

1. Recap
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3. While Loops
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4. Lists
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5. For Loops
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KOLT Python

Strings, Loops & Lists

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Monday 7th October, 2019

KOLT



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Agenda

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Branching

```
if <condition>:  
    <expression>  
    <expression>  
    ...
```

```
if <condition>:  
    <expression>  
    <expression>  
    ...  
else:  
    <expression>  
    <expression>  
    ...
```

```
if <condition>:  
    <expression>  
    <expression>  
    ...  
elif <condition>:  
    <expression>  
    <expression>  
    ...  
...  
else:  
    <expression>  
    <expression>  
    ...
```

- <condition> has a **bool** value (True or False)
- Which expressions will be evaluated in which conditions?

Branching Example

```
if have_ideas_for_exciting_examples():  
    .  
    .  
    .  
elif gul_sena_has_awesome_ideas():  
    let_her_prepare_the_slides()  
else:  
    prepare_slides_about_your_misery()  
    apologize_to_class()
```

Branching Example

```
if have_ideas_for_exciting_examples():  
    .  
    .  
    .  
elif gul_sena_has_awesome_ideas():  
    let_her_prepare_the_slides()  
else:  
    prepare_slides_about_your_misery()  
    apologize_to_class()
```

Comparison Operators

- <: Strictly less than
- <=: Less than or equal
- >: Strictly greater than
- >=: Greater than or equal
- ==: Equal
- !=: Not equal

```
3.0 == 3    # => True
3.0 >= 3    # => True
# Small-case characters
# have bigger ASCII value
'Aa' > 'aa' # => False
'hi' == 'hi' # => True
'a' == None  # => True
3 > 'a'      # => TypeError
3 == 'a'     # => False
```

bool Operators

How to represent logical operations in Python? (and, or, not)

A	B	A or B	A and B	not A
True	True	True	True	False
True	False	True	False	False
False	True	True	False	True
False	False	False	False	True

True or False and False \Rightarrow **True**

- and
- or
- not

WHY?



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Strings



Strings

```
my_string = 'abcde'
```

Strings

```
my_string = 'abcde'
```

```
    0 1 2 3 4  
    'a b c d e'
```

Strings

```
my_string = 'abcde'
```

```
0 1 2 3 4  
'a b c d e'  
-5 -4 -3 -2 -1
```

Strings

```
my_string = 'abcde'
```

```
  0 1 2 3 4  
'a b c d e'  
-5-4-3-2-1
```

```
print(my_string[2])
```

Strings

```
my_string = 'abcde'
```

```
  0 1 2 3 4  
'a b c d e'  
-5 -4 -3 -2 -1
```

```
print(my_string[2]) ⇒ prints c
```

Strings

```
my_string = 'abcde'
```

```
    0 1 2 3 4  
    'a b c d e'  
   -5 -4 -3 -2 -1
```

```
print(my_string[2]) ⇒ prints c  
print(my_string[-2])
```

Strings

```
my_string = 'abcde'
```

```
    0 1 2 3 4  
    'a b c d e'  
   -5 -4 -3 -2 -1
```

```
print(my_string[2]) ⇒ prints c
```

```
print(my_string[-2]) ⇒ prints d
```

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Indexing & Slicing

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Access specific characters using **indexing**, i.e, [**index**]

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Slice strings by using `[start:stop:step]`

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Access specific characters using **indexing**, i.e, `[index]`
Slice strings by using `[start:stop:step]`

```
s = 'Python'
s[1] # => 'y'
s[0:4] # => 'Pyth'
s[:3] # => 'Pyt'
s[3:] # => 'hon'
s[:] # => 'Python'
```

Indexing & Slicing

Access specific characters using **indexing**, i.e, `[index]`
Slice strings by using `[start:stop:step]`

```
s = 'Python'
s[1] # => 'y'
s[0:4] # => 'Pyth'
s[:3] # => 'Pyt'
s[3:] # => 'hon'
s[:] # => 'Python'
```

```
s = 'Python'
s[:5:2] # => 'Pto'
s[1:4:3] # => 'y'
s[::3] # => 'Ph'
s[::-1] # => 'nohtyP'
```



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String Operations

String Operations

```
print('This a simple calculator program.')
number1 = input('Please enter the first number:')
number2 = input('Please enter the second number:')
print(f'{number1}+{number2} is {number1 + number2}')
```

