A tour of the module `itertools`

EuroPython 2025 🇨🇿

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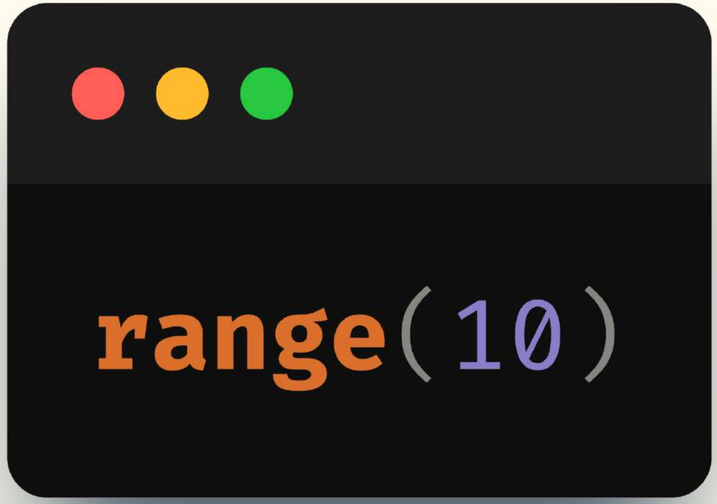
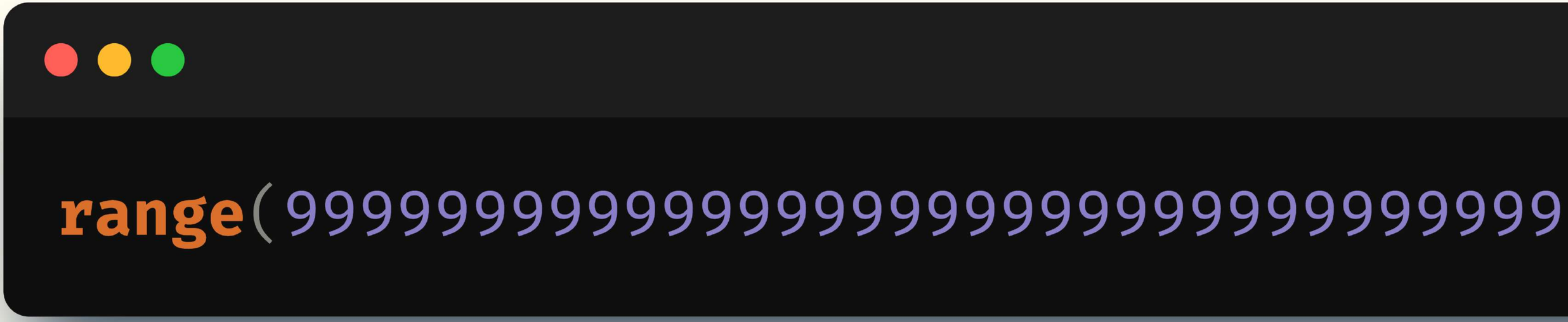
mathspp.com/drops

Why itertools?



vs



`range` *generates* elements on demand

`range` ***generates*** **elements on demand**

vs

Lists hold their elements in memory

Laziness is key

Lazy iterables are awesome

`itertools` ❤️ **iterables**

itertools menu

CONTENT WARNING

```
accumulate
batched
chain
combinations
combinations_with_replacement
compress
count
cycle
dropwhile
filterfalse
groupby
islice
pairwise
permutations
product
repeat
starmap
takewhile
tee
zip_longest
```

Filtering

- `compress`
- `dropwhile`
- `filterfalse`
- `takewhile`

Complementary

- `accumulate`
- `starmap`
- `zip_longest`

Reshaping

- `batched`
- `chain`
- `groupby`
- `islice`
- `pairwise`

Combinatorial

- `permutations`
- `product`
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- `combinations_with_replacement`

Infinite

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`tee`

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- islice
- pairwise

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combinations

```
flavours = ["chocolate", "vanilla", "strawberry"]
for scoops in combinations(flavours, 2):
    print(scoops)
```

```
flavours = ["chocolate", "vanilla", "strawberry"]
for scoops in combinations(flavours, 2):
    print(scoops)
```

```
('chocolate', 'vanilla')
('chocolate', 'strawberry')
('vanilla', 'strawberry')
```

permutations

```
flavours = ["chocolate", "vanilla", "strawberry"]
for scoops in permutations(flavours, 2):
    print(scoops)
```

```
flavours = ["chocolate", "vanilla", "strawberry"]
for scoops in permutations(flavours, 2):
    print(scoops)
```

```
('chocolate', 'vanilla')
('chocolate', 'strawberry')
('vanilla', 'chocolate')
('vanilla', 'strawberry')
('strawberry', 'chocolate')
('strawberry', 'vanilla')
```

