
False
```

```
>>> for letter in vowels:
...     print(letter)
```

```
a
e
i
o
u
```

Advanced List Creation

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Or concatenation:

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>>> myList = [0] * 5  
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Or concatenation:

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>>> vowels = ["a", "e", "i", "o", "u"]
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You can also create lists using the `*` operator:

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>>> myList = [0] * 5
>>> print(myList)
[0, 0, 0, 0, 0]
```

Or concatenation:

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>>> vowels = ["a", "e", "i", "o", "u"]
>>> vowels = vowels + ["y"]
```

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You can also create lists using the `*` operator:

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>>> myList = [0] * 5
>>> print(myList)
[0, 0, 0, 0, 0]
```

Or concatenation:

```
>>> vowels = ["a", "e", "i", "o", "u"]
>>> vowels = vowels + ["y"]
>>> print(vowels)
```

Advanced List Creation

You can also create lists using the `*` operator:

```
>>> myList = [0] * 5
>>> print(myList)
[0, 0, 0, 0, 0]
```

Or concatenation:

```
>>> vowels = ["a", "e", "i", "o", "u"]
>>> vowels = vowels + ["y"]
>>> print(vowels)
["a", "e", "i", "o", "u", "y"]
```

Basic list indexing

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>>> vowels = ["a", "e", "i", "o", "u"]
```

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To access an individual item in the list, use its *index*:

```
>>> vowels = ["a", "e", "i", "o", "u"]  
          0
```


Basic list indexing

To access an individual item in the list, use its *index*:

```
>>> vowels = ["a", "e", "i", "o", "u"]  
           0    1
```

Basic list indexing

To access an individual item in the list, use its *index*:

```
>>> vowels = ["a", "e", "i", "o", "u"]  
           0   1   2
```

Basic list indexing

To access an individual item in the list, use its *index*:

```
>>> vowels = ["a", "e", "i", "o", "u"]  
            0     1     2     3
```

Basic list indexing

To access an individual item in the list, use its *index*:

```
>>> vowels = ["a", "e", "i", "o", "u"]  
            0    1    2    3    4
```

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To access an individual item in the list, use its *index*:

```
>>> vowels = ["a", "e", "i", "o", "u"]  
              0     1     2     3     4
```

```
>>> print(vowels[0])
```

Basic list indexing

To access an individual item in the list, use its *index*:

```
>>> vowels = ["a", "e", "i", "o", "u"]  
              0     1     2     3     4
```

```
>>> print(vowels[0])
```

```
a
```

Basic list indexing

To access an individual item in the list, use its *index*:

```
>>> vowels = ["a", "e", "i", "o", "u"]  
              0     1     2     3     4
```

```
>>> print(vowels[0])
```

```
a
```

```
>>> print(vowels[4])
```

Basic list indexing

To access an individual item in the list, use its *index*:

```
>>> vowels = ["a", "e", "i", "o", "u"]  
              0     1     2     3     4
```

```
>>> print(vowels[0])
```

a

```
>>> print(vowels[4])
```

u

Basic list indexing

To access an individual item in the list, use its *index*:

```
>>> vowels = ["a", "e", "i", "o", "u"]  
              0     1     2     3     4
```

```
>>> print(vowels[0])
```

a

```
>>> print(vowels[4])
```

u

```
>>> print(vowels[5])
```

Basic list indexing

To access an individual item in the list, use its *index*:

```
>>> vowels = ["a", "e", "i", "o", "u"]  
              0     1     2     3     4
```

```
>>> print(vowels[0])
```

a

```
>>> print(vowels[4])
```

u

```
>>> print(vowels[5])
```

```
IndexError: list index out of range
```

Basic list indexing

To access an individual item in the list, use its *index*:

```
>>> vowels = ["a", "e", "i", "o", "u"]  
              0     1     2     3     4
```

```
>>> print(vowels[0])
```

a

```
>>> print(vowels[4])
```

u

```
>>> print(vowels[5])
```

```
IndexError: list index out of range
```

```
>>> len(vowels)
```

Basic list indexing

To access an individual item in the list, use its *index*:

```
>>> vowels = ["a", "e", "i", "o", "u"]  
              0     1     2     3     4
```