String Operations

```
print('This a simple calculator program.')
number1 = input('Please enter the first number:')
number2 = input('Please enter the second number:')
print(f'{number1}+{number2} is {number1 + number2}')
```

```
number1 = int(input('First number:'))
number2 = input('Please enter the second number:')
print(f'{number1}x{number2} is {number1 * number2}')
```

String Operations

```
print('This a simple calculator program.')
number1 = input('Please enter the first number:')
number2 = input('Please enter the second number:')
print(f'{number1}+{number2} is {number1 + number2}')
```

```
number1 = int(input('First number:'))
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```

str1 + str2 ⇒ Concatenate str1 and str2



String Operations

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```
number1 = int(input('First number:'))
number2 = input('Please enter the second number:')
print(f'{number1}x{number2} is {number1 * number2}')
```

str1 + str2 ⇒ **Concatenate** str1 and str2

str1 * n ⇒ Repeat str1 *n* times.



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Example: Evil Laughter



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While Loops

While Loops

Repeat some <expression>s as long as a <condition> is True.

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```
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    ...
```

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Repeat some <expression>s as long as a <condition> is True.

```
while <condition>:  
    <expression>  
    <expression>  
    ...
```

```
x = 15  
while x > 10:  
    print(x)  
    x-=1
```

While Loops

Repeat some <expression>s as long as a <condition> is True.

```
while <condition>:  
    <expression>  
    <expression>  
    ...
```

```
x = 15  
while x > 10:  
    print(x)  
    x-=1
```

```
counter = 11  
while counter > 6:  
    counter -= 1  
    print(2**counter)  
    counter -= 1
```

While Loops

Repeat some <expression>s as long as a <condition> is True.

```
while <condition>:  
    <expression>  
    <expression>  
    ...
```

```
x = 15  
while x > 10:  
    print(x)  
    x-=1
```

```
counter = 11  
while counter > 6:  
    counter -= 1  
    print(2**counter)  
    counter -= 1
```

<condition> is only checked **before** each execution.



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Example: Evil Laughter (Cont.)



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Lists

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Lists



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5. For Loops
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Lists



Imagine variables, but with limitless capacity. . .

Lists



Imagine variables, but with limitless capacity. . .

```
sunnyside = ['Mr. Potato Head', 'Hamm',  
'Buzz Lightyear', 'Slinky Dog']
```

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Lists

Lists

```
empty_list = []  
letters = ['a', 'b', 'c', 'd']  
numbers = [2, 3, 5]
```

Lists

```
empty_list = []  
letters = ['a', 'b', 'c', 'd']  
numbers = [2, 3, 5]
```

```
mixed_list = [4, 13, 'hello']
```


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Accessing Elements

Accessing Elements

```
values = [1, 'hello', None, [3], True]
```

Accessing Elements

```
values = [1, 'hello', None, [3], True]
```

```
    0     1     2     3     4  
[ 1, 'hello', None, [3], True ]
```

Accessing Elements

```
values = [1, 'hello', None, [3], True]
```

0	1	2	3	4	
[	1,	'hello',	None,	[3],	True]
-5	-4	-3	-2	-1	

Accessing Elements

```
values = [1, 'hello', None, [3], True]
```

0	1	2	3	4	
[	1,	'hello',	None,	[3],	True]
-5	-4	-3	-2	-1	

Use **indexing** to access and **update** elements inside list.

Accessing Elements

```
values = [1, 'hello', None, [3], True]
```

0	1	2	3	4	
[	1,	'hello',	None,	[3],	True]
-5	-4	-3	-2	-1	

Use **indexing** to access and **update** elements inside list.
`print(values[2])`

Accessing Elements

```
values = [1, 'hello', None, [3], True]
```

0	1	2	3	4	
[	1,	'hello',	None,	[3],	True]
-5	-4	-3	-2	-1	

Use **indexing** to access and **update** elements inside list.

```
print(values[2])  
values[2] = 'new value'
```

Adding New Elements

Append elements at the end of a list by **append()**

Adding New Elements

Append elements at the end of a list by **append()**

```
numbers = [1, 2, 3]
numbers.append(7) # => numbers = [1, 2, 3, 7]
numbers.append(11) # => numbers = [1, 2, 3, 7, 11]

a_list = [1, 'a', 'python', 4.2]
a_list.append(3) # => a_list = [1, 'a', 'python', 4.2, 3]
a_list.append('hello')
# => a_list = [1, 'a', 'python', 4.2, 3, 'hello']
```

Adding New Elements

Append elements at the end of a list by **append()**

