

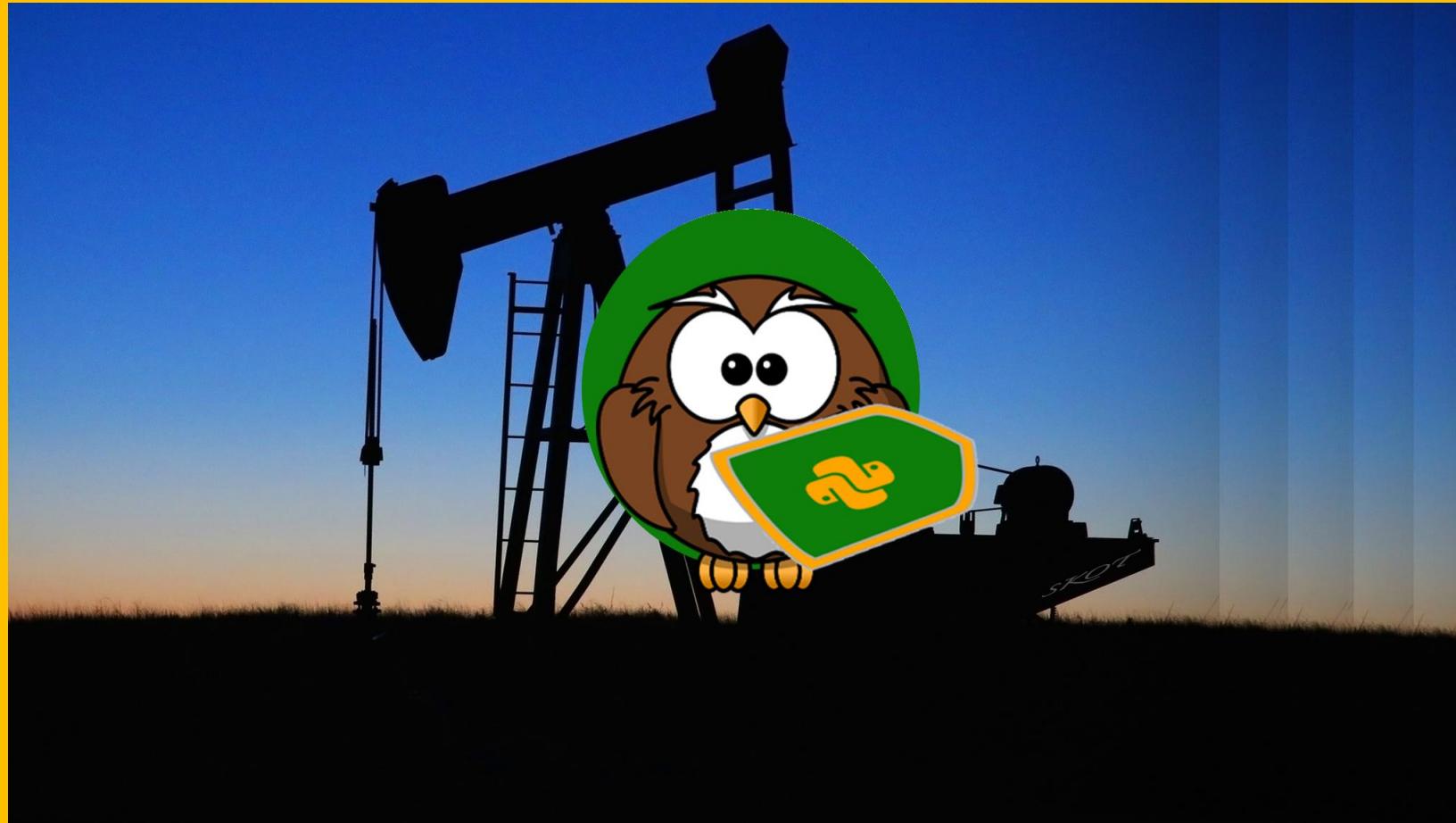
Modern Pythoneering

The Built-In Reports

By Randall Nagy



A.K.A: PyQuesting!





100 Python Questions

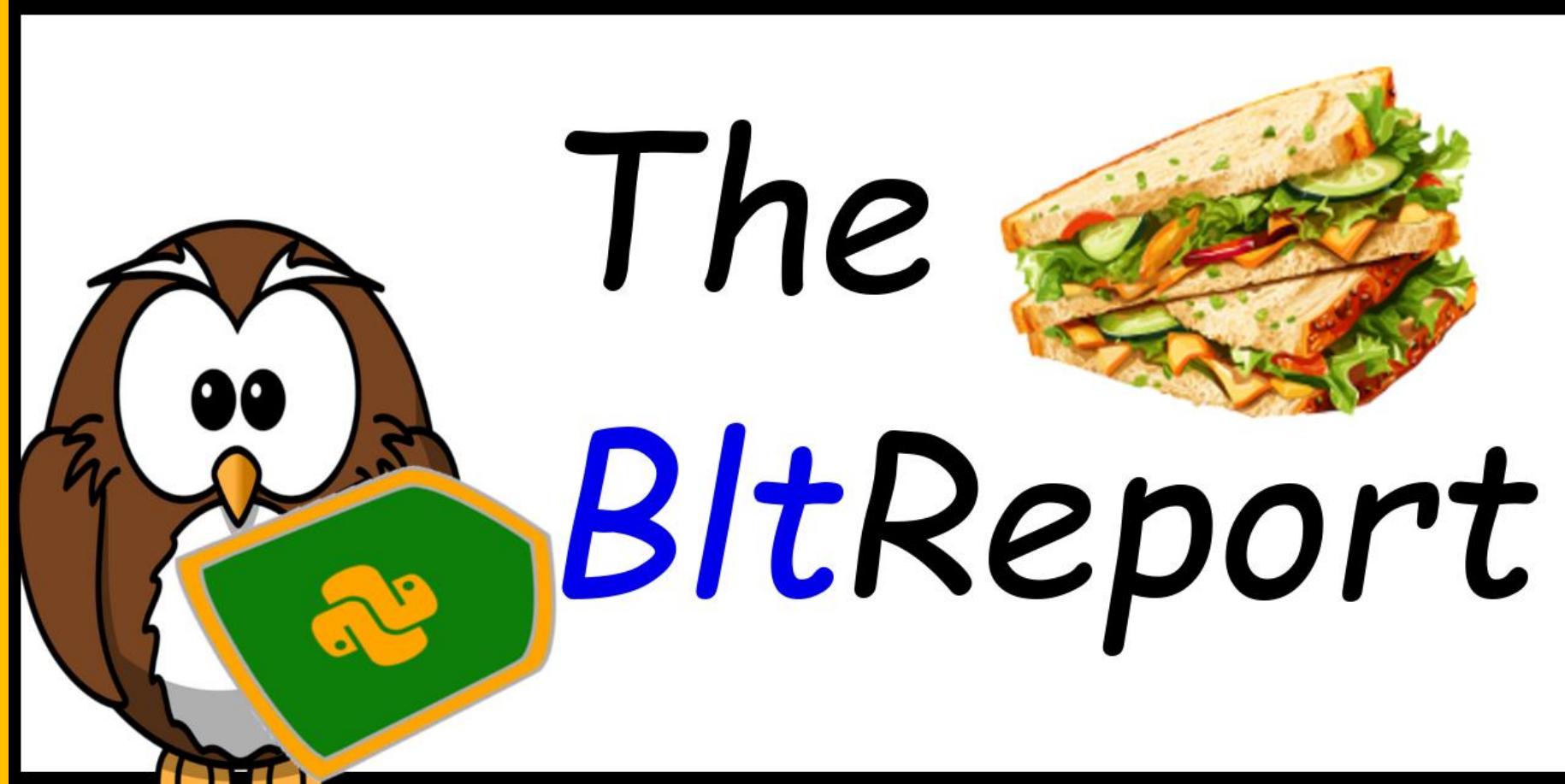
Concepts & Code

RANDALL NAGY

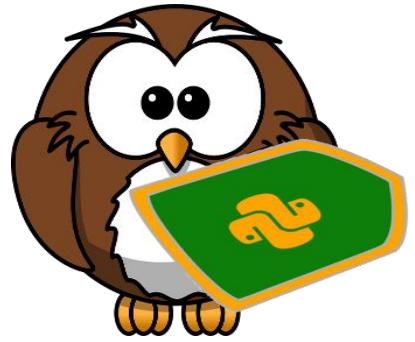




Video: BLT_00100



The BitReport



The ‘Upper-Cased’

Keywords:

- True
- False
- None



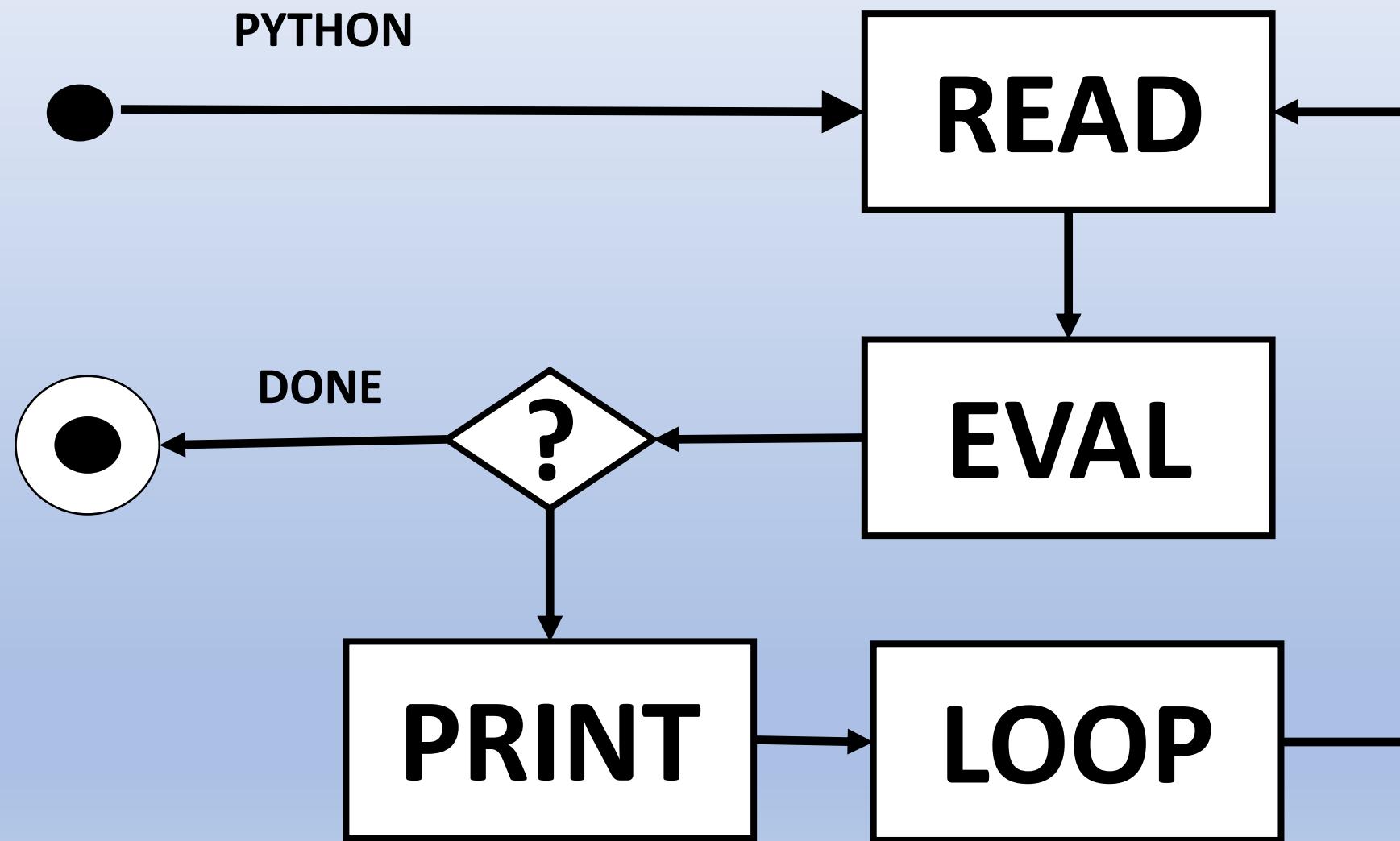
The Built-Ins

Ops:

- `type()`
- `eval()`
- `bool()`
- `int()`



R.E.P.L ?





KA1002: The REPL

Beginner

What is REPL?

- (1) All objects are REPLacable
- (2) Read, Evaluate, Print, and Loop
- (3) The default version of Python
- (4) A well-known research & design pattern
- (5) None of the above

1
R0





KA1056: Boolean Basics

Beginner

Boolean Values:

- (1) Either `True` or `False`
- (2) Can include `None`
- (3) Are default return types
- (4) May be lower cased
- (5) All of the above

1

R0





KA1060: Evaluations

Beginner

`eval('bool(1)')` will:

- (1) Raise an Exception
- (2) Return True
- (3) Return False
- (4) Return NoneType
- (5) None of the above

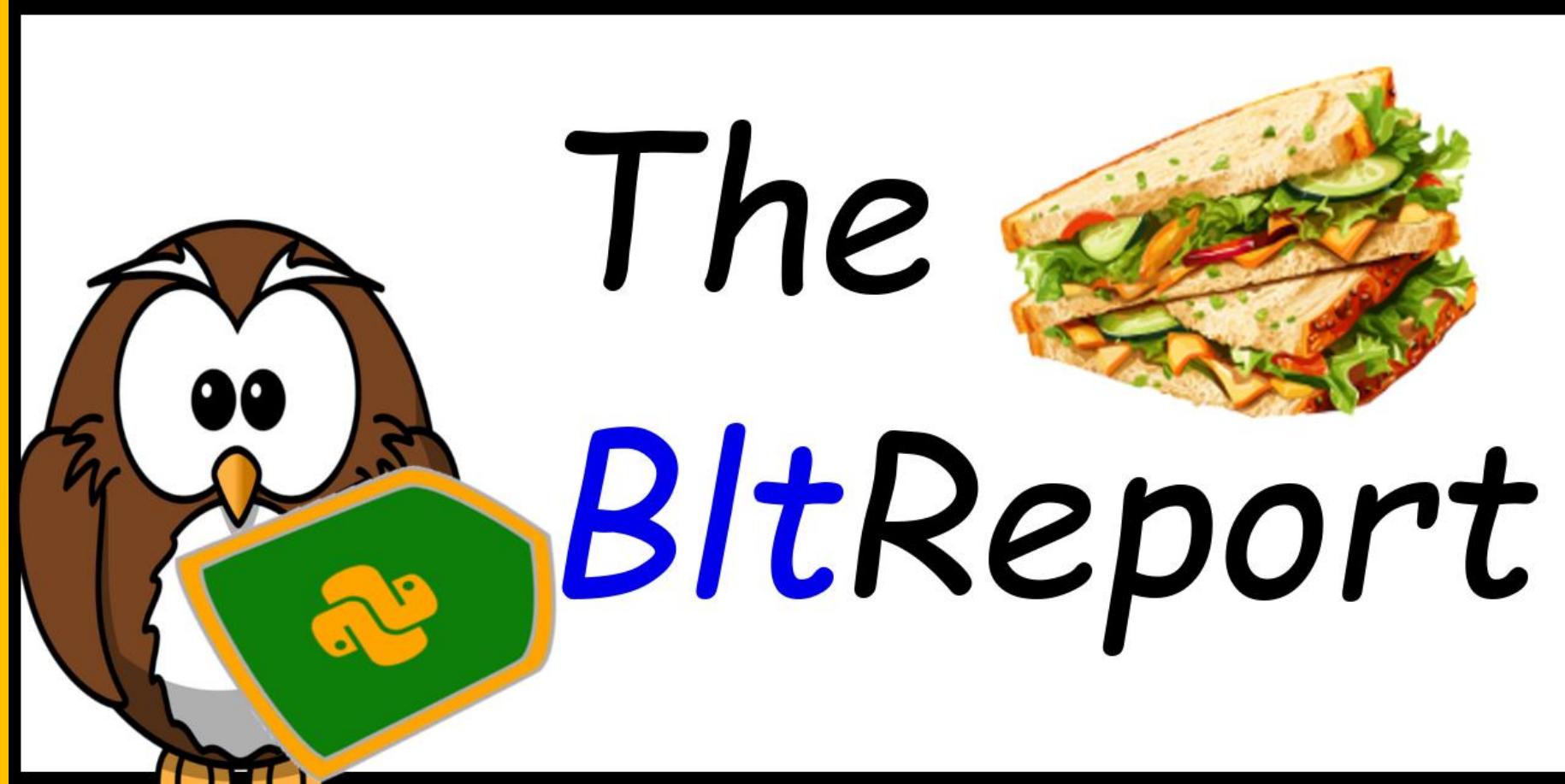
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R0





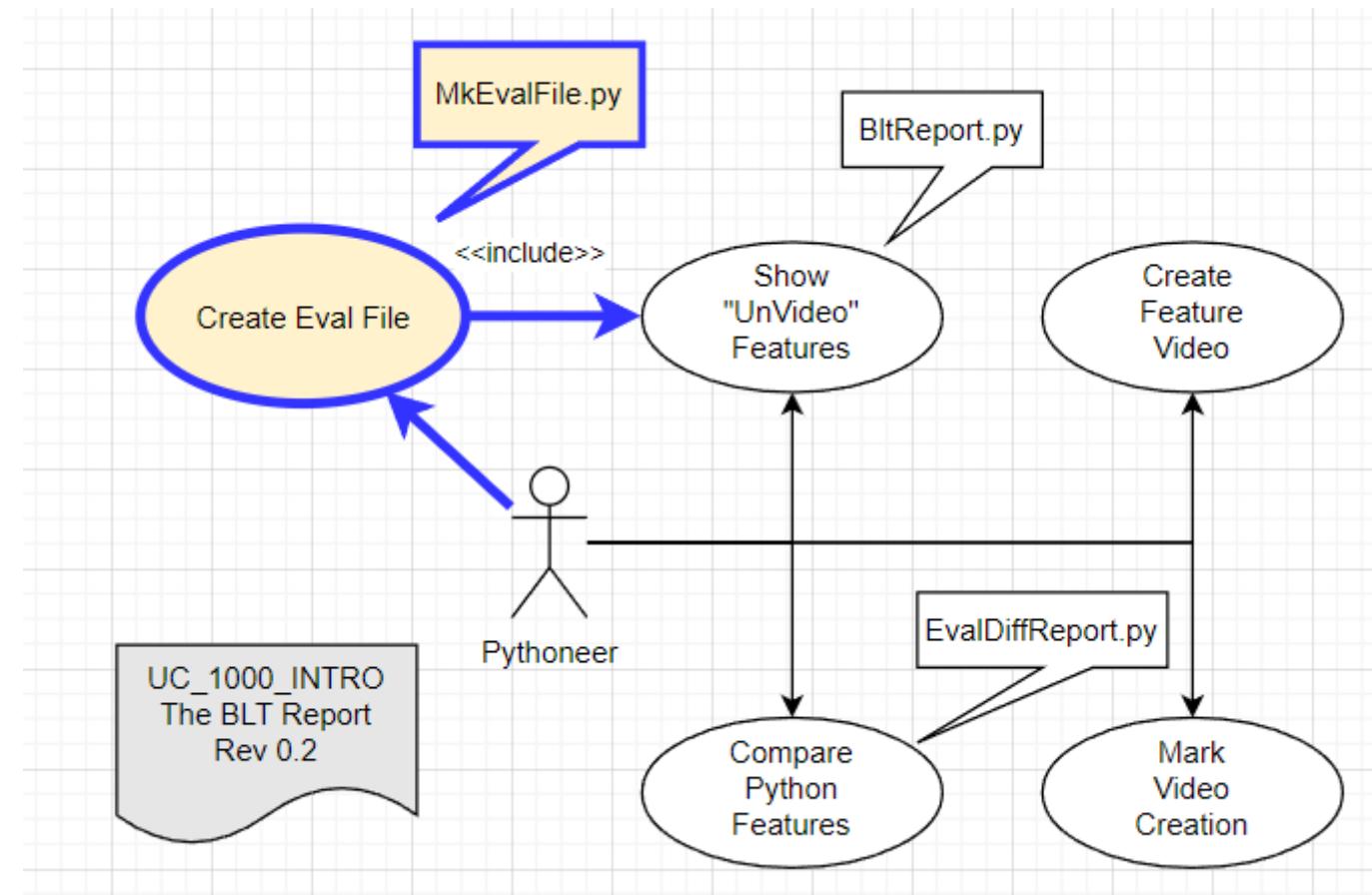
Video: BLT_00200



The BitReport



Code Changes





Review

Ops:

- `print()`
- `int()`
- `bool()`
- `type()`
- `eval()` ...



Reviewing print() Options

```
>>> help(print)
Help on built-in function print in module builtins:

print(*args, **kwargs)
    print(value, ..., sep=' ', end='\n', file=sys.stdout, flush=False)

    Prints the values to a stream, or to sys.stdout by default.
    Optional keyword arguments:
        file:  a file-like object (stream); defaults to the current sys.stdout.
        sep:   string inserted between values, default a space.
        end:   string appended after the last value, default a newline.
        flush: whether to forcibly flush the stream.
```



Common int() / bool() Members

- Comprehension

```
>>> print(*[z for z in dir(7) if not z[0] == '_'],sep='\n')
as_integer_ratio
bit_length
conjugate
denominator
from_bytes
imag
numerator
real
to_bytes
>>>
```



.bit_length?