```
>>> print(vowels[0])
```

a

```
>>> print(vowels[4])
```

u

```
>>> print(vowels[5])
```

```
IndexError: list index out of range
```

```
>>> len(vowels)
```

5

The range function

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```
for i in range(len(vowels)):  
    print(vowels[i])
```

The range function

This is why the `range(n)` function counts from 0, ..., $n-1$

```
for i in range(len(vowels)):
    print(vowels[i])
```

a

e

i

o

u

Advanced indexing

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Use negative numbers to index from the back of the list:

```
>>> vowels = ["a", "e", "i", "o", "u"]
```

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Use negative numbers to index from the back of the list:

```
>>> vowels = ["a", "e", "i", "o", "u"]  
          -5
```

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Use negative numbers to index from the back of the list:

```
>>> vowels = ["a", "e", "i", "o", "u"]  
          -5  -4
```

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>>> vowels = ["a", "e", "i", "o", "u"]  
           -5  -4  -3
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>>> vowels = ["a", "e", "i", "o", "u"]  
           -5  -4   -3  -2
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Use negative numbers to index from the back of the list:

```
>>> vowels = ["a", "e", "i", "o", "u"]  
           -5  -4   -3  -2   -1
```

```
for i in range(1, len(vowels)+1):  
    print(vowels[-i])
```


Advanced indexing

Use negative numbers to index from the back of the list:

```
>>> vowels = ["a", "e", "i", "o", "u"]  
           -5  -4  -3  -2  -1
```

```
for i in range(1, len(vowels)+1):  
    print(vowels[-i])
```

```
u  
o  
i  
e  
a
```

Slicing

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Can create a sublist by “slicing” a list:

```
>>> vowels = ["a", "e", "i", "o", "u"]
```

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Can create a sublist by “slicing” a list:

```
>>> vowels = ["a", "e", "i", "o", "u"]
```

```
>>> print(vowels[1:3])
```

Slicing

Can create a sublist by “slicing” a list:

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>>> vowels = ["a", "e", "i", "o", "u"]
```

```
>>> print(vowels[1:3])
```

```
[e, i]
```

Slicing

Can create a sublist by “slicing” a list:

```
>>> vowels = ["a", "e", "i", "o", "u"]
```

```
>>> print(vowels[1:3])  
[e, i]
```

```
>>> print(vowels[:3])
```

Slicing

Can create a sublist by “slicing” a list:

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>>> vowels = ["a", "e", "i", "o", "u"]
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```
>>> print(vowels[1:3])  
[e, i]
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```
>>> print(vowels[:3])  
[a, e, i]
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[e, i]
```

```
>>> print(vowels[:3])  
[a, e, i]
```

```
>>> print(vowels[3:])
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>>> print(vowels[:3])  
[a, e, i]
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[a, e, i]
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```
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[o, u]
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```
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[a, e, i]
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```
>>> print(vowels[3:])  
[o, u]
```

```
>>> print(vowels[:])  
[a, e, i, o, u]
```

Concept Check!

Consider the following list:

```
myList = [1, 2, 3, 4, 5]
```

What will each of the following commands print?

1. `print(len(myList))`
2. `print(myList + [0])`
3. `print(myList[2])`
4. `print(myList[-1])`
5. `print(myList[1:-1])`
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| 4. <code>print(myList[-1])</code>   | 5                               |
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| 6. <code>print(myList[:-1])</code>  | [1, 2, 3, 4]       |

# Mutability and Tuples

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```
>>> myList = [1, 2, 3, 4]
>>> myList[0] = 2
```

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If you are just using as a named constant, then a *tuple* is *immutable*:

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>>> myTuple = (1, 2, 3, 4)
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>>> myTuple = (1, 2, 3, 4)
>>> myTuple[0] = 2 ✗
```

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A list is *mutable*.

This means that you can alter the value of an item in a list in the future:

```
>>> myList = [1, 2, 3, 4]
>>> myList[0] = 2 ✓
```

If you are just using as a named constant, then a *tuple* is *immutable*:

```
>>> myTuple = (1, 2, 3, 4)
>>> myTuple[0] = 2 ✗
```

```
TypeError: "tuple" object does not support item
assignment
```