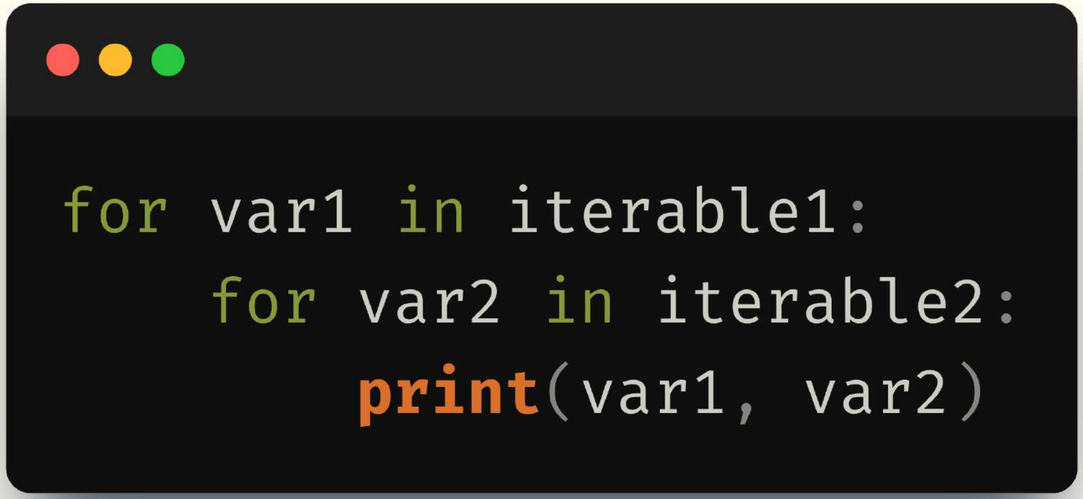
product

```
nr_scoops = [2, 3]
served_on = ["cup", "cone"]
```


nr_scoops = [2, 3]
served_on = ["cup", "cone"]
for scoop_n, served_on in product(nr_scoops, served_on):
print(f"{scoop_n} scoops served on a {served_on}.")

```python
nr_scoops = [2, 3]
served_on = ["cup", "cone"]
for scoop_n, served_on in product(nr_scoops, served_on):
    print(f"{scoop_n} scoops served on a {served_on}.")
```

```
2 scoops served on a cup.
2 scoops served on a cone.
3 scoops served on a cup.
3 scoops served on a cone.
```


for var1 in iterable1:
for var2 in iterable2:
print(var1, var2)


for var1, var2 in product(iterable1, iterable2):
print(var1, var2)

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- islice
- pairwise

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- combinations
- combinations_with_replacement