```
numbers = [1, 2, 3]
numbers.append(7) # => numbers = [1, 2, 3, 7]
numbers.append(11) # => numbers = [1, 2, 3, 7, 11]

a_list = [1, 'a', 'python', 4.2]
a_list.append(3) # => a_list = [1, 'a', 'python', 4.2, 3]
a_list.append('hello')
# => a_list = [1, 'a', 'python', 4.2, 3, 'hello']
```

```
x = [1, 2, 3]
y = [4, 5]
x.append(y) # => x = [1, 2, 3, [4, 5]]
```

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Inspecting List Elements

Inspecting List Elements

Slice lists by using `[start:stop:step]`

Inspecting List Elements

Slice lists by using `[start:stop:step]`

```
x = [1, 2, 3, 4, 5]
x[2:4] # => [3, 4]
x[3:4] # => [4]
x[1:-1] # => [2, 3, 4]
```

Inspecting List Elements

Slice lists by using **[start:stop:step]**

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

```
x[2:4] # => [3, 4]
```

```
x[3:4] # => [4]
```

```
x[1:-1] # => [2, 3, 4]
```

```
y = ['a', 'b', 'c', 'd', 'e', 'f']
```

```
y[:3] # => ['a', 'b', 'c']
```

```
y[2:] # => ['c', 'd', 'e', 'f']
```

```
y[:-1] # => ['a', 'b', 'c', 'd', 'e']
```

```
y[:] # => ['a', 'b', 'c', 'd', 'e', 'f']
```

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Inspecting List Elements

Inspecting List Elements

```
y = ['a', 'b', 'c', 'd', 'e', 'f']
```

```
y[1:5:2] # => ['b', 'd']
```

```
y[::3] # => ['a', 'd']
```


Inspecting List Elements

```
y = ['a', 'b', 'c', 'd', 'e', 'f']
```

```
y[1:5:2] # => ['b', 'd']
```

```
y[::3] # => ['a', 'd']
```

```
y = ['a', 'b', 'c', 'd', 'e', 'f']
```

```
y[::-1] # => ['f', 'e', 'd', 'c', 'b', 'a']
```

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Removing An Element

Removing An Element

Remove elements in a list by **remove()**

Removing An Element

Remove elements in a list by **remove()**

```
numbers = [1, 2, 3, 4]
numbers.remove(2) # => numbers = [1, 3, 4]

letters = ['a', 'b', 'c']
letters.remove('b') # => letters = ['a', 'c']

numbers_repeated = [1, 2, 5, 4, 2, 6]
numbers_repeated.remove(2) # => number_repeated = [1, 5, 4, 2, 6]

my_list = [1, 'a']
my_list.remove('b') # => ValueError
```

Removing An Element

Remove elements in a list by **remove()**

```
numbers = [1, 2, 3, 4]
numbers.remove(2) # => numbers = [1, 3, 4]

letters = ['a', 'b', 'c']
letters.remove('b') # => letters = ['a', 'c']

numbers_repeated = [1, 2, 5, 4, 2, 6]
numbers_repeated.remove(2) # => number_repeated = [1, 5, 4, 2, 6]

my_list = [1, 'a']
my_list.remove('b') # => ValueError
```

How to avoid ValueError?

Removing An Element

Remove elements in a list by **remove()**

```
numbers = [1, 2, 3, 4]
numbers.remove(2) # => numbers = [1, 3, 4]

letters = ['a', 'b', 'c']
letters.remove('b') # => letters = ['a', 'c']

numbers_repeated = [1, 2, 5, 4, 2, 6]
numbers_repeated.remove(2) # => number_repeated = [1, 5, 4, 2, 6]

my_list = [1, 'a']
my_list.remove('b') # => ValueError
```

How to avoid ValueError? (Hint: **Branching**)

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in Operator

in Operator

Search an operand in the specified sequence by using **in**

in Operator

Search an operand in the specified sequence by using **in**

```
0 in [] # => False
'y' in 'Python' # => True
23 in ['hello', 40, 'a', 5] # => False
23 in ['hello', 40, 'a', 23] # => True
23 in ['hello', 40, 'a', '23'] # => False
```

in Operator

Search an operand in the specified sequence by using **in**

```
0 in [] # => False
'y' in 'Python' # => True
23 in ['hello', 40, 'a', 5] # => False
23 in ['hello', 40, 'a', 23] # => True
23 in ['hello', 40, 'a', '23'] # => False
```

- Works with both lists and strings

in Operator

Search an operand in the specified sequence by using **in**

```
0 in [] # => False
'y' in 'Python' # => True
23 in ['hello', 40, 'a', 5] # => False
23 in ['hello', 40, 'a', 23] # => True
23 in ['hello', 40, 'a', '23'] # => False
```

- Works with both lists and strings
- Works with ranges

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len() Function

len() Function

`len()` is an operator to determine the size of lists, strings, etc.

len() Function

`len()` is an operator to determine the size of lists, strings, etc.