- bool() ~v~ int()

```
>>> bool(1).bit_length()
1
>>> int(1).bit_length()
1
>>> int(255).bit_length()
8
>>> bool(255).bit_length()
1
```



From / To Bytes

```
>>> int(1).to_bytes(2, 'big', signed=False)
b'\x00\x01'
>>> int(1).to_bytes(2, 'little', signed=False)
b'\x01\x00'
>>> int().from_bytes(b'\x01\x00', 'little', signed=False)
1

>>> little = int(1).to_bytes(2, 'little', signed=False)
>>> print(little)
b'\x01\x00'
>>> print(int().from_bytes(little, 'big', signed=False))
256
```



Conjugate

```
>>> import math  
>>> i = int(math.pi)  
>>> i.conjugate()  
3  
>>>  
>>> i = int(-math.pi)  
>>> i.conjugate()  
-3
```



as_integer_ratio

```
>>> help(int(7).as_integer_ratio)
```

Help on built-in function as_integer_ratio:

`as_integer_ratio()` method of `builtins.int` instance

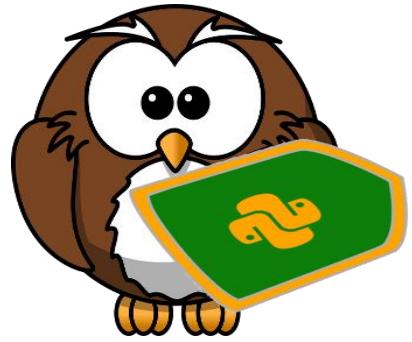
Return integer ratio.

Return a pair of integers, whose ratio is exactly equal to the original int and with a positive denominator.



Numerator : Ratios

```
>>> int(7).as_integer_ratio()  
(7, 1)  
>>> int(-7).as_integer_ratio()  
(-7, 1)  
>>> int(0xe7).as_integer_ratio()  
(231, 1)  
>>> int(-0xe7).as_integer_ratio()  
(-231, 1)
```



Properties

```
>>> int(7).numerator  
7  
>>> int(7).denominator  
1
```



Properties

```
>>> import math
>>> math.pi
3.141592653589793
>>> int(math.pi)
3
>>> i = int(math.pi)
>>> i.imag
0
>>> i.real
3
```



Integral Type Commons

- ✓ `as_integer_ratio`
- ✓ `bit_length`
- ✓ `conjugate`
- ✓ `denominator`
- ✓ `from_bytes`
- ✓ `imag`
- ✓ `numerator`
- ✓ `real`
- ✓ `to_bytes`

The screenshot shows a window titled "IDLE Shell" with a menu bar including File, Edit, Shell, Debug, Options, Window, and Help. The main area contains a Python interactive shell session:

```
>>> bool(255)
True
>>> bool(-255)
True
>>> bool(0)
False
>>> |
```

In the bottom right corner of the window, there is a status bar with the text "Ln: 31 Col: 4".



Class Dictionaries

- `__dict__` ~v~ `vars()`

```
>>> class Z:  
    a=1;b=2  
    def __init__(self):  
        self.c=7;self.d=8
```

```
>>> z().__dict__  
{'c': 7, 'd': 8}  
>>> vars(z())  
{'c': 7, 'd': 8}
```



Alternate type() Initialization

- Case Study: BltTypeEx.py

```
class zclass:  
    def __init__(self, **kwargs):  
        self.times = 1000  
        print(f'Created zclass {kwargs}')  
  
normal = zclass(times=3000)  
print('1', vars(normal))  
  
other = type('zclass', tuple(), dict(times=9000))  
print('2', vars(other))
```



Python Meta

Try this @home?

```
>>> for a in copyright, credits, license:  
    print(a)
```

```
>>> help("this")
```

```
>>> import antigravity
```



- ▶ **False**
- ▷ **all**
- ▶ **bool**
- ▷ **callable**
- ▷ **complex**
- ▷ **dict**
- ▶ **eval**
- ▷ **float**
- ▷ **globals**
- ▷ **hex**
- ▷ **isinstance**
- ▶ **license**
- ▷ **max**
- ▷ **object**
- ▷ **pow**
- ▷ **range**
- ▷ **set**
- ▷ **staticmethod**
- ▷ **tuple**
- ▶ **None**
- ▷ **any**
- ▷ **breakpoint**
- ▷ **chr**
- ▶ **copyright**
- ▷ **dir**
- ▷ **exec**
- ▷ **format**
- ▷ **hasattr**
- ▷ **id**
- ▷ **issubclass**
- ▷ **list**
- ▷ **memoryview**
- ▷ **oct**
- ▶ **print**
- ▷ **repr**
- ▷ **setattr**
- ▷ **str**
- ▶ **True**
- ▷ **ascii**
- ▷ **bytearray**
- ▷ **classmethod**
- ▶ **credits**
- ▷ **divmod**
- ▶ **exit**
- ▷ **frozenset**
- ▷ **hash**
- ▶ **input**
- ▷ **iter**
- ▷ **locals**
- ▷ **min**
- ▷ **open**
- ▷ **property**
- ▷ **reversed**
- ▷ **slice**
- ▷ **sum**
- ▶ **vars**
- ▷ **abs**
- ▷ **bin**
- ▷ **bytes**
- ▷ **compile**
- ▷ **delattr**
- ▷ **enumerate**
- ▷ **filter**
- ▷ **getattr**
- ▷ **help**
- ▶ **int**
- ▷ **len**
- ▷ **map**
- ▷ **next**
- ▷ **ord**
- ▶ **quit**
- ▷ **round**
- ▷ **sorted**
- ▷ **super**
- ▷ **zip**



KA1061: Integer Values

Beginner

```
>>> int(-255)
```

- (1) Exception
- (2) -False
- (3) True
- (4) 255
- (5) -255

1

R0





KA2036: Object Values

Intermediate

We use `vars()` to:

- (1) Create object dictionaries
- (2) Manage collection types
- (3) Access 'dunder dict' values
- (4) Manage string values
- (5) Manage integral values

1

R0





KA2037: Boolean Values

Intermediate

```
>>> bool (-255)
```

- (1) Exception
- (2) -False
- (3) True
- (4) 255
- (5) -255

1

R0





KA2038: List Comprehension

Intermediate

```
>>> [c for c in dir(7) if not c[0] == '_']
```

- (1) Range Exception
- (2) All public members
- (3) []
- (4) All private operations
- (5) None of the above

1

R0





KA3036: Type Management

Advanced

Use `type()` to:

- (1) Change existing members
- (2) Create Objects
- (3) Safely remove presence
- (4) Determine instance type
- (5) Two of the above

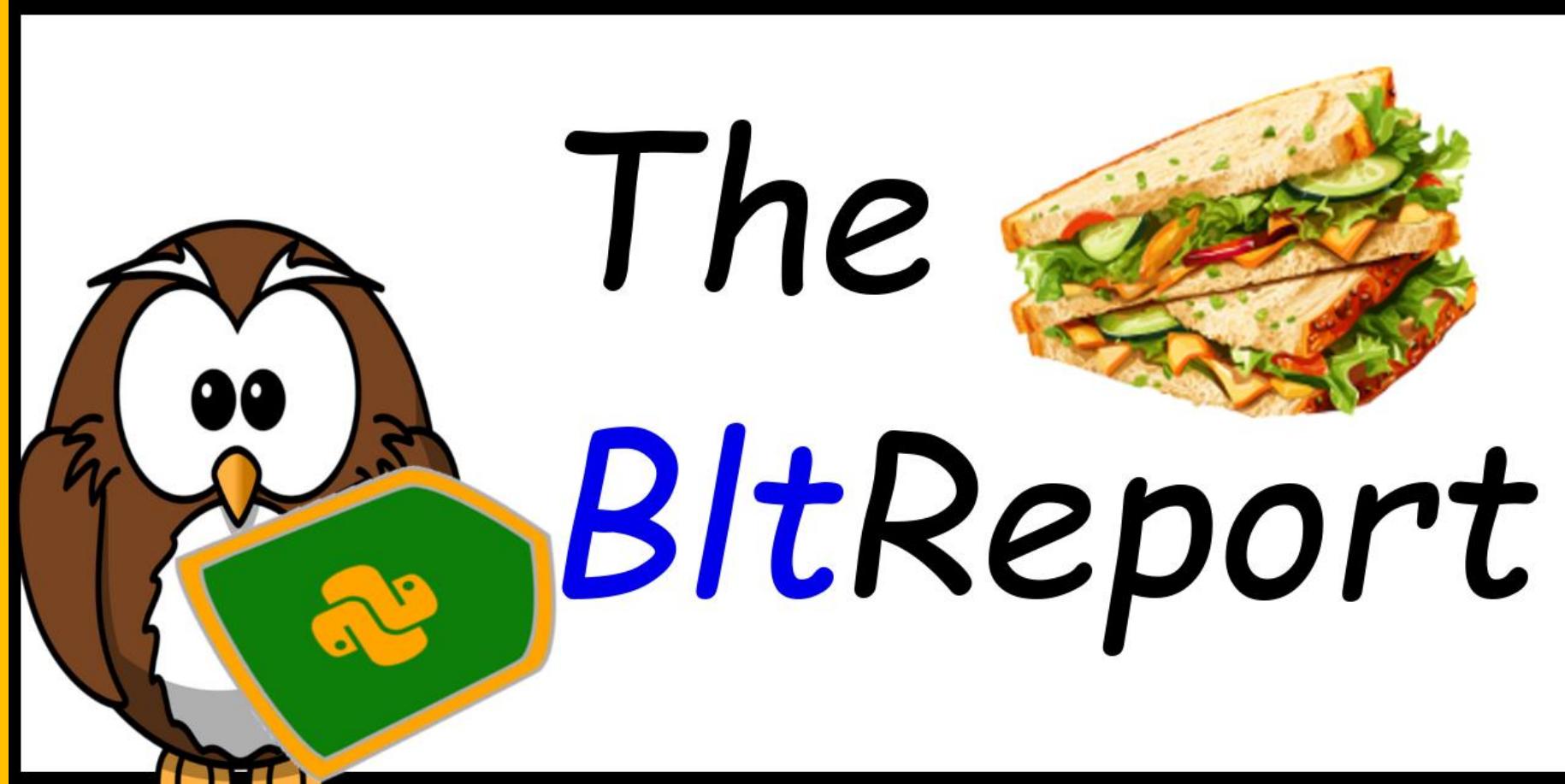
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Video: BLT_00300



The BitReport

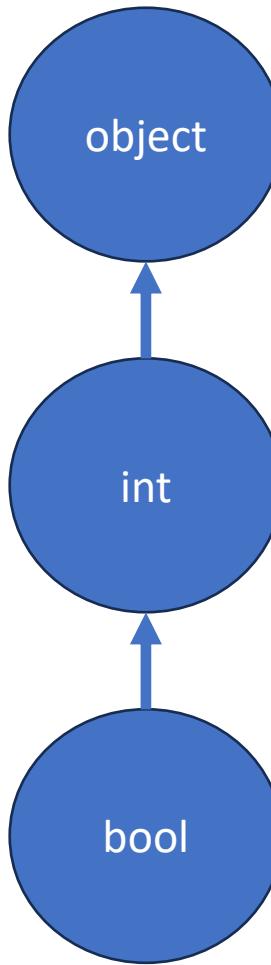


- ▶ **False**
- ▷ **all**
- ▶ **bool**
- ▷ **callable**
- ▷ **complex**
- ▷ **dict**
- ▶ **eval**
- ▷ **float**
- ▷ **globals**
- ▷ **hex**
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- ▷ **tuple**
- ▶ **None**
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- ▷ **format**
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- ▷ **id**
- ▷ **issubclass**
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- ▷ **setattr**
- ▷ **str**
- ▶ **True**
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- ▶ **credits**
- ▷ **divmod**
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- ▷ **hash**
- ▶ **input**
- ▷ **iter**
- ▷ **locals**
- ▷ **min**
- ▷ **open**
- ▷ **property**
- ▷ **reversed**
- ▷ **slice**
- ▷ **sum**
- ▶ **vars**
- ▷ **abs**
- ▷ **bin**
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- ▷ **filter**
- ▷ **getattr**
- ▷ **help**
- ▶ **int**
- ▷ **len**
- ▷ **map**
- ▷ **next**
- ▷ **ord**
- ▶ **quit**
- ▷ **round**
- ▷ **sorted**
- ▷ **super**
- ▷ **zip**



'isa' == isinstance()

- Instance ~to~ Recipe(s)
 - `isinstance(True, int)`
 - `isinstance(7, bool)`





issubclass()

- Recipe ~to~ Recipe(s)
 - `issubclass(bool, int)`
 - `issubclass(int, bool)`



Review: type() Initialization

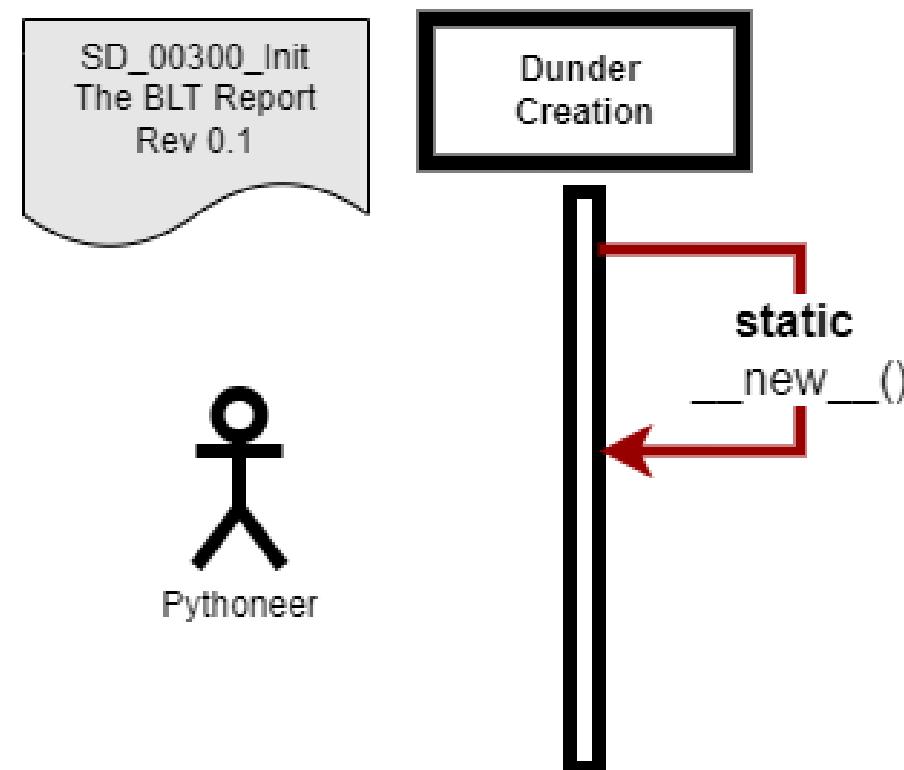
- Case Study: BltTypeEx.py

```
class zclass:  
    def __init__(self, **kwargs):  
        self.times = 1000  
        print(f'Created zclass {kwargs}')  
  
normal = zclass(times=3000)  
print('1', vars(normal))  
  
other = type('zclass', tuple(), dict(times=9000))  
print('2', vars(other))
```



Review: Classic Initialization ...

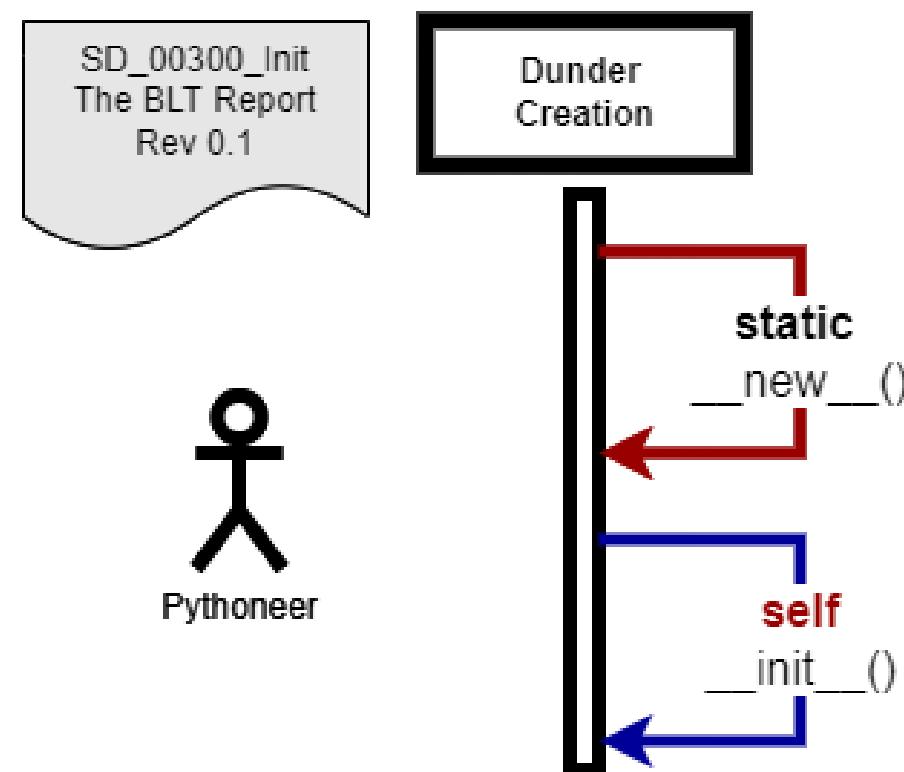
- Case Study: BltTypeEx.py

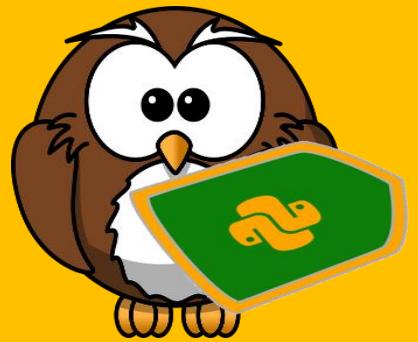




Review: Classic Initialization

- Case Study: BltTypeEx.py





The “Four ‘Atters”

- Safe – Always True / False
 - SET
 - HAS
- ‘Exceptional’
 - GET
 - Member **Requested** / AttributeError
 - DEL
 - **None** / AttributeError



Built-In setattr() ...

```
>>> help(setattr)
Help on built-in function setattr in module builtins:

setattr(obj, name, value, /)
    Sets the named attribute on the given object to the specified value.

    setattr(x, 'y', v) is equivalent to ``x.y = v``

>>> z = Z()
>>> setattr(z, 'a', 'Bingo!')
>>> z.a
'Bingo!'
```



Functional setattr()

```
>>> help(setattr)
Help on built-in function setattr in module builtins:

setattr(obj, name, value, /)
    Sets the named attribute on the given object to the specified value.

    setattr(x, 'y', v) is equivalent to ``x.y = v``

>>> class Z:
        pass

>>> z = Z()
>>> setattr(z, 'a', lambda: 'Howdie!')
>>> z.a()
'Howdie!'
```



Built-In hasattr()

```
>>> help(hasattr)
Help on built-in function hasattr in module builtins:

hasattr(obj, name, /)
    Return whether the object has an attribute with the given name.

    This is done by calling getattr(obj, name) and catching AttributeError.

>>> z = Z()
>>> setattr(z, 'a', lambda: 'Howdie!')
>>> hasattr(z, 'a')
True
>>> hasattr(z, 'b')
False
```



getattr()

- “GET” is Imperative?

```
>>> help(getattr)
Help on built-in function getattr in module builtins:
```

```
getattr(...)

    getattr(object, name[, default]) -> value
```

Get a named attribute from an object; `getattr(x, 'y')` is equivalent to `x.y`. When a `default` argument is given, it is returned when the attribute doesn't exist; without it, an exception is raised in that case.

```
>>> setattr(z, 'a', lambda: 'Howdie!')
>>> getattr(z, 'a')
<function <lambda> at 0x000001EEB4E0CDC0>
>>> getattr(z, 'a')()
'Howdie!'
```



getattr()

- “GET” is Imperative
 - Exceptional!

```
>>> hasattr(7, 'a')
False
>>> getattr(7, 'a')
Traceback (most recent call last):
  File "<pyshell#3>", line 1, in <module>
    getattr(7, 'a')
AttributeError: 'int' object has no attribute 'a'
```



delattr()

- Attribute Removal

```
>>> help(delattr)
Help on built-in function delattr in module builtins:

delattr(obj, name, /)
    Deletes the named attribute from the given object.

    delattr(x, 'y') is equivalent to ``del x.y``

>>> class Z:
        pass

>>> z = Z()
>>> z.a = True
>>> delattr(z, 'a')
```



delattr()

- “DELETE” is Imperative?
 - Exceptional!

```
>>> delattr(7, 'a')
Traceback (most recent call last):
  File "<pyshell#6>", line 1, in <module>
    delattr(7, 'a')
AttributeError: 'int' object has no attribute 'a'
```



Concept: ‘Weak References’?