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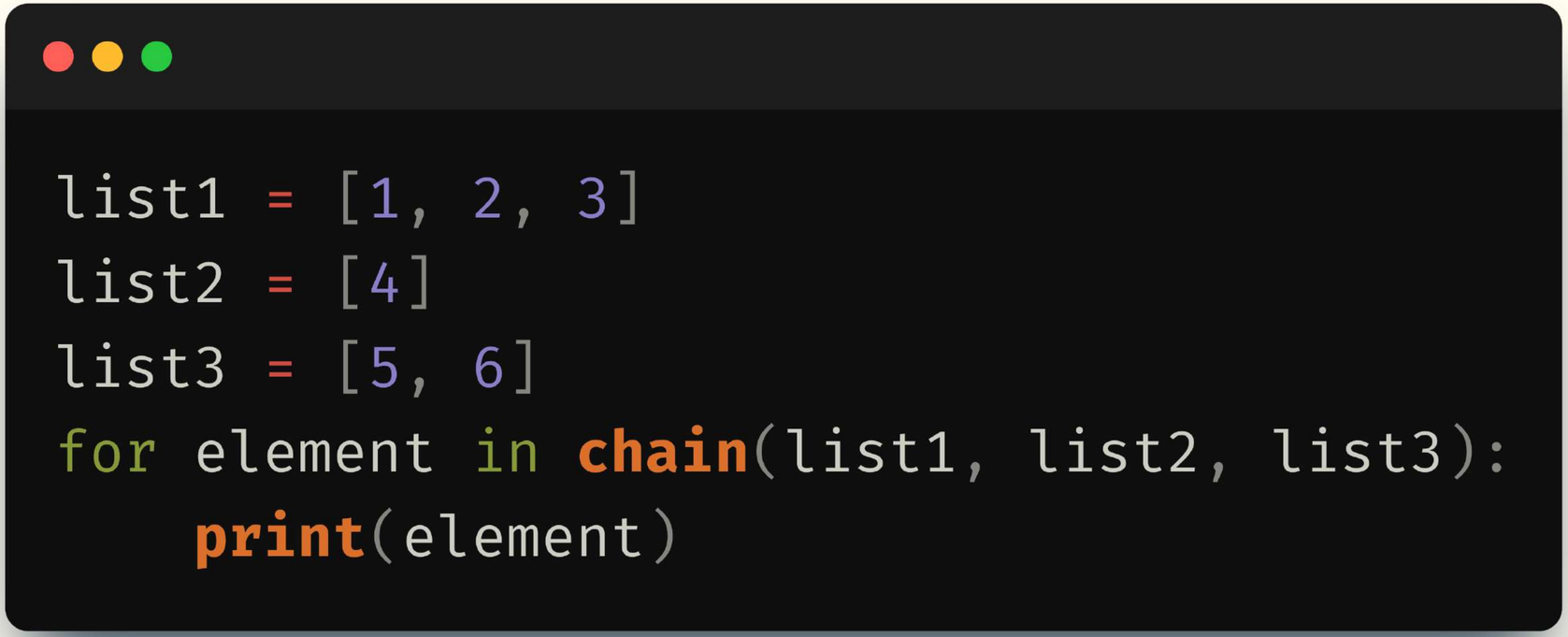
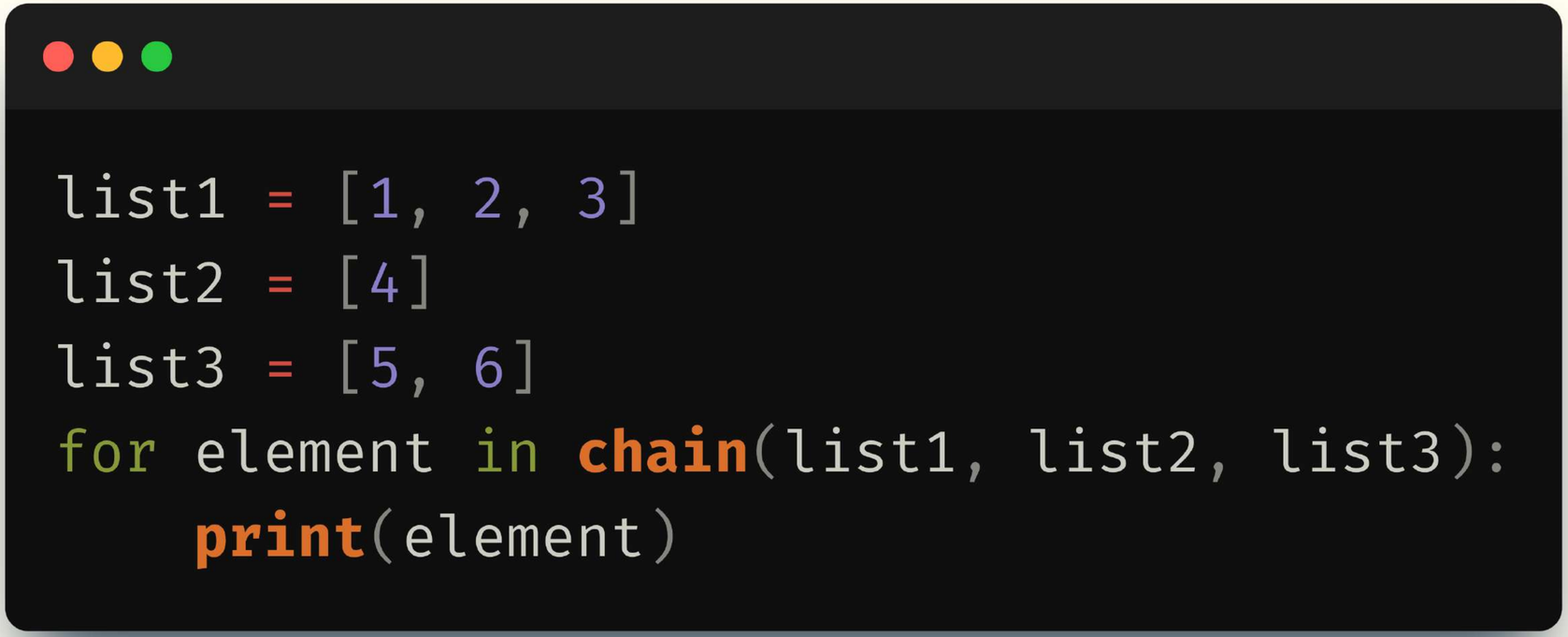
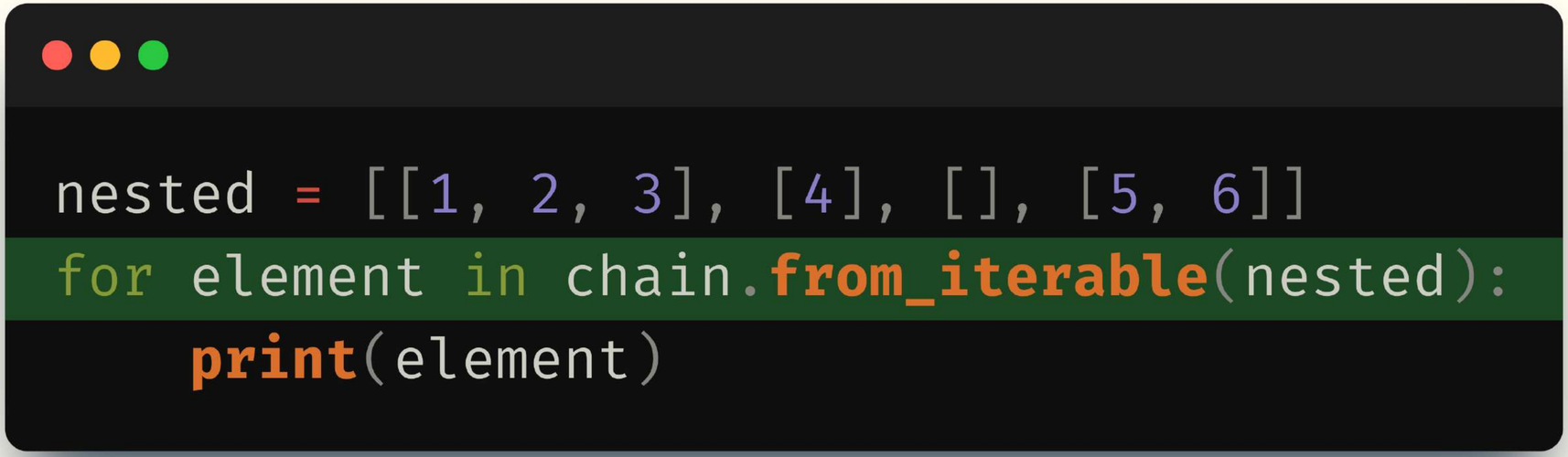
tee