```
s = 'Python'
len(s) # => 6

my_list = [0, 1, 2, 3]
len(my_list) # => 4
```

List Slicing

Access collection of elements with `[start:stop:step]`
Gives a list, even when number of elements is not bigger than 1.

```
numbers[0::2]    # => [0, 2, 4]
numbers[:]      # => [0, 1, 2, 3, 4, 5]
numbers[1:]     # => [1, 2, 3, 4, 5]
numbers[-2:]    # => [4, 5]
numbers[1:4]    # => [1, 2, 3]
numbers[1:1]    # => []
numbers[-99:99] # => [0, 1, 2, 3, 4, 5]
numbers[::-1]   # => [5, 4, 3, 2, 1, 0]
numbers[::-2]   # => [5, 3, 1]
```

Slices with `step = 1` are called **Basic Slice**.

Slices with `step != 1` are called **Extended Slice**.

List Mutation

list.append(x): Append x to end of the sequence

list.insert(i, x): Insert x to index i

list.pop(i=-1): Remove and return element at index i

list.remove(x): Remove first occurrence of x

list.extend(iterable): Add all elements in iterable to end of list

list[i] = new_value: Update value of index i with new value

list[basic_slice] = iterable: Change elements in basic slice with elements in iterable, sizes can be different:

`numbers[:] = []`

list[extended_slice] = iterable: Change elements in extended slice with elements in iterable 1-1, sizes must be equal.

Some Other List Operations

in operator: Check whether an element is in list.

`3 in numbers` \Rightarrow `True`

len(list): Returns the length of list (and other collections).

list.index(value, start=0, stop=len(list)):

Return first index of value.

list.count(value): Count number of occurrences of value.

list.reverse(): Reverse the list (in-place)

list.sort(): Sort list elements (in-place)

For more, type `help(list)` in your interactive interpreter.

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range() Function

range() Function

`range(start, stop, step)` is a function to create ranges

```
a = range(3) # => generates 0, 1, 2
b = range(0,3) # => generates 0, 1, 2
c = range(2,4) # => generates 2, 3
d = range(0,6,2) # => generates 0, 2, 4
0 in a # => True
1 in b # => True
4 in c # => False
2 in d # => True
6 in d # => False
```

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For Loops

For Loops

```
for <item> in <iterable>:  
    <expression>  
    <expression>  
    ...
```

For Loops

```
for <item> in <iterable>:  
    <expression>  
    <expression>  
    ...
```

```
for ch in 'Python':  
    print(ch)
```

For Loops

```
for <item> in <iterable>:  
    <expression>  
    <expression>  
    ...
```

```
for ch in 'Python':  
    print(ch)
```

```
for num in [4,23,12,0,50]:  
    print(num * 3, sep=".")
```

For Loops

```
for <item> in <iterable>:  
    <expression>  
    <expression>  
    ...
```

```
for ch in 'Python':  
    print(ch)
```

```
for num in [4,23,12,0,50]:  
    print(num * 3, sep=".")
```

```
for i in range(0,8):  
    print(i)
```


Break, Continue & Pass

break immediately terminates the closest loop

```
for i in range(0, 5):  
    if i % 2 == 1:  
        break  
    print(i)
```

Break, Continue & Pass

break immediately terminates the closest loop

```
for i in range(0, 5):  
    if i % 2 == 1:  
        break  
    print(i)
```

```
x = 1  
while x < 100:  
    x *= 2  
    if (x+1) % 3 == 0:  
        break  
    print(x)
```

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1. Recap
○○○○○

2. Strings
○○○○

3. While Loops
○○

4. Lists
○○○○○○○○○○○○

5. For Loops
○○○●

Break, Continue & Pass

Break, Continue & Pass

pass does not have an effect

```
for letter in 'Python':  
    if letter == 'y':  
        pass  
    print(letter)
```

Break, Continue & Pass

pass does not have an effect

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for letter in 'Python':  
    if letter == 'y':  
        pass  
    print(letter)
```

- Loops, conditional statements, functions etc. cannot be empty