- More: [Python Docs](#)

“A weak reference to an object is **not enough** to keep the object alive ...

A primary use for weak references is to implement caches or mappings holding large objects, where it’s desired that a large **object not be kept alive** solely because it appears in a cache or mapping.”



- ▶ `False`
- ▶ `None`
- ▶ `True`
- ▶ `abs`
- ▶ `all`
- ▶ `any`
- ▶ `ascii`
- ▶ `bin`
- ▶ `bool`
- ▶ `breakpoint`
- ▶ `bytearray`
- ▶ `bytes`
- ▶ `callable`
- ▶ `chr`
- ▶ `classmethod`
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- ▶ `locals`
- ▶ `map`
- ▶ `license`
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- ▶ `min`
- ▶ `next`
- ▶ `max`
- ▶ `oct`
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- ▶ `pow`
- ▶ `repr`
- ▶ `reversed`
- ▶ `round`
- ▶ `range`
- ▶ `setattr`
- ▶ `slice`
- ▶ `sorted`
- ▶ `set`
- ▶ `str`
- ▶ `sum`
- ▶ `super`
- ▶ `staticmethod`
- ▶ `type`
- ▶ `vars`
- ▶ `tuple`



KA2039: Instance Detection

Intermediate

>>> isinstance()

- (1) Checks `isa` relationships
- (2) Accepts exactly two parameters
- (3) Always requires ≥ 1 class
- (4) Returns True or False
- (5) All of the above

1

R0





KA2040: Class Detection

Intermediate

>>> issubclass()

- (1) Checks `isa` relationships
- (2) Accepts exactly two parameters
- (3) Always requires ≥ 1 class
- (4) Returns True or False
- (5) All of the above

1

R0





KA2041: Class Relations

Intermediate

>>> All Python classes have:

- (1) No common ancestor
- (2) A common `int` ancestor
- (3) A common `str` ancestor
- (4) Multiple inheritance
- (5) None of the above

1

R0





KA3031: Object Management

Advanced

How to check object membership?

- (1) Use Inheritance
- (2) Use 'Duck Typing'
- (3) Use `hasattr()`
- (4) Use `getattr()`
- (5) Either 3 or 4





KA3032: Object Management

Advanced

How to add object membership?

- (1) Use Inheritance
- (2) Use 'Duck Typing'
- (3) Use `hasattr()`
- (4) Use `setattr()`
- (5) Either 3 or 4





KA3033: Object Management

Advanced

Use `hasattr()` to:

- (1) Create Inheritance
- (2) Create 'Duck Typing'
- (3) Safely check presence
- (4) Return named attribute
- (5) All of the above

1

R0





KA3034: Object Management

Advanced

Use `getattr()` to:

- (1) Check Inheritance
- (2) Create 'Duck Typing'
- (3) Safely check presence
- (4) Return named attribute
- (5) All of the above

1

R0





KA3035: Object Management

Advanced

Use `setattr()` to:

- (1) Replace existing member
- (2) Assign new attribute
- (3) Safely check presence
- (4) Attempt attribute removal
- (5) Two of the above

1

R0





KA3036: Object Management

Advanced

Use `delattr()` to:

- (1) Replace existing member
- (2) Assign new attribute
- (3) Safely remove presence
- (4) Attempt attribute removal
- (5) None of the above

1

R0





KA3037: Type Management

Advanced

Use `type()` to:

- (1) Change existing members
- (2) Create Objects
- (3) Safely remove presence
- (4) Determine instance type
- (5) Two of the above

1

R0





KA3038: Object Management

Advanced

A 'Weak Reference':

- (1) Changes existing members
- (2) Creates Objects
- (3) Safely removes members
- (4) Determines instance type
- (5) None of the above

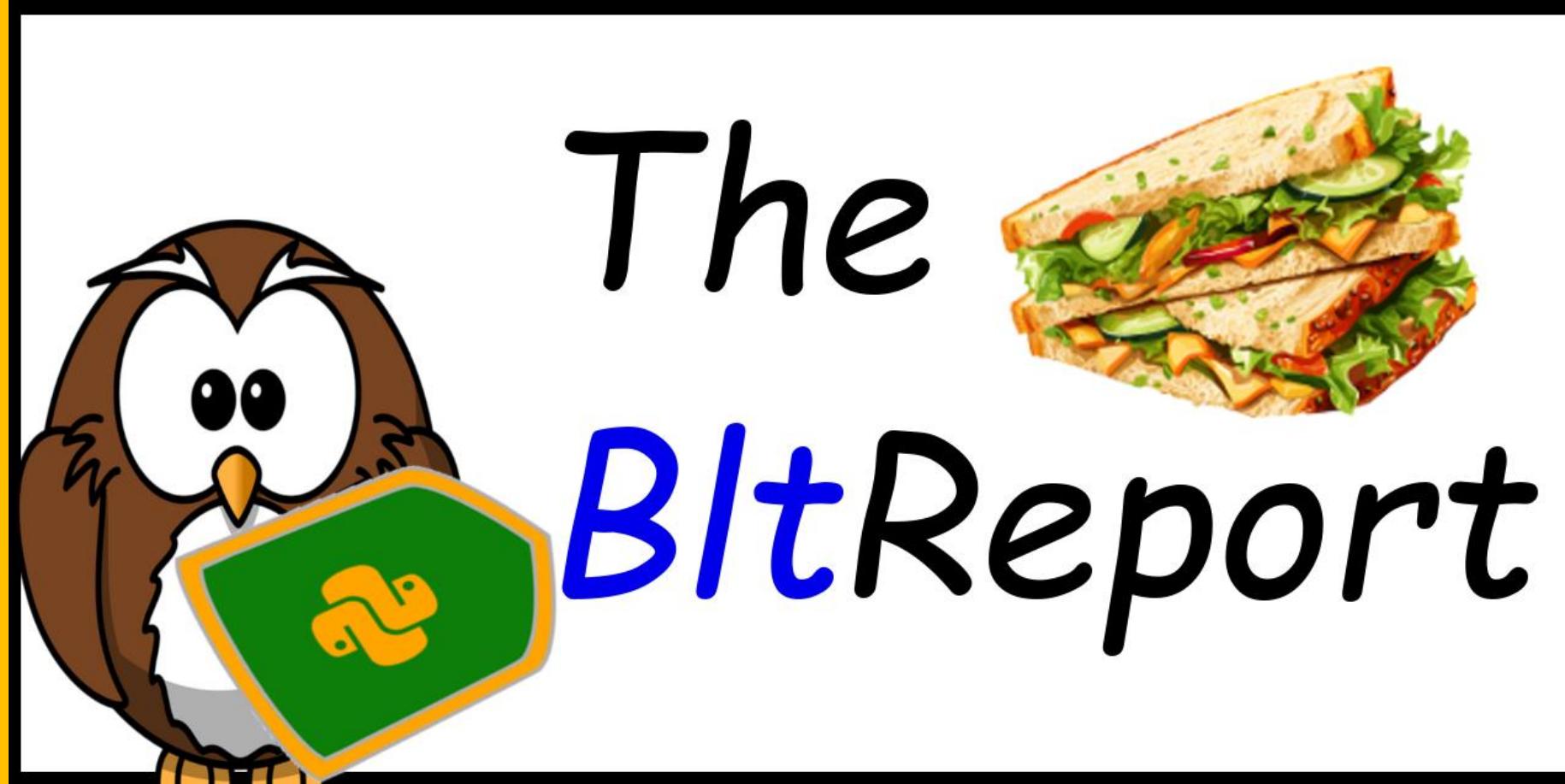
1

R0





Video: BLT_00400



The BitReport



- ▶ `False`
- ▶ `None`
- ▶ `True`
- ▶ `abs`
- ▶ `all`
- ▶ `any`
- ▶ `ascii`
- ▶ `bin`
- ▶ `bool`
- ▶ `breakpoint`
- ▶ `bytearray`
- ▶ `bytes`
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- ▶ `quit`
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- ▶ `setattr`
- ▶ `slice`
- ▶ `sorted`
- ▶ `set`
- ▶ `str`
- ▶ `sum`
- ▶ `super`
- ▶ `staticmethod`
- ▶ `type`
- ▶ `vars`
- ▶ `tuple`



Classic enumerate()

```
class enumerate(object)
| enumerate(iterable, start=0)

| Return an enumerate object.

| iterable
|     an object supporting iteration

| The enumerate object yields pairs containing a count (from start, which
| defaults to zero) and a value yielded by the iterable argument.
```

```
>>> type(enumerate)
<class 'type'>
```



Iterable Types?

```
>>> set(dir(enumerate('Nagy'))) - \
    set(dir(object()))
{'__next__', '__iter__', '__class_getitem__'}
>>>
```



- ▶ **False**
- ▷ **all**
- ▶ **bool**
- ▷ **callable**
- ▷ **complex**
- ▷ **dict**
- ▶ **eval**
- ▷ **float**
- ▷ **globals**
- ▷ **hex**
- ▶ **isinstance**
- ▶ **license**
- ▷ **max**
- ▶ **object**
- ▷ **pow**
- ▷ **range**
- ▷ **set**
- ▷ **staticmethod**
- ▷ **tuple**
- ▶ **None**
- ▷ **any**
- ▷ **breakpoint**
- ▷ **chr**
- ▶ **copyright**
- ▷ **dir**
- ▷ **exec**
- ▷ **format**
- ▶ **hasattr**
- ▷ **id**
- ▶ **issubclass**
- ▷ **list**
- ▷ **memoryview**
- ▷ **oct**
- ▶ **print**
- ▷ **repr**
- ▶ **setattr**
- ▷ **str**
- ▶ **type**
- ▶ **True**
- ▷ **ascii**
- ▷ **bytearray**
- ▷ **classmethod**
- ▶ **credits**
- ▷ **divmod**
- ▶ **exit**
- ▷ **frozenset**
- ▷ **hash**
- ▶ **input**
- ▷ **iter**
- ▷ **locals**
- ▷ **min**
- ▷ **open**
- ▷ **property**
- ▷ **reversed**
- ▷ **slice**
- ▷ **sum**
- ▶ **vars**
- ▷ **abs**
- ▷ **bin**
- ▷ **bytes**
- ▷ **compile**
- ▶ **delattr**
- ▶ **enumerate**
- ▷ **filter**
- ▶ **getattr**
- ▷ **help**
- ▶ **int**
- ▷ **len**
- ▷ **map**
- ▷ **next**
- ▷ **ord**
- ▶ **quit**
- ▷ **round**
- ▷ **sorted**
- ▷ **super**
- ▷ **zip**



KA1063: Enumerations

Beginner

Built-in enumerate()

- (1) Is a class
- (2) Is a function

1

R0





KA1064: Iteration

Beginner

Which types are iterable?

- (1) int()
- (2) str()
- (3) float()
- (4) bool()
- (5) None of the above

1

R0





KA1065: Iteration

Beginner

Which types are iterable?

- (1) dict()
- (2) str()
- (3) list()
- (4) set()
- (5) All of the above

1

R0





KA3039: Iteration Management

Advanced

Iterable classes:

- (1) Cannot be created
- (2) Are part of object()
- (3) Are part of all built-ins
- (4) Determines instance type
- (5) None of the above

1

R0





KA3040: Iteration Management

Advanced

Iterables must implement `__next__`

- (1) True
- (2) False

1
R0





KA3041: Iteration Management

Advanced

Iterables must implement `__iter__`

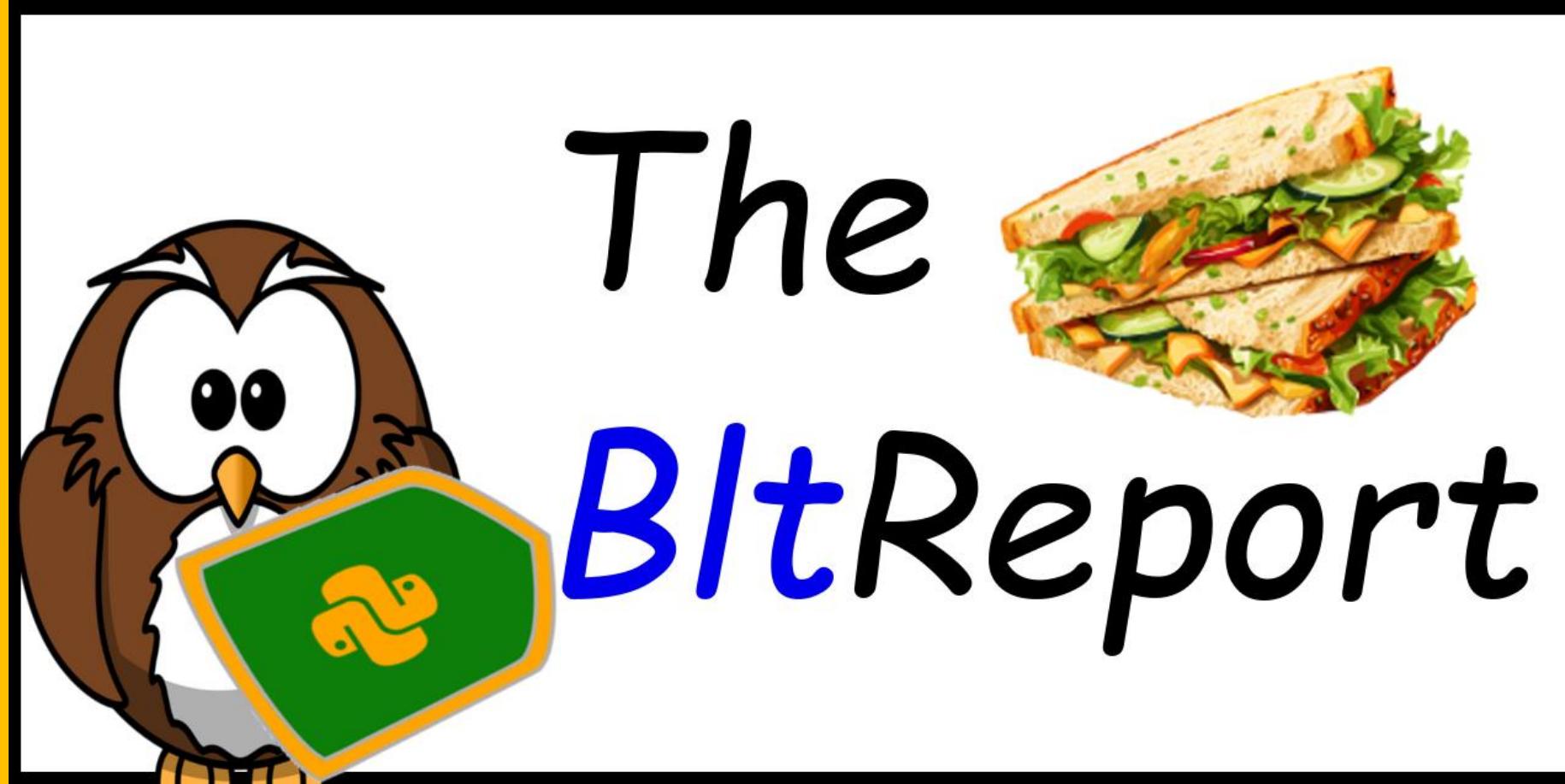
- (1) True
- (2) False

1
R0





Video: BLT_00500



The BitReport



Focus: range(...)

- ▶ `False`
- ▶ `None`
- ▶ `True`
- ▶ `abs`
- ▶ `all`
- ▶ `any`
- ▶ `ascii`
- ▶ `bin`
- ▶ `bool`
- ▶ `breakpoint`
- ▶ `bytearray`
- ▶ `bytes`
- ▶ `callable`
- ▶ `chr`
- ▶ `classmethod`
- ▶ `compile`
- ▶ `complex`
- ▶ `copyright`
- ▶ `credits`
- ▶ `delattr`
- ▶ `dict`
- ▶ `dir`
- ▶ `divmod`
- ▶ `enumerate`
- ▶ `eval`
- ▶ `exec`
- ▶ `exit`
- ▶ `filter`
- ▶ `float`
- ▶ `format`
- ▶ `frozenset`
- ▶ `getattr`
- ▶ `globals`
- ▶ `hasattr`
- ▶ `hash`
- ▶ `help`
- ▶ `hex`
- ▶ `id`
- ▶ `input`
- ▶ `int`
- ▶ `isinstance`
- ▶ `issubclass`
- ▶ `iter`
- ▶ `len`
- ▶ `license`
- ▶ `list`
- ▶ `locals`
- ▶ `map`
- ▶ `max`
- ▶ `memoryview`
- ▶ `min`
- ▶ `next`
- ▶ `object`
- ▶ `oct`
- ▶ `open`
- ▶ `ord`
- ▶ `pow`
- ▶ `print`
- ▶ `property`
- ▶ `quit`
- ▶ `range`
- ▶ `repr`
- ▶ `reversed`
- ▶ `round`
- ▶ `set`
- ▶ `setattr`
- ▶ `slice`
- ▶ `sorted`
- ▶ `staticmethod`
- ▶ `str`
- ▶ `sum`
- ▶ `super`
- ▶ `tuple`
- ▶ `type`
- ▶ `vars`
- ▶ `zip`



Demo: Using range(...)

- Three Forms
 - Zero-Based (default)
 - Offset Specified
 - Stepped Values



Ranged Instance Representation

```
>>> type(range(5))  
<class 'range'>
```

```
>>> range(5)  
range(0, 5)
```



Iterable Types?

```
>>> set(dir(enumerate('Nagy'))) - \
    set(dir(object()))
{'__next__', '__iter__', '__class_getitem__'}
>>>
```



Ranged Report ...

```
z = set(dir(range(5))) - set(dir(object()))
z = sorted(z)
for ss, item in enumerate(z):
    if ss % 2 == 0:
        print()
    print(f'{ss+1:>02} {item:<16}', end='')
```



Ranged Delta

01	<code>__bool__</code>	03	<code>__getitem__</code>
02	<code>__contains__</code>	05	<code>__len__</code>
04	<code>__iter__</code>	07	<code>count</code>
06	<code>__reversed__</code>	09	<code>start</code>
08	<code>index</code>	11	<code>stop</code>
10	<code>step</code>		



Commons: Range & Enumerate

```
1  r = set(dir(range(5)))    __  __  __  __  
2  e = set(dir(enumerate(''))) __  __  __  __  
3  z = sorted(r.intersection(e))  
4  for ss, item in enumerate(z):  
5      if ss % 2 == 0:  
6          print()  
7          print(f'{ss+1:>02} {item:<20}', end=' ')  
8  __ __  
9  __ __  
10 __ __  
11 __ __  
12 __ __  
13 __ __  
14 __ __  
15 __ __  
16 __ __  
17 __ __  
18 __ __  
19 __ __  
20 __ __  
21 __ __  
22 __ __  
23 __ __  
24 __ __
```



KA1028: Slicing Range

Beginner

How to enumerate the odd numbers from:

`t = range(10, 16)`

- (1) `print(enumerate(t, 1, 2))`
- (2) `print(*t[1::2])`
- (3) `print(range(t, 1, 2))`
- (4) `print(t[1::2])`
- (5) None of the above

1

R0





KA1066: Range Rep

Beginner

```
>>> range(5)
```

- (1) range(5)
- (2) range(1, 6)
- (3) range(1, 5)
- (4) range(0, 5)
- (5) None of the above

1

R0





KA1067: Modulus -v- Range

Beginner

Show every odd between 1 and 10

- (1) `print(*range(1,11,2))`
- (2) `for i in range(11):`
`if i % 3 == 0:`
`print(i)`
- (3) `for i in range(1,11,1):`
`if i % 3 == 0:`
`print(i)`
- (4) `range(1,10,3)`
- (5) Two of the above

1

R0





KA2030: Range -v- Enumerate

Intermediate

What is a difference between `range()` and `enumerate()`?

- (1) `range()` returns 2 values
- (2) `enumerate()` returns 3 values
- (3) `enumerate()` has three forms / types
- (4) `range()` offers a step / increment value
- (5) None of the above

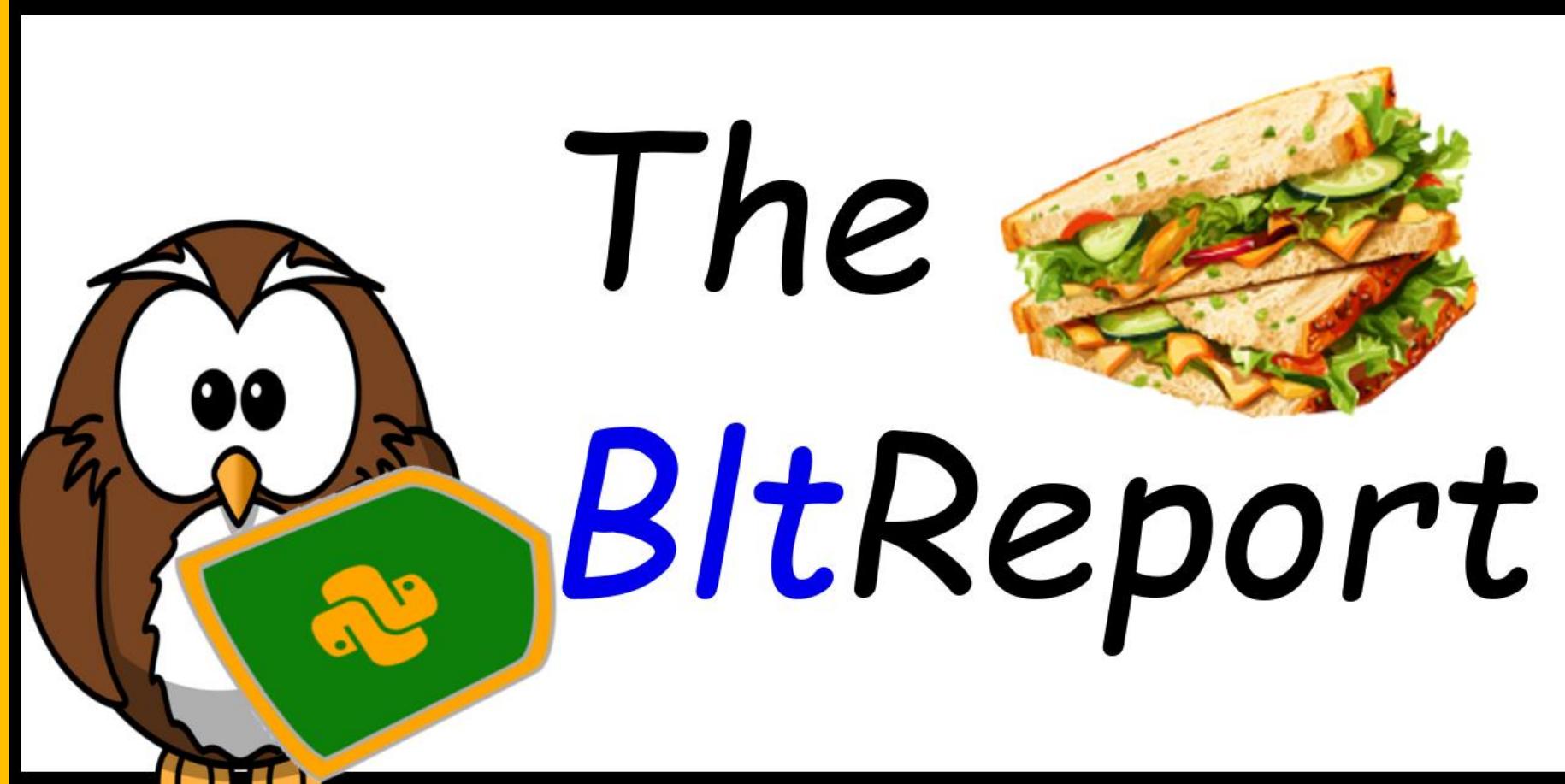
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R0





Video: BLT_00600



The BitReport



- ▶ `False`
- ▶ `None`
- ▶ `True`
- ▶ `abs`
- ▶ `all`
- ▶ `any`
- ▶ `ascii`
- ▶ `bin`
- ▶ `bool`
- ▶ `breakpoint`
- ▶ `bytarray`
- ▶ `bytes`
- ▶ `callable`
- ▶ `chr`
- ▶ `classmethod`
- ▶ `compile`
- ▶ `dict`
- ▶ `copyright`
- ▶ `credits`
- ▶ `delattr`
- ▶ `dict`
- ▶ `dir`
- ▶ `divmod`
- ▶ `enumerate`
- ▶ `eval`
- ▶ `exec`
- ▶ `exit`
- ▶ `filter`
- ▶ `float`
- ▶ `format`
- ▶ `frozenset`
- ▶ `getattr`
- ▶ `hash`
- ▶ `help`
- ▶ `globals`
- ▶ `hasattr`
- ▶ `id`
- ▶ `int`
- ▶ `hex`
- ▶ `issubclass`
- ▶ `input`
- ▶ `iter`
- ▶ `len`
- ▶ `isinstance`
- ▶ `list`
- ▶ `locals`
- ▶ `map`
- ▶ `license`
- ▶ `memoryview`
- ▶ `min`
- ▶ `next`
- ▶ `max`
- ▶ `oct`
- ▶ `open`
- ▶ `ord`
- ▶ `object`
- ▶ `print`
- ▶ `property`
- ▶ `quit`
- ▶ `pow`
- ▶ `repr`
- ▶ `reversed`
- ▶ `round`
- ▶ `range`
- ▶ `setattr`
- ▶ `slice`
- ▶ `sorted`
- ▶ `set`
- ▶ `str`
- ▶ `sum`
- ▶ `super`
- ▶ `staticmethod`
- ▶ `type`
- ▶ `vars`
- ▶ `tuple`



Demo: repr()

```
>>> help(repr)
Help on built-in function repr in module builtins:

repr(obj, /)
    Return the canonical string representation of the object.

    For many object types, including most builtins, eval(repr(obj)) == obj.
```



Demo: id()

```
>>> help(id)
Help on built-in function id in module builtins:
```

```
id(obj, /)
    Return the identity of an object.
```

This is guaranteed to be unique among simultaneously existing objects.
(CPython uses the object's memory address.)



Demo: str()

```
class str(object)
| str(object='') -> str
| str(bytes_or_buffer[, encoding[, errors]]) -> str
|
| Create a new string object from the given object. If encoding or
| errors is specified, then the object must expose a data buffer
| that will be decoded using the given encoding and error handler.
| Otherwise, returns the result of object.__str__() (if defined)
| or repr(object).
```



String Caching?

```
>>> s = 'Nagy'  
>>> id(s)  
2051767269744  
>>> x = 'Nagy'  
>>> id(x)  
2051767269744
```

```
>>> del s;del x  
>>> s = 'Nagy'  
>>> id(s)  
2051769189936
```



String Encoding

```
class str(object)
| str(object='') -> str
| str(bytes_or_buffer[, encoding[, errors]]) -> str
|
| Create a new string object from the given object. If encoding or
| errors is specified, then the object must expose a data buffer
| that will be decoded using the given encoding and error handler.
| Otherwise, returns the result of object.__str__() (if defined)
| or repr(object).
```

```
>>> import sys
>>> sys.getdefaultencoding()
'utf-8'
```



KA1009: Object Identification

Beginner

The built-in `id()` function will:

- (1) Compare object identities
- (2) Verify object content
- (3) Uniquely identify an object
- (4) Identify the Python version

1

R0





KA2014: Class Representation

Intermediate

The purpose of the `repr()` built-in function is to ?

- (1) Reproduce two objects by combination
- (2) Return a cloned-instance of an object
- (3) Return a string for humans to view
- (4) Get a string to re-create an object
- (5) None of the above

1

R0





KA2042: Object Evaluation

Intermediate

The difference between `str()` and `repr()`:

- (1) `str()` objects use `eval()`
- (2) `eval()` objects use `str()`
- (3) `repr()` is for humans
- (4) Strings are always the same
- (5) None of the above

1

R0





KA2043: Object Contents

Intermediate

A `__str__` opportunity may represent:

- (1) Instance reporting
- (2) Object evaluation
- (3) Big Data
- (4) SQL Databases
- (5) None of the above

1

R0





KA3043: String Encoding

Advanced

How to determine platform str() encoding?

- (1) import os;sys.getdefaultencoding()
- (2) import sys;os.getdefaultencoding()
- (3) import sys;sys.getdefaultencoding()
- (4) import str;sys.getdefaultencoding()
- (5) import str;str.getdefaultencoding()

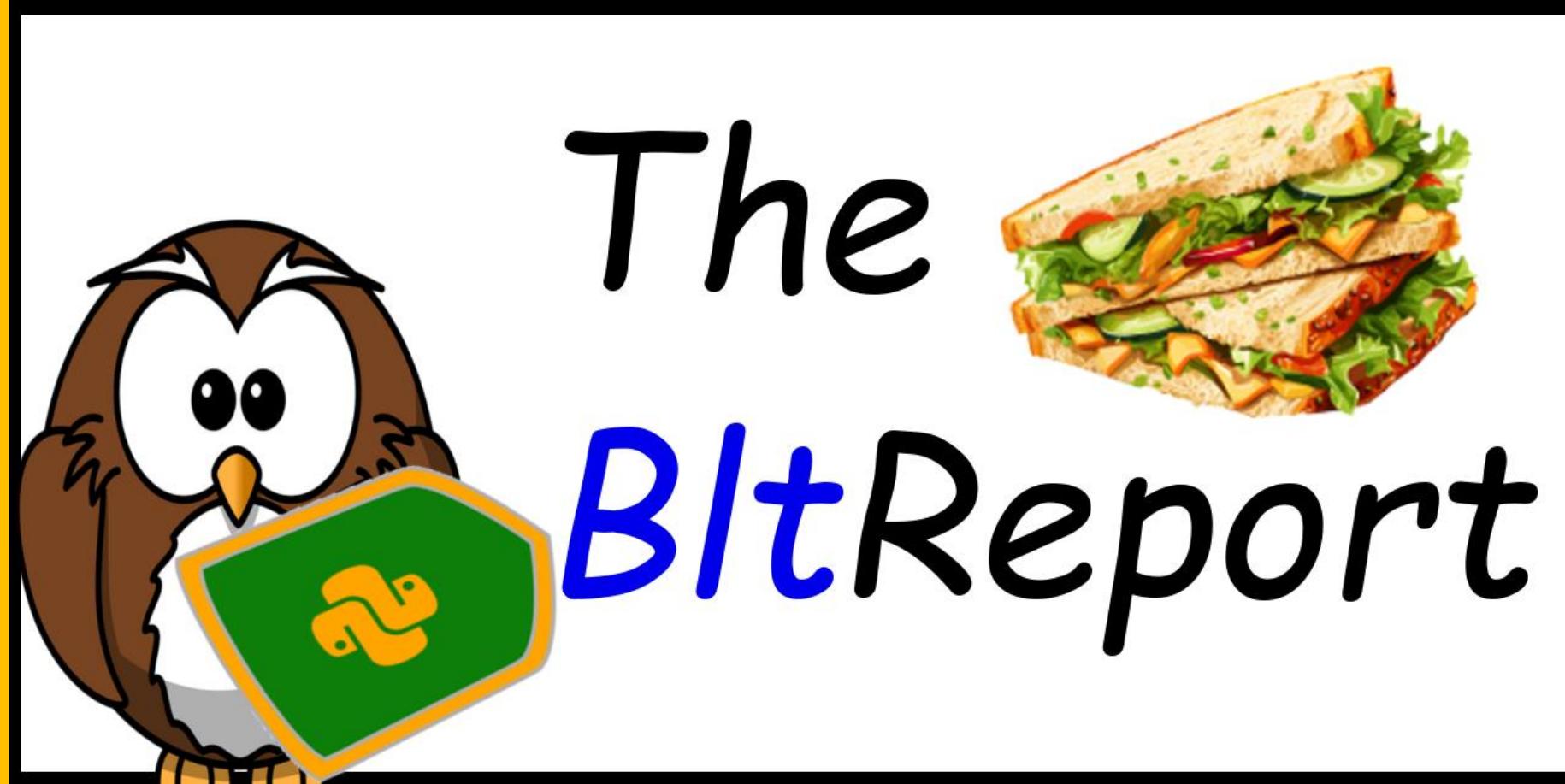
1

R0





Video: BLT_00700



The BitReport



- ▶ **False**
- ▶ **None**
- ▶ **True**
- ▶ **abs**
- ▶ **all**
- ▶ **any**
- ▶ **ascii**
- ▶ **bin**
- ▶ **bool**
- ▶ **breakpoint**
- ▶ **bytarray**
- ▶ **bytes**
- ▶ **callable**
- ▶ **chr**
- ▶ **classmethod**
- ▶ **compile**
- ▶ **complex**
- ▶ **copyright**
- ▶ **credits**
- ▶ **delattr**
- ▶ **dict**
- ▶ **dir**
- ▶ **divmod**
- ▶ **enumerate**
- ▶ **eval**
- ▶ **exec**
- ▶ **exit**
- ▶ **filter**
- ▶ **float**
- ▶ **format**
- ▶ **frozenset**
- ▶ **getattr**
- ▶ **globals**
- ▶ **hasattr**
- ▶ **hash**
- ▶ **help**
- ▶ **hex**
- ▶ **id**
- ▶ **input**
- ▶ **int**
- ▶ **isinstance**
- ▶ **issubclass**
- ▶ **iter**
- ▶ **len**
- ▶ **license**
- ▶ **list**
- ▶ **locals**
- ▶ **map**
- ▶ **max**
- ▶ **memoryview**
- ▶ **min**
- ▶ **next**
- ▶ **object**
- ▶ **oct**
- ▶ **open**
- ▶ **ord**
- ▶ **pow**
- ▶ **print**
- ▶ **property**
- ▶ **quit**
- ▶ **range**
- ▶ **repr**
- ▶ **reversed**
- ▶ **round**
- ▶ **set**
- ▶ **setattr**
- ▶ **slice**
- ▶ **sorted**
- ▶ **staticmethod**
- ▶ **str**
- ▶ **sum**
- ▶ **super**
- ▶ **tuple**
- ▶ **type**
- ▶ **vars**
- ▶ **zip**



Exec ~v~ Eval: No help()?

```
>>> help(eval)
```

Help on built-in function eval in module builtins:

```
eval(source, globals=None, locals=None, /)
    Evaluate the given source in the context of global and local mappings.
```

The source may be a string representing a Python expression
or a code object as returned by compile().

The globals must be a dictionary and locals can be any mapping,
defaulting to the current globals and locals.

If only globals is given, locals defaults to it.

```
>>> help(exec)
```

Help on built-in function exec in module builtins:

```
exec(source, globals=None, locals=None, /)
    Execute the given source in the context of global and local mappings.
```

The source may be a string representing one or more Python statements
or a code object as returned by compile().

The globals must be a dictionary and locals can be any mapping,
defaulting to the current globals and locals.

If only globals is given, locals defaults to it.

object

None



Locals? Globals?

- locals()
- globals()

```
>>> type(locals())
<class 'dict'>
>>> type(globals())
<class 'dict'>
```



locals() –v globals()

```
>>> help(globals)
Help on built-in function globals in module builtins:

globals()
    Return the dictionary containing the current scope's global variables.

    NOTE: Updates to this dictionary *will* affect name lookups in the current
    global scope and vice-versa.

>>> help(locals)
Help on built-in function locals in module builtins:
-> dict()

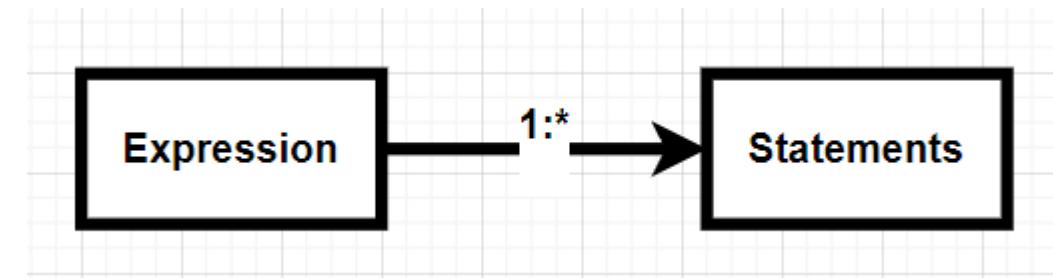
locals()
    Return a dictionary containing the current scope's local variables.

    NOTE: Whether or not updates to this dictionary will affect name lookups in
    the local scope and vice-versa is *implementation dependent* and not
    covered by any backwards compatibility guarantees.
```



Expressions ~v~ Statements

- An Expression may have many Statements, but a Statement cannot.
 - Python “Expr Nodes”





Eval Environment Preserved

```
>>> g={'a':4};c = eval('{"a":a+7}', g)
>>> c
{'a': 11}
>>> g['a']
4
>>>
```



Exec Environment Updated

```
>>> g={'a':0};c = exec('a+=1', g)
>>> c
>>> print(c)
None
>>> g
{'a': 1, '__builtins__': {'__name__':
exceptions, and other objects.\n\nNo
```



Bottom-Line Concepts

- Use

- Expressions

- exec** if you do not need the return value
Environment automatically updates

- Statements

- eval** if return is desired
Environment not automatically updated

```
>>> print(eval('[1,2,3]'))
[1, 2, 3]
>>> print(exec('a=[1,2,3]'))
None
```



Expression exec()

- Eval: ‘Expression Exception’

```
>>> exec('a=[1,2,3]')
>>> print(eval('a=[1,2,3]'))
Traceback (most recent call last):
  File "<pyshell#61>", line 1, in <module>
    print(eval('a=[1,2,3]'))
  File "<string>", line 1
    a=[1,2,3]
    ^
SyntaxError: invalid syntax
```



KA2045: Code Evaluation

Intermediate

The built-in eval():

- (1) Can override globals()
- (2) Can use custom locals()
- (3) Always returns a result
- (4) Can be used by compile()
- (5) All of the above

1

R0





KA3042: Code Evaluators

Advanced

Difference between eval() and exec()?

- (1) eval() parses strings
- (2) exec() runs programs
- (3) Both are used by compile()
- (4) eval() returns a result
- (5) exec() returns a result

1

R0





KA3045: Globals

Advanced

Pythons built-in global() returns a

- (1) string
- (2) boolean
- (3) mutable copy
- (4) mutable reference
- (5) potential object

1

R0





KA3046: Expressions -v- Statements

Advanced

An Expression may have many Statements, but a Statement cannot have many Expressions.

- (1) True
- (2) False

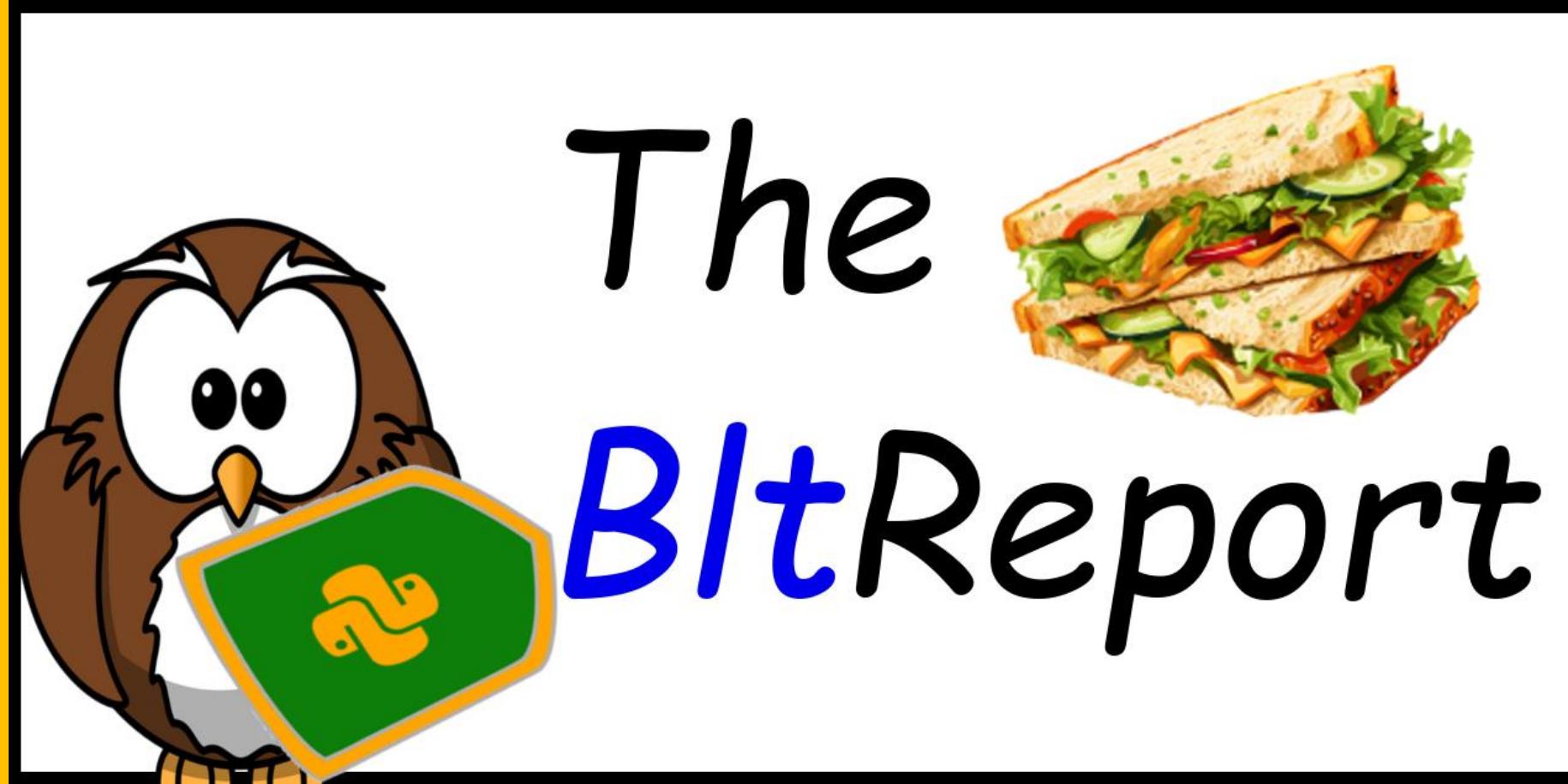
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R0





Video: BLT_00800



The BitReport



- ▶ [False](#)
- ▷ [all](#)
- ▶ [bool](#)
- ▷ [callable](#)
- ▷ [complex](#)
- ▷ [dict](#)
- ▶ [eval](#)
- ▷ [float](#)
- ▶ [globals](#)
- ▷ [hex](#)
- ▶ [isinstance](#)
- ▶ [license](#)
- ▷ [max](#)
- ▶ [object](#)
- ▷ [pow](#)
- ▶ [range](#)
- ▷ [set](#)
- ▷ [staticmethod](#)
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- ▶ [id](#)
- ▶ [issubclass](#)
- ▷ [list](#)
- ▷ [memoryview](#)
- ▷ [oct](#)
- ▶ [print](#)
- ▶ [repr](#)
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- ▶ [str](#)
- ▶ [type](#)
- ▶ [True](#)
- ▷ [ascii](#)
- ▷ [bytearray](#)
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- ▷ [next](#)
- ▷ [ord](#)
- ▶ [quit](#)
- ▷ [round](#)
- ▷ [sorted](#)
- ▷ [super](#)
- ▷ [zip](#)



Info: compile()

```
>>> help(compile)
```

```
Help on built-in function compile in module builtins:
```

```
compile(source, filename, mode, flags=0, dont_inherit=False, optimize=-1, *, _feature_version=-1)
```

Compile source into a code object that can be executed by **exec()** or **eval()**.

The source code may represent a Python **module**, **statement** or **expression**.

The **filename** will be used for run-time error messages.

The **mode** must be '**exec**' to compile a **module**, '**single**' to compile a **single (interactive) statement**, or '**eval**' to compile an **expression**.

The **flags** argument, if present, controls which future statements influence the compilation of the code.

The **dont_inherit** argument, if **true**, stops the compilation inheriting the effects of any future statements in effect in the code calling **compile**; if absent or **false** these statements do influence the compilation, in addition to any features explicitly specified.



Return Type

```
>>> for mode in 'single', 'eval', 'exec':  
    print(type(compile('[123]', '', mode)))
```

```
<class 'code'>  
<class 'code'>  
<class 'code'>
```



Realizing compile()d Results

```
>>> compile('[1,2,3]', '', 'exec')
<code object <module> at 0x000001D429AA2240, file "", line 1>

|>>> compile('[1,2,3]', '', 'eval')
|<code object <module> at 0x000001D429AA22F0, file "", line 1>

>>> c = compile('[1,2,3]', '', 'exec')
>>> print(eval(c))
None

|>>> c = compile('[1,2,3]', '', 'eval')
|>>> print(eval(c))
[1, 2, 3]
```



Statement: 'eval'

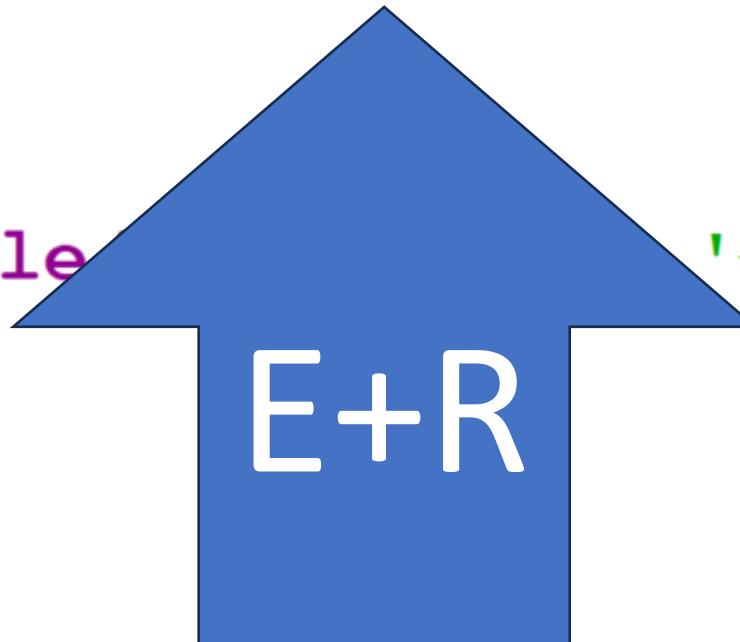
```
>>> a=4;eval(compile('a+5','<string>','eval'))
9
>>> a
4

>>> a=4;eval(compile('a*=10;a+5','<string>','eval'))
Traceback (most recent call last):
  File "<pyshell#142>", line 1, in <module>
    a=4;eval(compile('a*=10;a+5','<string>','eval'))
  File "<string>", line 1
    a*=10;a+5
          ^
SyntaxError: invalid syntax
```



Expression: 'single' and 'exec'

```
>>> a=4;eval(compile('a*=10;a+5','<string>','single'))  
45  
>>> a  
40  
>>> a=4;eval(compile('a*=10;a+5','<string>','exec'))  
>>> a  
40
```





Module Importation

```
>>> eval(compile('import MightyMaxims','<user>','single'))
>>> eval(compile('import MightyMaxims','<user>','exec'))
>>> eval(compile('import MightyMaxims','<user>','eval'))
Traceback (most recent call last):
  File "<pyshell#114>", line 1, in <module>
    eval(compile('import MightyMaxims','<user>','eval'))
  File "<user>", line 1
    import MightyMaxims
 ^
SyntaxError: invalid syntax
```



Which compile()?

- Importing Modules

- ‘single’

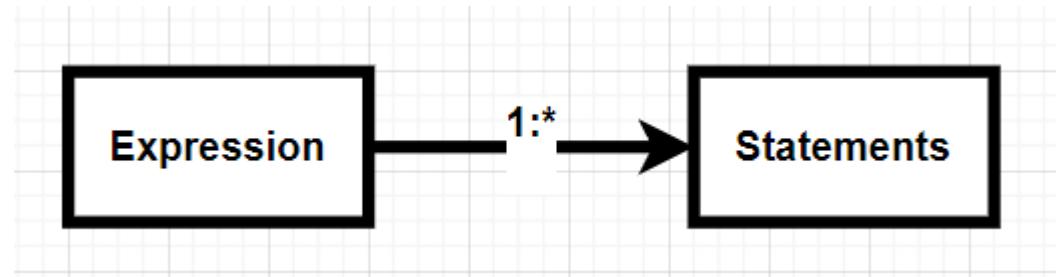
- Compile an Expression
 - Compile a Module
 - Effects & Results

- ‘eval’

- Compile a Statement (“what if”)
 - Results

- ‘exec’

- Compile an Expression (“make it so”)
 - Compile a Module
 - Effects





Parameter Opportunities

✓ Source

- Unicode String
- Byte String
- Abstract Syntax Tree ([AST](#)) Object
 - Note: [`ast.parse`](#) also converts code into AST

- Filename

- Mode

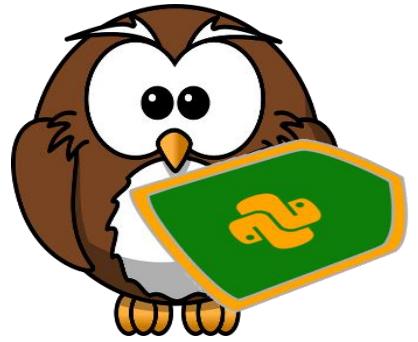
- Flags

- Optimize



Parameter Opportunities

- Source
- ✓ Filename
 - File from whence above came
 - ELSE some distinct tag / name
 - '<string>' (common)
- Mode
- Flags
- Optimize



Parameter Opportunities

- Source
- Filename
- ✓ Mode
 - 'single', 'eval', 'exec'
- Flags
- Optimize



Parameter Opportunities

- Source
- Filename
- Mode
- ✓ Flags (optional arguments)
 - **don't_inherit** - [future features](#)
 - **flags** - [Compiler options](#)
- Optimize



Parameter Opportunities

✓ Optimize – Integral Values

- CLI Default (-1)
- None (0)
 - `__debug__` is True
- One (1)
 - `__debug__` is False
 - Remove assert()ions
- Two (2)
 - Also removes docstrings



KA3044: Compile

Advanced

Pythons built-in compile()

- (1) May use 'eval()' or 'exec()'
- (2) Parameters allow locals()
- (3) Parameters allow globals()
- (4) Requires a file-name
- (5) Compiles & executes code

1

R0





KA3046: Expressions -v- Statements

Advanced

An Expression may have many Statements, but a Statement cannot have many Expressions.

- (1) True
- (2) False

1

R0





KA3047: Expressions -v- Statements

Advanced

An Expression may have many Statements, but a Statement cannot have many Statements

- (1) True
- (2) False

1

R0





KA3048: Compile

Advanced

Pythons built-in compile()

- (1) 'eval', 'exec', 'single'
- (2) 'debug', 'eval', 'single'
- (3) 'compile', 'run', 'debug'
- (4) 'secure', 'lock', 'unlock'
- (5) Compiles & executes code

1

R0





KA3049: Compile

Advanced

Pythons built-in compile()

- (1) Returns a 'code class'
- (2) Realized using exec()
- (3) Realized using eval()
- (4) Two of the above
- (5) All of the above

1

R0





KA3050: Compile

Advanced

```
a=4;eval(compile('a+=5','','exec'))
```

- (1) a == 9
- (2) a == 4
- (3) SyntaxError
- (4) Two of the above
- (5) None of the above

1

R0





KA3051: Compile

Advanced

```
a=4;eval(compile('a+=5','','eval'))
```

- (1) a == 9
- (2) a == 4
- (3) SyntaxError
- (4) Two of the above
- (5) None of the above

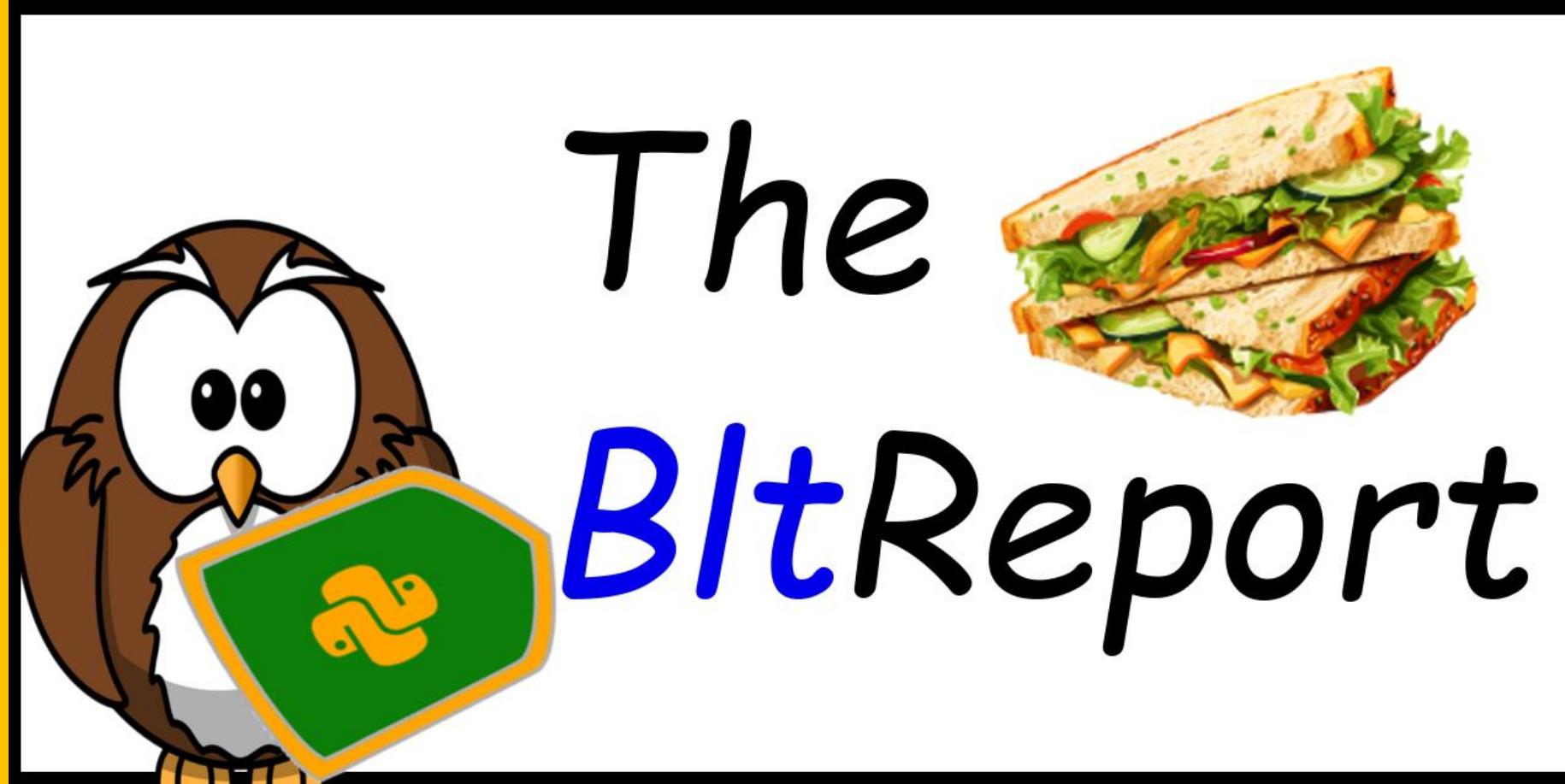
1

R0





Video: BLT_00900





- ▶ `False`
- ▶ `None`
- ▶ `True`
- ▷ `all`
- ▷ `any`
- ▷ `ascii`
- ▶ `bool`
- ▷ `breakpoint`
- ▷ `bytarray`
- ▶ `callable`
- ▷ `chr`
- ▷ `classmethod`
- ▶ `copyright`
- ▷ `credits`
- ▷ `delattr`
- ▷ `dict`
- ▷ `dir`
- ▷ `divmod`
- ▶ `eval`
- ▷ `exec`
- ▷ `enumerate`
- ▷ `float`
- ▷ `format`
- ▷ `filter`
- ▷ `globals`
- ▷ `hasattr`
- ▷ `getattr`
- ▷ `hex`
- ▷ `id`
- ▷ `help`
- ▶ `isinstance`
- ▷ `issubclass`
- ▷ `int`
- ▶ `license`
- ▷ `list`
- ▷ `len`
- ▷ `max`
- ▷ `memoryview`
- ▷ `map`
- ▶ `object`
- ▷ `min`
- ▷ `next`
- ▷ `pow`
- ▷ `oct`
- ▷ `ord`
- ▶ `range`
- ▷ `open`
- ▷ `quit`
- ▷ `set`
- ▷ `property`
- ▷ `round`
- ▶ `staticmethod`
- ▷ `repr`
- ▷ `reversed`
- ▷ `slice`
- ▷ `tuple`
- ▷ `setattr`
- ▷ `sorted`
- ▷ `str`
- ▷ `super`
- ▷ `type`
- ▷ `sum`
- ▷ `vars`
- ▷ `zip`



```
>>> help(staticmethod)
Help on class staticmethod in module builtins:

class staticmethod(object)
| staticmethod(function) -> method
|
| Convert a function to be a static method.
|
| A static method does not receive an implicit first argument.
| To declare a static method, use this idiom:
|
|     class C:
|         @staticmethod
|         def f(arg1, arg2, ...):
|             ...
|
| It can be called either on the class (e.g. C.f()) or on an instance
| (e.g. C().f()). Both the class and the instance are ignored, and
| neither is passed implicitly as the first argument to the method.
```



Review: D.I.Y Decorators ...

```
class Z:  
    def __init__(self, func):  
        print(type(func), func.__name__)  
        self.a_func = func  
  
    def __call__(self):  
        print('Calling', self.a_func.__name__)  
        results = self.a_func()  
        print('Returning', results)  
        return results
```

File: DiyDecorator.py



Static @Z

```
>>> class B:  
    @Z  
        def foo(): return 5
```

```
<class 'function'> foo  
>>> B.foo()  
Calling foo  
Returning 5  
5
```



Review: Decorated 'Ops

- 'Ops In-Action:

```
>>> type(z)
<class 'type'>
>>> type(staticmethod)
<class 'type'>
```

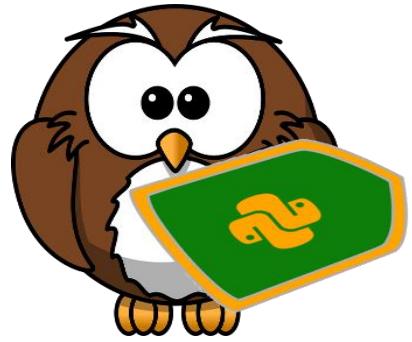


BONUS: D.I.Y Decorated 'Ops

- 'Ops In-Action:

```
>>> @Z
def foo(): ...

<class 'function'> foo
>>> isinstance(foo, Z)
True
>>> callable(Z)
True
>>> callable(foo)
True
>>> foo()
Calling foo
Returning None
>>>
```



@staticmethod ~v~ D.I.Y

```
>>> @staticmethod  
def foo(): ...
```

```
>>> callable(foo)  
False
```



Using @staticmethod ...

```
class S:  
    def __init__(self): ...  
  
    @staticmethod  
    def foo():  
        print('Spam! =) ')
```

OPTIONAL
CALLABLE

File: StaticDecorator.py



Using @staticmethod

```
>>> s()
<main.S object at 0x0000018C8DF75A60>
>>> s()()
Returning 5
5
>>> s.foo()
Spam! =)
>>> s = S()
>>> s.foo()
Spam! =)
```



Where's the ... Function?

```
>>> s = staticmethod(lambda : 'Zoom')
>>> s.__func__
'Zoom'                                     >>> type(s)
                                             <class 'staticmethod'>
>>>
>>> @staticmethod
def foo(): return 'zoom!'

>>> foo.__func__()
'zoom!'
```



KA3003: exec()

Advanced

What is Python's built-in `exec()` function used for?

- (1) To run an external application
- (2) To check if an object is callable
- (3) To evaluate and test Python code
- (4) To change environment variables
- (5) None of the above

1

R0





KA3008: Function Call Management

Advanced

Which Meta Method(s) are required to create a callable object?

1

R0





KA3009: Function Call Detection

Advanced

Which built-in function allows us to determine if an instance is callable?

1

R0





KA3019: Function Decoration

Advanced

What is a `decorator function`?



1

R0



KA3023: Static Methods

Advanced

What is the purpose of a @staticmethod?

1

R0





KA3052:
@staticmethod

Advanced

The `staticmethod` decorator can be used on
non-class functions

- (1) True
- (2) False

1

R0





KA3053: Decorators

Advanced

How would you create a decorator?

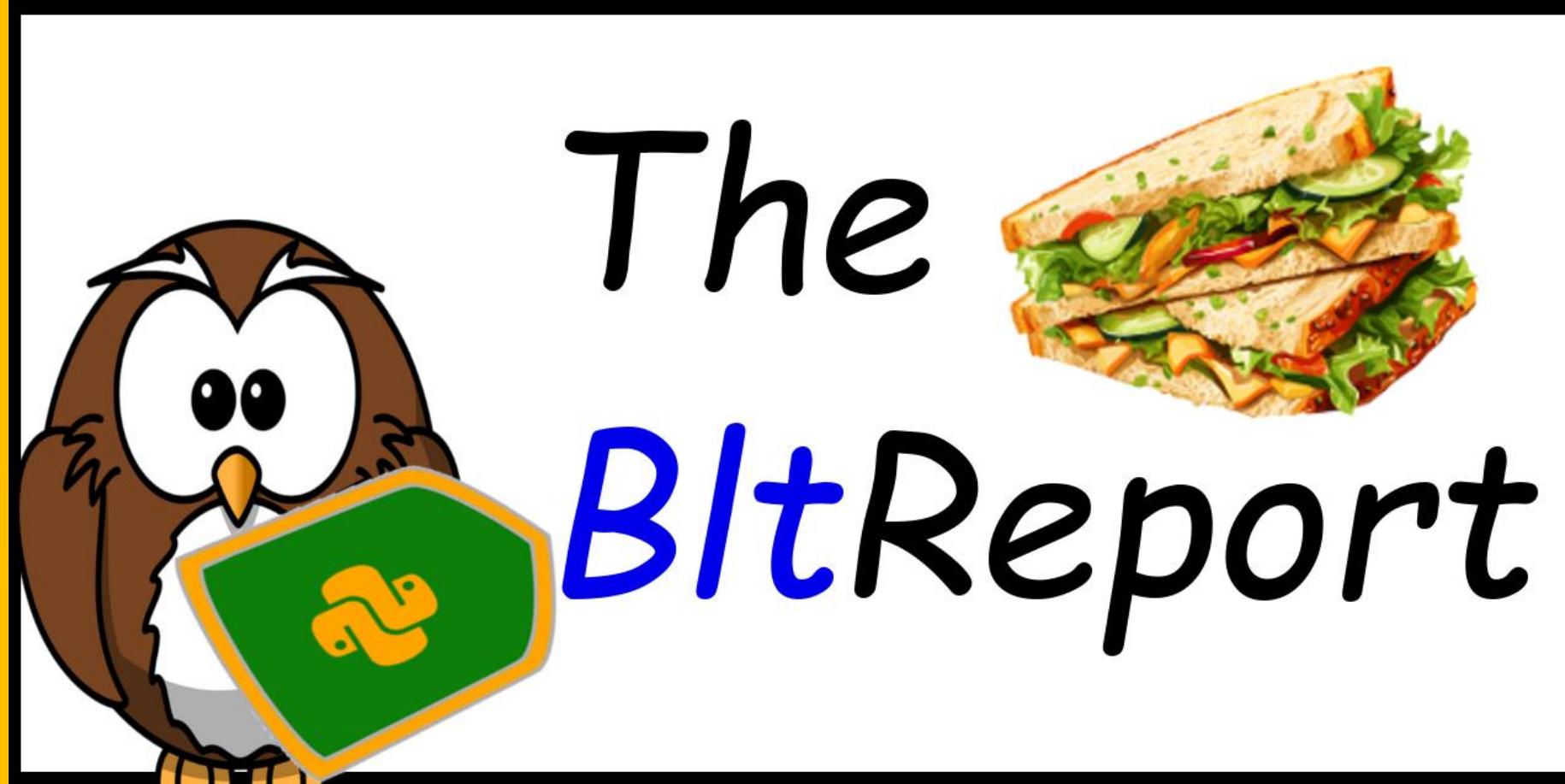
1

R0





Video: BLT_01000



The BitReport



- ▶ **False**
- ▷ **all**
- ▶ **bool**
- ▶ **callable**
- ▷ **complex**
- ▷ **dict**
- ▶ **eval**
- ▷ **float**
- ▶ **globals**
- ▷ **hex**
- ▶ **isinstance**
- ▶ **license**
- ▷ **max**
- ▶ **object**
- ▷ **pow**
- ▶ **range**
- ▷ **set**
- ▶ **staticmethod**
- ▷ **tuple**
- ▶ **None**
- ▷ **any**
- ▷ **breakpoint**
- ▷ **chr**
- ▶ **copyright**
- ▷ **dir**
- ▶ **exec**
- ▷ **format**
- ▶ **hasattr**
- ▶ **id**
- ▶ **issubclass**
- ▷ **list**
- ▷ **memoryview**
- ▷ **oct**
- ▶ **print**
- ▶ **repr**
- ▶ **setattr**
- ▶ **str**
- ▶ **type**
- ▶ **True**
- ▷ **ascii**
- ▷ **bytarray**
- ▶ **classmethod**
- ▶ **credits**
- ▷ **divmod**
- ▶ **exit**
- ▷ **frozenset**
- ▷ **hash**
- ▶ **input**
- ▷ **iter**
- ▶ **locals**
- ▷ **min**
- ▷ **open**
- ▶ **property**
- ▷ **reversed**
- ▷ **slice**
- ▷ **sum**
- ▶ **vars**
- ▷ **abs**
- ▷ **bin**
- ▷ **bytes**
- ▶ **compile**
- ▷ **delattr**
- ▶ **enumerate**
- ▷ **filter**
- ▶ **getattr**
- ▷ **help**
- ▶ **int**
- ▷ **len**
- ▷ **map**
- ▷ **next**
- ▷ **ord**
- ▶ **quit**
- ▷ **round**
- ▷ **sorted**
- ▷ **super**
- ▷ **zip**



```
class classmethod(object)
| classmethod(function) -> method

| Convert a function to be a class method.

| A class method receives the class as implicit first argument,
| just like an instance method receives the instance.
| To declare a class method, use this idiom:

|     class C:
|         @classmethod
|         def f(cls, arg1, arg2, ...):
|             ...

| It can be called either on the class (e.g. C.f()) or on an instance
| (e.g. C().f()). The instance is ignored except for its class.
| If a class method is called for a derived class, the derived class
| object is passed as the implied first argument.

| Class methods are different than C++ or Java static methods.
| If you want those, see the staticmethod builtin.
```



```
>>> help(staticmethod)
Help on class staticmethod in module builtins:

class staticmethod(object)
| staticmethod(function) -> method
|
| Convert a function to be a static method.
|
| A static method does not receive an implicit first argument.
| To declare a static method, use this idiom:
|
|     class C:
|         @staticmethod
|         def f(arg1, arg2, ...):
|             ...
|
| It can be called either on the class (e.g. C.f()) or on an instance
| (e.g. C().f()). Both the class and the instance are ignored, and
| neither is passed implicitly as the first argument to the method.
```



Review: __func__

```
>>> s = staticmethod(lambda : 'Zoom')
>>> s.__func__()
'Zoom'
>>>
>>> @staticmethod
def foo(): return 'zoom!'

>>> foo.__func__()
'zoom!'
```



Same Expectation (“Framework”)

```
>>> c = classmethod(lambda : 'Same!')  
>>> c.__func__()  
'Same!'  
>>>
```

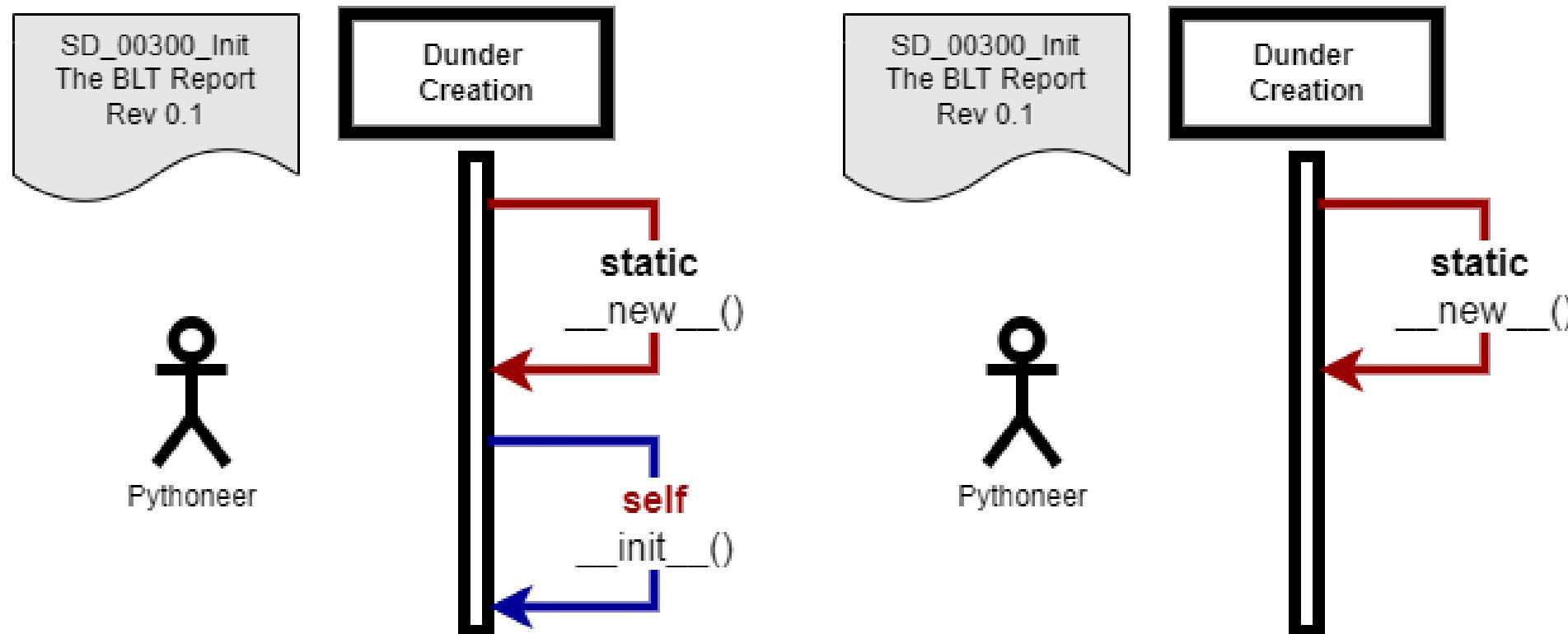


```
class S:  
    def __init__(self, msg='Default'):  
        if msg: print(msg)  
  
    @classmethod  
    def foo(cls):  
        return cls('classM')  
  
    @staticmethod  
    def __call__():  
        return S('staticM')
```

File: ClassDecorator.py



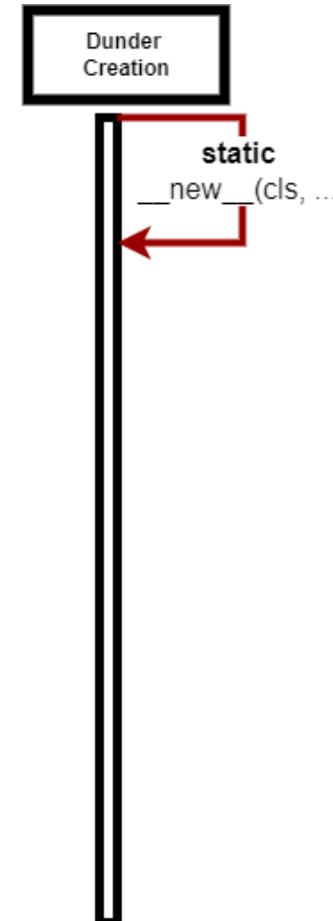
Review: Classic Initialization





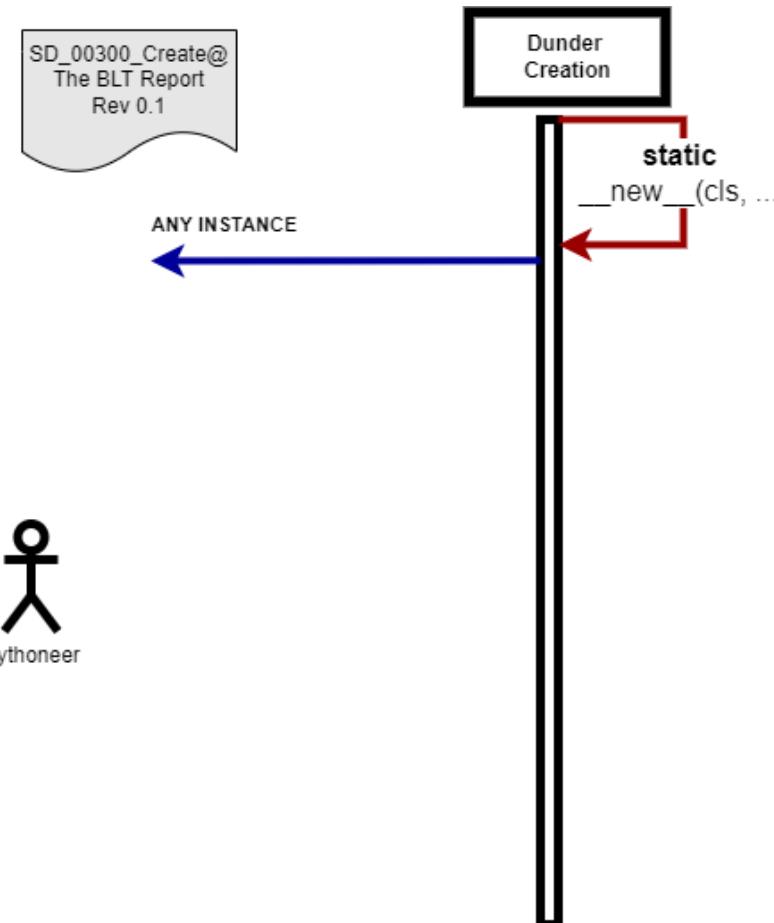
`__new__(cls, ...)`

SD_00300_Create@
The BLT Report
Rev 0.1



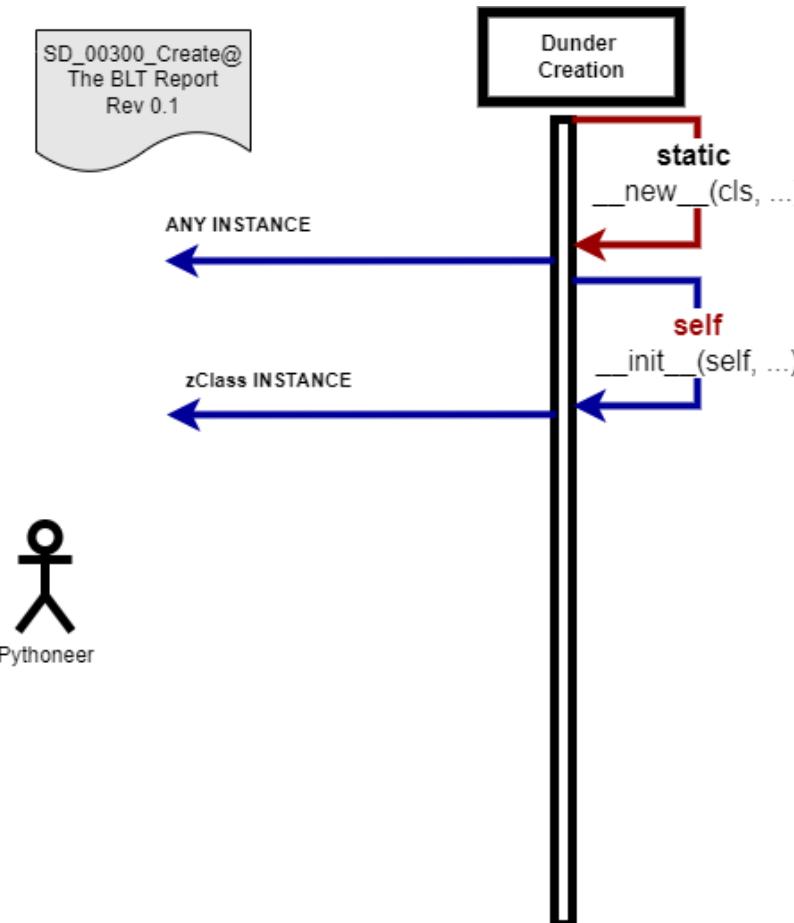


Possible ... !



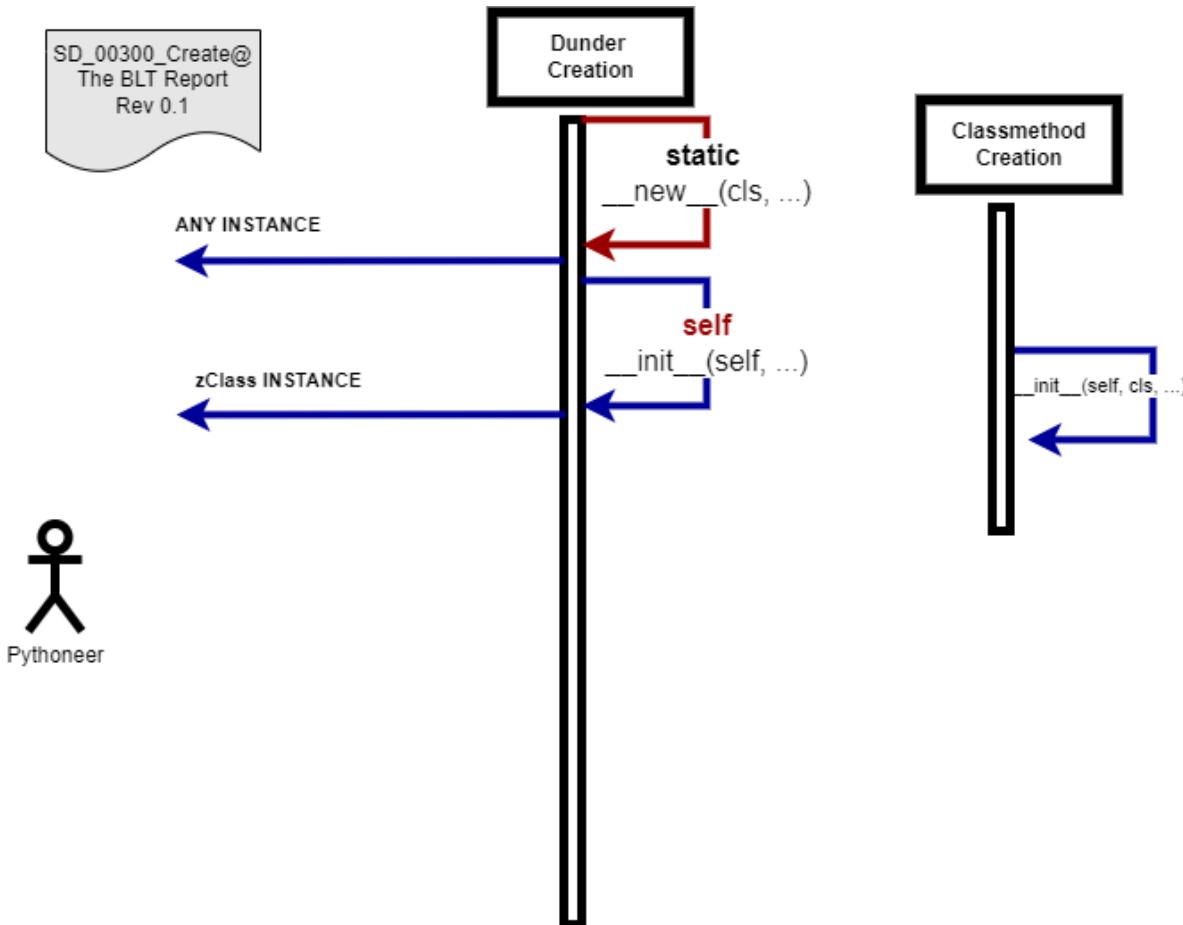


Usually, Same Type ...



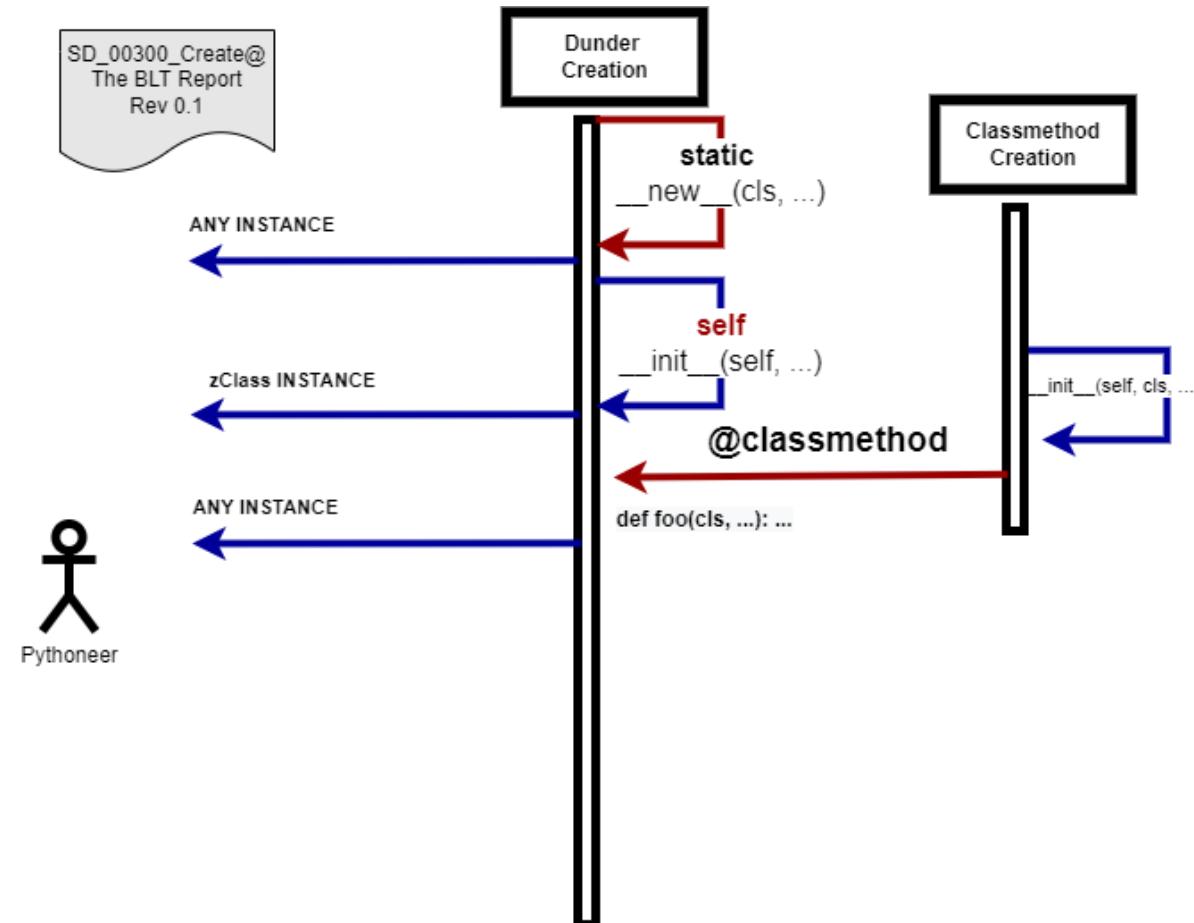


Same cls Type ...



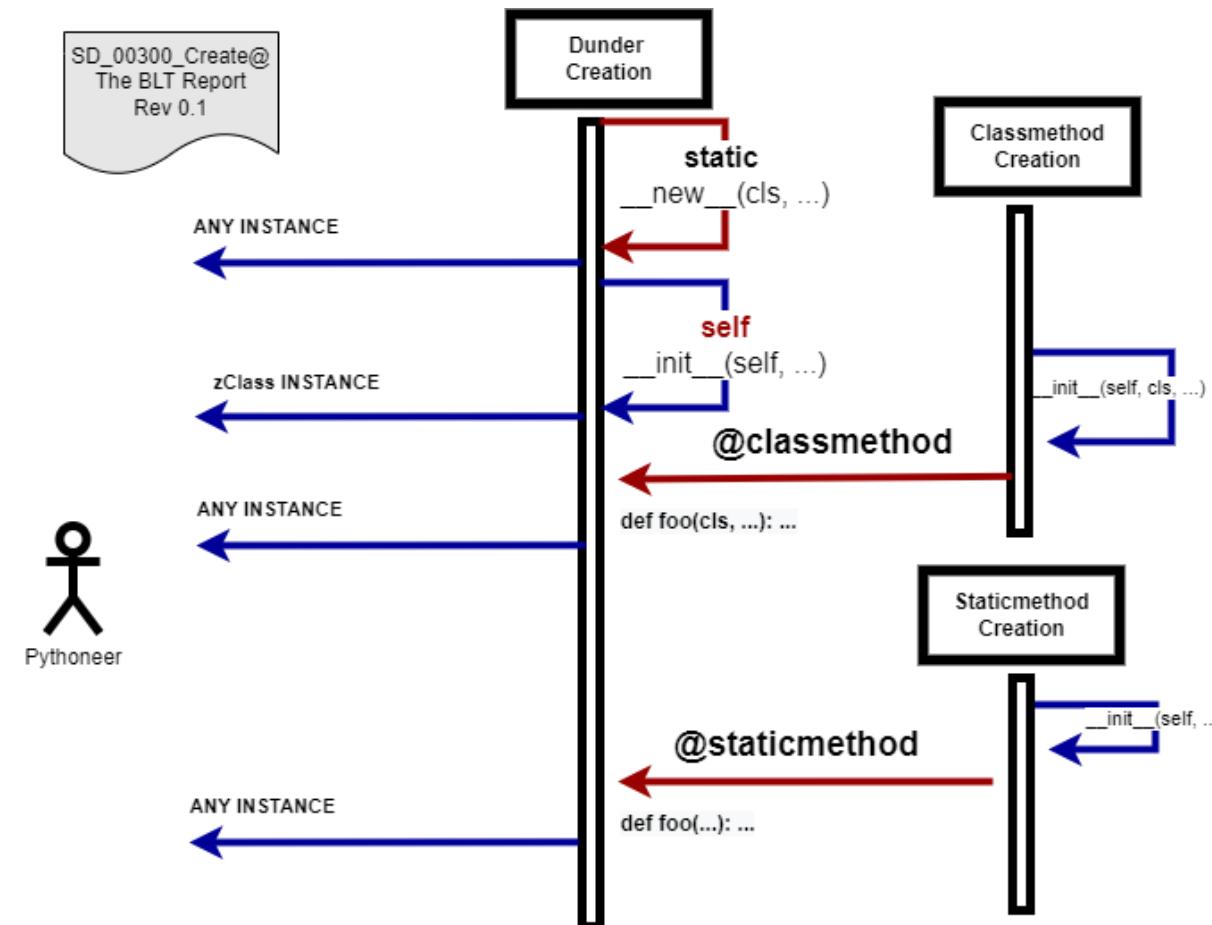


Anything ~via~ `__func__` 'Ops





Anything ~via~ __func__ 'Ops

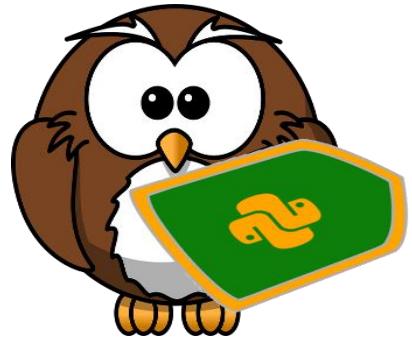




Creation Opportunities

- `@staticmethod`
 - Might return *anything*
 - More parameters may be provided
 - No parameters required
- `@classmethod`
 - Requisite parameter is ‘type’
 - More parameters may be provided
 - Also could return *anything!*





KA3021: Static Construction

Advanced

What is the purpose of a @classmethod?

1

R0





KA3022:
@classmethod -v-
new

Advanced

What parameters do a @classmethod and the new dunder have in common?

1

R0





KA3025: Object Factories

Advanced

What is the purpose of an `Object Factory`?



1

R0



KA2005: Basic Inheritance

Intermediate

In Python 'inheritance' is a way to ?

- (1) Manage object factories
- (2) Manage meta-data
- (3) Assign interfaces
- (4) Ensure meta relationships
- (5) None of the above

1

R0





KA2015: Framework Basics

Intermediate

The purpose of a 'framework' is to ?

- (1) Enforce the C.R.U.D design pattern
- (2) Provide a testable infrastructure
- (3) Provide common code re-use patterns
- (4) Ensure object-factor relationships
- (5) None of the above

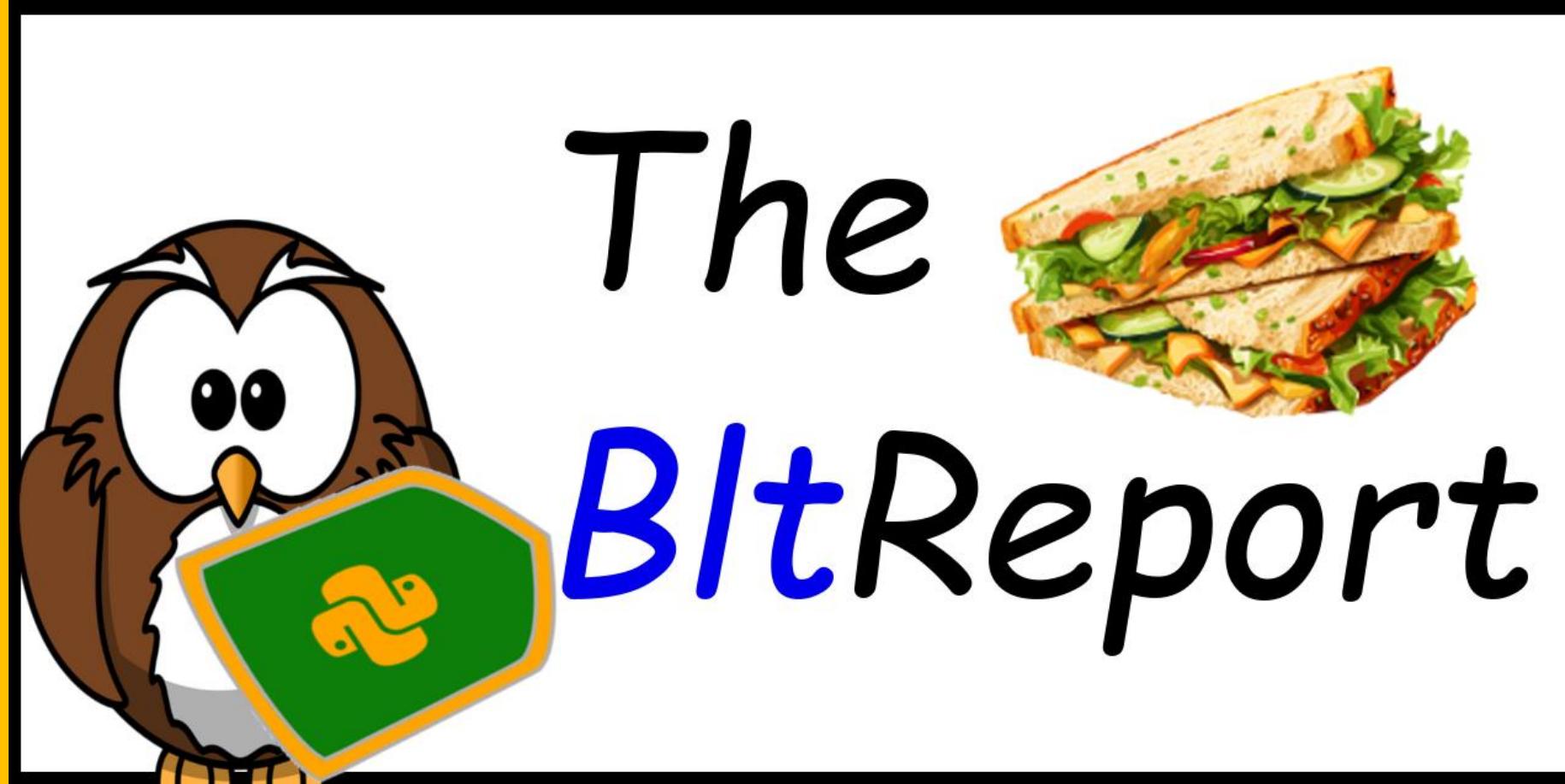
1

R0



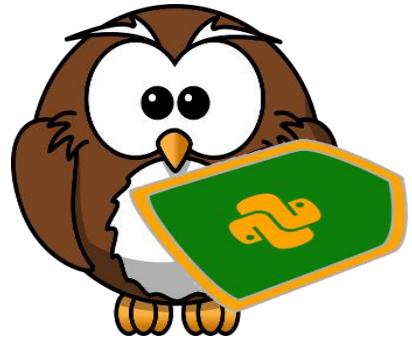


Video: BLT_01100





- ▶ **False**
- ▷ **all**
- ▶ **bool**
- ▶ **callable**
- ▷ **complex**
- ▷ **dict**
- ▶ **eval**
- ▷ **float**
- ▶ **globals**
- ▷ **hex**
- ▶ **isinstance**
- ▶ **license**
- ▷ **max**
- ▶ **object**
- ▷ **pow**
- ▶ **range**
- ▶ **set**
- ▶ **staticmethod**
- ▷ **tuple**
- ▶ **None**
- ▷ **any**
- ▷ **breakpoint**
- ▷ **chr**
- ▶ **copyright**
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- ▷ **list**
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- ▶ **str**
- ▶ **type**
- ▶ **True**
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- ▷ **min**
- ▷ **open**
- ▷ **property**
- ▷ **reversed**
- ▶ **slice**
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- ▷ **filter**
- ▶ **getattr**
- ▷ **help**
- ▶ **int**
- ▷ **len**
- ▷ **map**
- ▷ **next**
- ▷ **ord**
- ▶ **quit**
- ▷ **round**
- ▷ **sorted**
- ▷ **super**
- ▷ **zip**



Rpt: Public 'Ops

```
>>> Rpt.type_report(Rpt)
01 common_report 02 get_private      03 get_public      04 get_set
05 reporter       06 resolve          07 type_report
```

File: TypeReport.py



/The-Built-In-Report/study/TypeReport.py

```
>>> Rpt.type_report(set)
01 add
03 copy
05 difference_update
07 intersection
09 isdisjoint
11 issuperset
13 remove
15 symmetric_difference_update
17 update
02 clear
04 difference
06 discard
08 intersection_update
10 issubset
12 pop
14 symmetric_difference
16 union
```



Collection Commons

```
>>> _ = Rpt.common_report(dict, set)
01 clear  02 copy   03 pop      04 update
```

```
>>> _ = Rpt.common_report(list, set)
01 clear  02 copy   03 pop      04 remove
```



Review: Set Creations

- Element Ordering == Eccentric!

```
>>> set('Booya!')
{'!', 'a', 'y', 'o', 'B'}
>>> set(_)
{'y', 'o', '!', 'B', 'a'}
>>> set(sorted('Booya!'))
{'o', 'y', 'a', '!', 'B'}
```



Mathematicals

```
>>> a = set('cat')
>>> b = set('cat')
>>> id(a);id(b)
1598952245728
1598952244832
>>> a - b
set()
```



Set Operators

& , **&=**

| , **|=**

^ , **^=**

- , **-=**

> , **>=**

< , **<=**



01 add

```
>>> help(set.add) ->None  
Help on method_descriptor:
```

```
add(...)  
    Add an element to a set.
```

This has no effect if the element is already present.



02 clear

```
>>> help(set.clear)->None
Help on method_descriptor:

clear(...)
    Remove all elements from this set.
```



03 copy

```
>>> help(set.copy) ->set
Help on method_descriptor:

copy(...)
    Return a shallow copy of a set.
```



04 difference

```
>>> help(set.difference) ->set
```

```
Help on method_descriptor:
```

```
difference(...)
```

Return the difference of two or more sets as a new set.

(i.e. all elements that are in this set but not the others.)

set - other

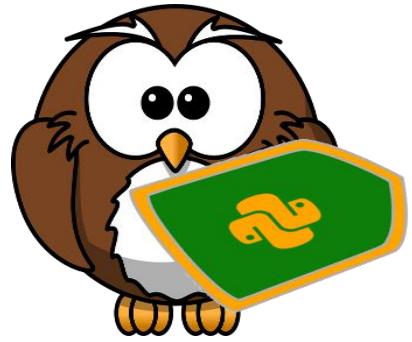


05 difference_update

```
>>> help(set.difference_update)
Help on method_descriptor:

difference_update(...)
    Remove all elements of another set from this set.
```

set -= other



06 discard

```
>>> help(set.discard)->None
```

Help on method descriptor:

discard(...)

Remove an element from a set if it is a member.

If the element is not a member, do nothing.



07 intersection

```
>>> help(set.intersection) ->set  
Help on method_descriptor:
```

```
intersection(...)
```

Return the intersection of two sets as a new set.

(i.e. all elements that are in both sets.)

set & other



08 intersection_update

```
>>> help(set.intersection_update)
Help on method_descriptor:
```

```
intersection_update(...)
```

Update a set with the intersection of itself and another.

set &= other



Caveat: Updates ...

```
class Z:  
    def __and__(self, param):  
        print('gotcha.')  
  
>>> Z() & Z()  
gotcha.
```



Caveat, Updated!

```
class Z:  
    def __and__(self, param):  
        print('gotcha.')
```

```
>>> Z() &= Z()
```

```
>>> a = Z()  
>>> b = Z()  
>>> a &= b  
gotcha.
```

SyntaxError: 'function call' is an illegal expression for augmented assignment

```
>>> print(set('rat') & set('cat'))  
{'t', 'a'}  
>>> print(set('rat') &= set('cat'))  
SyntaxError: invalid syntax
```



09 isdisjoint

```
>>> help(set.isdisjoint) ->bool
Help on method_descriptor:

isdisjoint(...)
    Return True if two sets have a null intersection.
```



10 issubset

```
>>> help(set.issubset) ->bool
```

```
Help on method_descriptor:
```

```
issubset(...)
```

```
    Report whether another set contains this set.
```

set <[=] other



11 issuperset

```
>>> help(set.issuperset) ->bool
```

```
Help on method_descriptor:
```

```
issuperset(...)
```

```
Report whether this set contains another set.
```

set >[=] other



12 pop

```
>>> help(set.pop)->object
Help on method_descriptor:

pop(...)
    Remove and return an arbitrary set element.
    Raises KeyError if the set is empty.
```



13 remove

```
>>> help(set.remove) ->None
```

```
Help on method_descriptor:
```

```
remove(...)
```

```
    Remove an element from a set; it must be a member.
```

```
If the element is not a member, raise a KeyError.
```



Item Removal

- `.remove(object)` – Raises Exceptions
 - `.discard(object)` – “Just Do It”
- ✓ Both return ‘**None**’



14 symmetric_difference ...

```
>>> help(set.symmetric_difference) ->set
```

```
Help on method_descriptor:
```

```
symmetric_difference(...)
```

Return the symmetric difference of two sets as a new set.

(i.e. all elements that are in exactly one of the sets.)

set \wedge other



14 symmetric_difference

```
>>> set('yaboo!').difference(set('booya'))  
{'!'}
```

```
>>> set('booya').difference(set('yaboo!'))  
set()
```

```
>>> set('booya').symmetric_difference(set('yaboo!'))  
{'!'}
```



15 symmetric_difference_update ...

```
>>> help(set.symmetric_difference_update) ->None
Help on method_descriptor:

symmetric_difference_update(...)
    Update a set with the symmetric difference of itself and another.
```

set $\wedge=$ other



15 symmetric_difference_update

```
>>> set('yaboo!').difference(set('booya'))
{'!'}

>>> set('booya').difference(set('yaboo!'))
set()

>>> set('yaboo!').symmetric_difference_update(set('booya'))
>>>
{'!'}

>>> set('booya').symmetric_difference_update(set('yaboo!'))
>>>
{'!'}
```



16 union ...

```
>>> help(set.union) ->set
Help on method_descriptor:

union(...)
    Return the union of sets as a new set.
    (i.e. all elements that are in either set.)
```

set | other



16 union

```
>>> a = set(' ')
>>> b = a.union(set('Nagy'),set('egy'), set('booya!'))
>>> id(a);id(b)
1655906044160
1655906045504
```

```
>>> a
set()
>>> b
{'o', '!', 'N', 'g', 'y', 'b', 'e', 'a'}
```



17 update ...

```
>>> help(set.update) ->None  
Help on method_descriptor:
```

```
update(...)
```

Update a set with the union of itself and others.

set |= other



17 update

```
>>> set(' ').union(set('Nagy'),set('egy'), set('booya!'))
{'o', '!', 'N', 'g', 'y', 'b', 'e', 'a'}
>>>
>>> set(' ').update(set('Nagy'),set('egy'), set('booya!'))
>>> -
{'o', '!', 'N', 'g', 'y', 'b', 'e', 'a'}
```



KA1032: Set Creation

Beginner

What is the difference between `set('cat')` and `{'cat'}`?

- (1) Nothing.
- (2) The number of elements will differ
- (3) Both perform Venn operations
- (4) The instance will be the same
- (5) Their content will be the same

1

R0





KA1033: Set Differences

Beginner

What is the Venn difference between set('cat') and set('rat')?

- (1) Nothing.
- (2) The number of elements will differ
- (3) Either 'r' or 'c'
- (4) Either 'cr' or 'rc'
- (5) Their difference will be the same

1

R0





KA1068: Set Basics

Beginner

```
>>> set('cat') - set('rat')
```

- (1) {'a', 't'}
- (2) {'t'}
- (3) {'c'}
- (4) {'c', 't'}
- (5) Two of the above

1

R0





KA1069: Set Basics

Beginner

```
>>> set('rat') - set('cat')
```

- (1) {'a', 't'}
- (2) {'r'}
- (3) {'c'}
- (4) {'c', 't'}
- (5) Two of the above

1

R0





KA2034: Set Comprehension

Intermediate

```
>>> {a for a in 'baggy' if a == 'g'}
```

- (1) set()
- (2) {'g', 'g'}
- (3) {'g'}
- (4) ['g']
- (5) ['g', 'g']

1

R0





KA3054: Advanced Set

Advanced

```
>>> set('cat') ^ set('rat')
```

- (1) {'c'}
- (2) {'t'}
- (3) {'c', 't'}
- (4) {'a'}
- (5) {'a', 't'}

1

R0





KA3055: Advanced Dunders

Advanced

How to intercept the `&` Operator?

- (1) `__&`
- (2) `__&__`
- (3) `__amp__`
- (4) `__amp_`
- (5) `__and__`

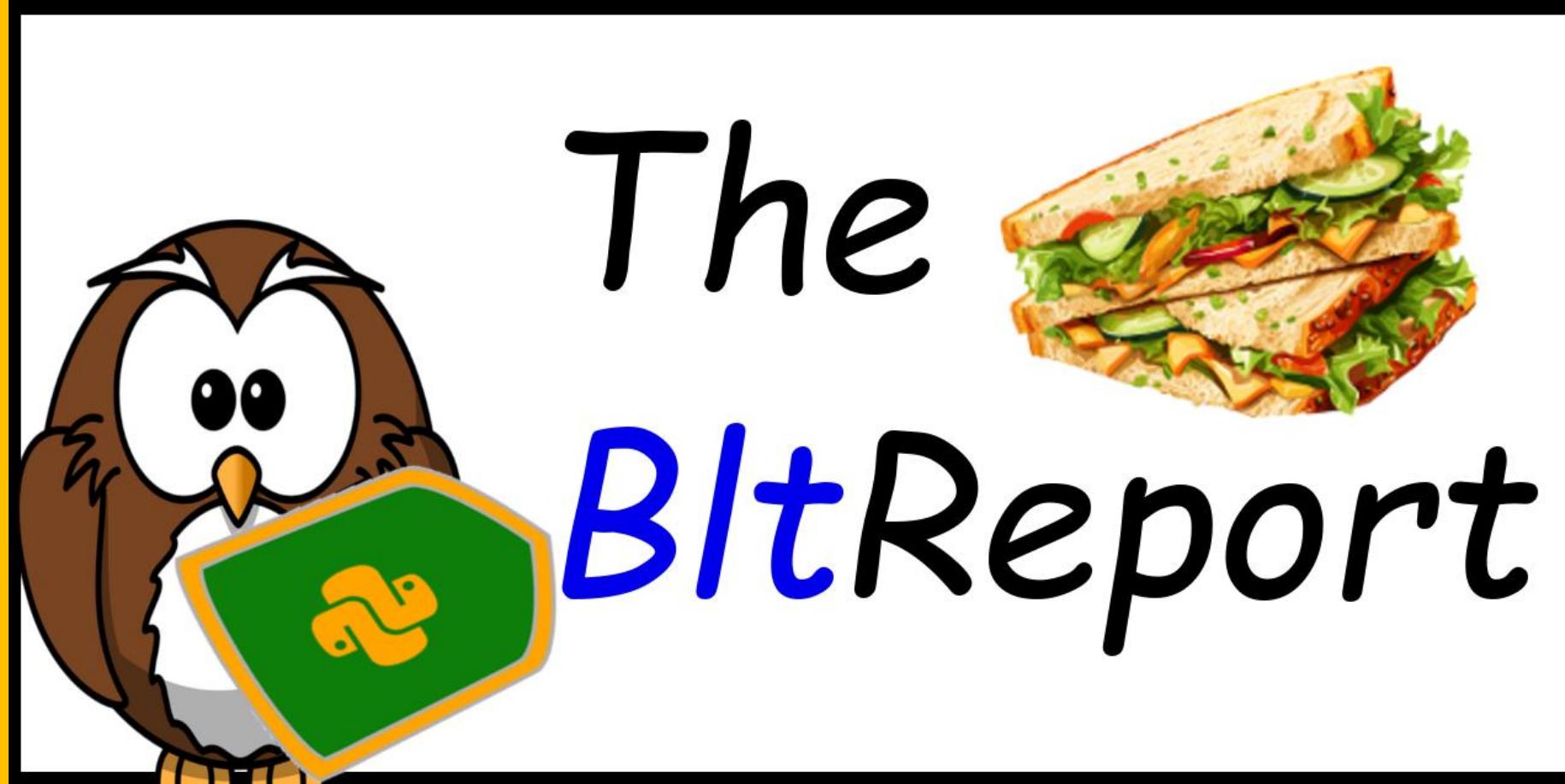
1

R0





Video: BLT_01200





- ▶ **False**
- ▷ **all**
- ▶ **bool**
- ▶ **callable**
- ▷ **complex**
- ▷ **dict**
- ▶ **eval**
- ▷ **float**
- ▶ **globals**
- ▷ **hex**
- ▶ **isinstance**
- ▶ **license**
- ▷ **max**
- ▶ **object**
- ▷ **pow**
- ▶ **range**
- ▶ **set**
- ▶ **staticmethod**
- ▷ **tuple**
- ▶ **None**
- ▷ **any**
- ▷ **breakpoint**
- ▷ **chr**
- ▶ **copyright**
- ▷ **dir**
- ▶ **exec**
- ▷ **format**
- ▶ **hasattr**
- ▶ **id**
- ▶ **issubclass**
- ▷ **list**
- ▷ **memoryview**
- ▷ **oct**
- ▶ **print**
- ▶ **repr**
- ▶ **setattr**
- ▶ **str**
- ▶ **type**
- ▶ **True**
- ▷ **ascii**
- ▷ **bytearray**
- ▶ **classmethod**
- ▶ **credits**
- ▷ **divmod**
- ▶ **exit**
- ▶ **frozenset**
- ▶ **hash**
- ▶ **input**
- ▷ **iter**
- ▶ **locals**
- ▷ **min**
- ▷ **open**
- ▶ **property**
- ▷ **reversed**
- ▶ **slice**
- ▷ **sum**
- ▶ **vars**
- ▷ **abs**
- ▷ **bin**
- ▷ **bytes**
- ▶ **compile**
- ▶ **delattr**
- ▶ **enumerate**
- ▷ **filter**
- ▶ **getattr**
- ▷ **help**
- ▶ **int**
- ▷ **len**
- ▷ **map**
- ▷ **next**
- ▷ **ord**
- ▶ **quit**
- ▷ **round**
- ▷ **sorted**
- ▷ **super**
- ▷ **zip**



Immutable ... Frozen-Set?

```
>>> Rpt.type_report(set)
```

```
01 add
```

```
03 copy
```

```
05 difference update
```

```
07 intersection
```

```
09 isdisjoint
```

```
11 issuperset
```

```
13 remove
```

```
15 symmetric_difference_update
```

```
17 update
```

```
02 clear
```

```
04 difference
```

```
06 discard
```

```
08 intersection update
```

```
10 issubset
```

```
12 pop
```

```
14 symmetric_difference
```

```
16 union
```

```
>>> issubclass(frozenset, set)
```

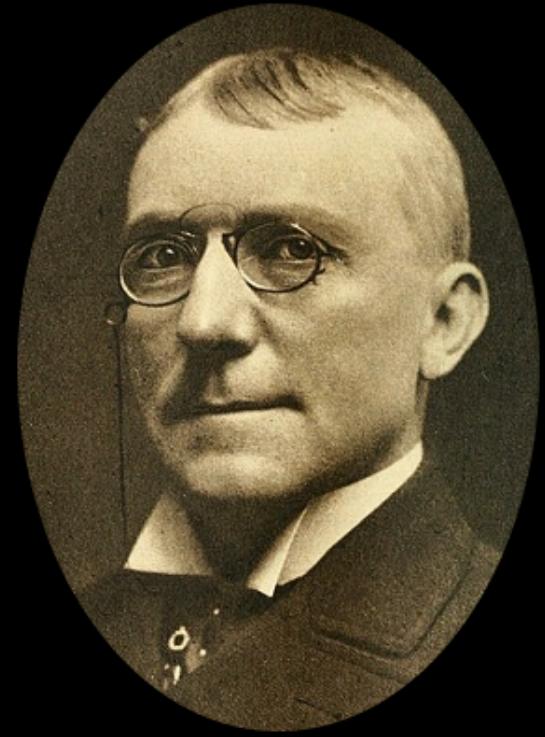
```
False
```

```
>>> issubclass(set, frozenset)
```

```
False
```



"Duck Typing"



**"When I see a bird
that walks like a
duck and swims like
a duck and quacks
like a duck, I call
that bird a duck."**

--- James Whitcomb Riley

Doctor Quote #73603



Classic Constructions

```
>>> frozenset('Whoopieeee!')
frozenset({'!', 'e', 'o', 'i', 'W', 'h', 'p'})
>>>
```

```
>>> set(_)
{'o', 'i', '!', 'W', 'e', 'h', 'p'}
```



“Frozen” Set Operators

intersection

&, &=

union

|, |=

sym diff

^, ^=

difference

-, -=

Creationals
(NO UPDATES)

>, >=
<, <=

True/False



Keys – Hashable?

```
>>> frozenset(range(1,6))
frozenset({1, 2, 3, 4, 5})
>>> set([1,2,3])
{1, 2, 3}

>>> {[1,2,3]}
Traceback (most recent call last):
  File "<pyshell#72>", line 1, in <module>
    {[1,2,3]}
TypeError: unhashable type: 'list'
```



Getting hash()

```
>>> help(hash)
Help on built-in function hash in module builtins:
```

```
hash(obj, /)
    Return the hash value for the given object.
```

Two objects that compare equal must also have the same hash value, but the reverse is not necessarily true.



Spelunking hash()

```
>>> Rpt.type_report(object())
False

>>> hash(object())
106799348275

>>> issubclass(list, object)
True

>>> hash(list())
Traceback (most recent call last):
  File "<pyshell#27>", line 1, in <module>
    hash(list())
TypeError: unhashable type: 'list'
```



KA2046: Frozenset

Intermediate

The `frozenset()`:

- (1) Is a built-in function
- (2) Can be modified
- (3) Is an instance of 'set'
- (4) Is a subclass of 'set'
- (5) None of the above

1

R0





KA2047: Using Hash

Intermediate

The hash () :

- (1) Always returns a number
- (2) Can be modified
- (3) Is not required by set()
- (4) Never raises an Exception
- (5) None of the above

1

R0





KA3026: Duck Typing

Advanced

What is 'Duck Typing'?



1

R0



KA3027: Duck Typing Caveats

Advanced

What are the pros & cons of 'Duck Typing'?

1

R0





KA3057: Hashing

Advanced

What is hashing?

- (1) Creating a string for a number
- (2) Creating a list for a string
- (3) Creating a number for an object
- (4) Raising a 'value error'
- (5) All of the above





KA3058: Frozenset

Advanced

A frozenset()

- (1) Cannot be changed
- (2) Can be created from an iterable
- (3) Is not a child of set()
- (4) Is a built-in function
- (5) All of the above

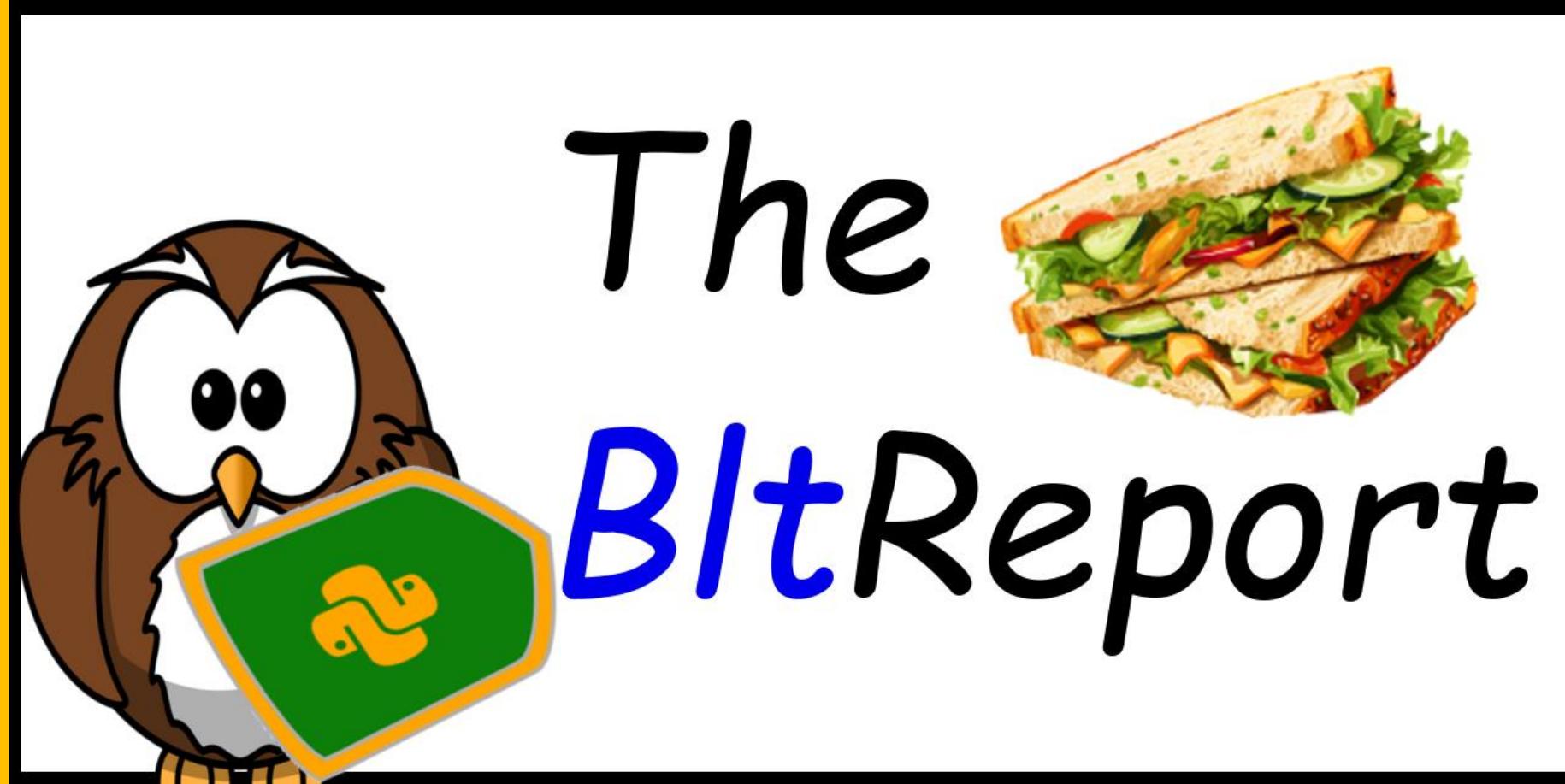
1

R0





Video: BLT_01300



The BitReport



- ▶ **False**
- ▶ **None**
- ▶ **True**
- ▶ **abs**
- ▷ **all**
- ▷ **any**
- ▷ **ascii**
- ▷ **bin**
- ▶ **bool**
- ▷ **breakpoint**
- ▷ **bytearray**
- ▷ **bytes**
- ▶ **callable**
- ▷ **chr**
- ▶ **classmethod**
- ▶ **compile**
- ▷ **complex**
- ▶ **copyright**
- ▶ **credits**
- ▶ **delattr**
- ▶ **dict**
- ▷ **dir**
- ▷ **divmod**
- ▶ **enumerate**
- ▶ **eval**
- ▶ **exec**
- ▶ **exit**
- ▷ **filter**
- ▷ **float**
- ▷ **format**
- ▶ **frozenset**
- ▶ **getattr**
- ▶ **globals**
- ▶ **hasattr**
- ▶ **hash**
- ▷ **help**
- ▷ **hex**
- ▶ **id**
- ▶ **input**
- ▶ **int**
- ▶ **isinstance**
- ▶ **issubclass**
- ▶ **iter**
- ▷ **len**
- ▶ **license**
- ▷ **list**
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- ▷ **memoryview**
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- ▷ **ord**
- ▷ **pow**
- ▶ **print**
- ▷ **property**
- ▶ **quit**
- ▶ **range**
- ▶ **repr**
- ▷ **reversed**
- ▷ **round**
- ▶ **set**
- ▶ **setattr**
- ▷ **slice**
- ▷ **sorted**
- ▶ **staticmethod**
- ▶ **str**
- ▷ **sum**
- ▷ **super**
- ▷ **tuple**
- ▶ **type**
- ▶ **vars**
- ▷ **zip**



Classic dict()

```
>>> Rpt.type_report(dict)
01 clear          02 copy           03 fromkeys      04 get            05 items
06 keys           07 pop            08 popitem       09 setdefault   10 update
11 values
```



OrderedDict?

- dict() changes

- Ordered <= 3.5
- Eccentric == 3.6
- Ordered >= 3.7





Assignment == 'Hashable'

- Both dict() & set()

```
>>> dict([[1,2], [3,4], [5,6]])  
{1: 2, 3: 4, 5: 6}
```

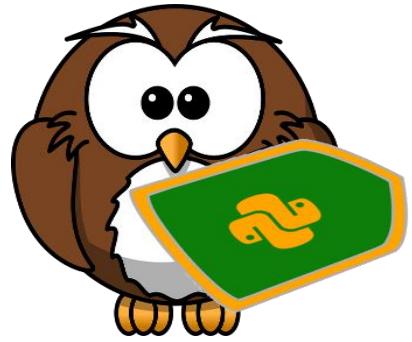
```
>>> {[1,2], [3,4], [5,6]}  
Traceback (most recent call last):  
  File "<pyshell#16>", line 1, in <module>  
    {[1,2], [3,4], [5,6]}  
TypeError: unhashable type: 'list'
```



01 clear

```
>>> help(dict.clear)
Help on method_descriptor:

clear(...)
    D.clear() -> None. Remove all items from D.
```



02 copy

```
>>> help(dict.copy)
Help on method_descriptor:

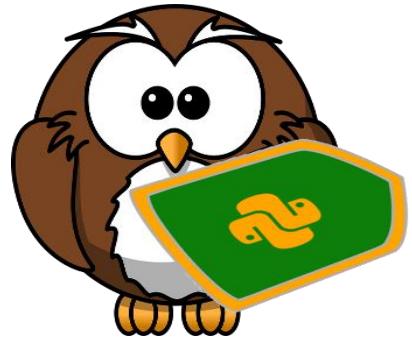
copy(...)
    D.copy() -> a shallow copy of D
```



03 fromkeys

```
>>> help(dict.fromkeys)
Help on built-in function fromkeys:

fromkeys(iterable, value=None, /) method of builtins.type instance
    Create a new dictionary with keys from iterable and values set to value.
```



04 get

```
>>> help(dict.get)
Help on method_descriptor:

get(self, key, default=None, /)
    Return the value for key if key is in the dictionary, else default.
```



05 items

```
>>> help(dict.items)
Help on method_descriptor:

items(...)
    D.items() -> a set-like object providing a view on D's items
```



Review: Assignment & Iterating ...

```
>>> d = dict([[1,2], [3,4], [5,6]])  
>>> for k in d:  
    print(f'*d[{k}] is {d[k]}')
```

```
*d[1] is 2  
*d[3] is 4  
*d[5] is 6
```



Common: Assignment == Updating ...

- “Array Style” Access

```
>>> d = dict([[1,2], [3,4], [5,6]])
>>> for k in d:
    d[k] *= 2
    print(f'*d[{k}] is {d[k]}')
```

```
*d[1] is 4
*d[3] is 8
*d[5] is 12
>>> d
{1: 4, 3: 8, 5: 12}
```



Common: Item Deletion

```
>>> for k in d:  
    if k % 3 == 0:  
        del d[k]  
    continue  
print(f'*d[{k}] is {d[k]}')
```

```
*d[1] is 2  
*d[5] is 6  
>>> d  
{1: 2, 5: 6}
```



06 keys

```
>>> help(dict.values)
Help on method_descriptor:

values(...)

    D.values() -> an object providing a view on D's values
```

```
>>> type(dict().values())
<class 'dict_values'>
```



11 values

```
>>> help(dict.keys)
Help on method_descriptor:

keys(...)

    D.keys() -> a set-like object providing a view on D's keys
```

```
>>> type(dict().keys())
<class 'dict_keys'>
```



07 pop

```
>>> help(dict.pop)
Help on method_descriptor:

pop(...)
    D.pop(k[,d]) -> v, remove specified key and return the corresponding value.

    If key is not found, default is returned if given, otherwise KeyError is raised
```



08 popitem

```
>>> help(dict.popitem)
Help on method_descriptor:
```

```
popitem(self, /)
```

Remove and return a (key, value) pair as a 2-tuple.

Pairs are returned in LIFO (last-in, first-out) order.

Raises `KeyError` if the dict is empty.

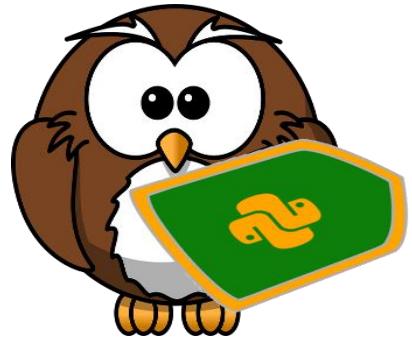


09 setdefault

```
>>> help(dict.setdefault)
Help on method_descriptor:

setdefault(self, key, default=None, /)
    Insert key with a value of default if key is not in the dictionary.

    Return the value for key if key is in the dictionary, else default.
```



10 update

```
>>> help(dict.update)
Help on method_descriptor:

update(...)
    D.update([E, ]**F) -> None.  Update D from dict/iterable E and F.
    If E is present and has a .keys() method, then does:  for k in E: D[k] = E[k]
    If E is present and lacks a .keys() method, then does:  for k, v in E: D[k] = v
    In either case, this is followed by: for k in F:  D[k] = F[k]
```



Dictionary Comprehensions?

- Worthless, or Wonderful?

```
>>> {ss:val for ss, val in enumerate('results') if val in 'aeiou'}  
{1: 'e', 3: 'u'}
```



KA1013: Key-Value Pairs

Beginner

What is the difference between set and dict?

- (1) dict manages key value pairs
- (2) set can have duplicate values
- (3) dict can have duplicate keys
- (4) set cannot be reverse-sorted
- (5) set and dict are equivalent

1

R0





KA1014: Sorting Dictionaries

Beginner

How can we custom sort dictionary values?

- (1) Use `sorted()` with a 'key' function
- (2) Use `sorted()` with a 'filter' function
- (3) Use the `.sort()` operation
- (4) Use the `.sorted()` operation
- (5) Use `filter()` with a 'sort' operation

1

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KA1015: Dictionary Orderings

Beginner

Does dict() insure insertion-key ordering?

- (1) dict() manages ordering
- (2) dict() never manages ordering
- (3) dict() always respects ordering
- (4) dict() may / may not preserve order
- (5) dict() does not use key value pairs

1

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KA1016: Dictionary Changes

Beginner

How do we add a key:value pair to my_dict?

- (1) `my_dict.append('key', value)`
- (2) `my_dict.insert('key', value)`
- (3) `my_dict['key'] = value`
- (4) `my_dict[value] = 'key'`
- (5) None of the above

1

R0





KA1017: Dictionary Removal

Beginner

How do we remove 'key' from my_dict?

- (1) my_dict.kill('key', value)
- (2) my_dict.remove('key', value)
- (3) my_dict['key'] = None
- (4) del my_dict['key']
- (5) None of the above

1

R0





Modern Python

Happy PyQuesting!



(presentation end)

Only 27 More To Go!

100 Python
Questions

Concepts & Code
RANDALL NAGY