chain


list1 = [1, 2, 3]
list2 = [4]
list3 = [5, 6]
for element in chain(list1, list2, list3):
print(element)


list1 = [1, 2, 3]
list2 = [4]
list3 = [5, 6]
for element in chain(list1, list2, list3):
print(element)

```
1
2
3
4
5
6
```


nested = [[1, 2, 3], [4], [], [5, 6]]
for element in chain.from_iterable(nested):
print(element)

```
1
2
3
4
5
6
```

islice


battleship_coords = product(range(10), range(10))
for square in battleship_coords[:10]: #?!
    print(square, end=" ")


battleship_coords = product(range(10), range(10))
for square in islice(battleship_coords, 10):
print(square, end=" ")

pairwise

```python
my_list = ["Hello", "from", "Prague"]
for before, after in zip(my_list[1:], my_list[:-1]):
    print(before, after)
```

```python
my_list = ["Hello", "from", "Prague"]
for before, after in zip(my_list[1:], my_list[:-1]):
    print(before, after)
```

```
Hello from
from Prague
```

```python
my_list = ["Hello", "from", "Prague"]
for before, after in pairwise(my_list):
    print(before, after)
```

```
Hello from
from Prague
```

Filtering

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Complementary

- `accumulate`
- `starmap`
- `zip_longest`

Reshaping

- `batched`
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- `islice`
- `pairwise`

Combinatorial

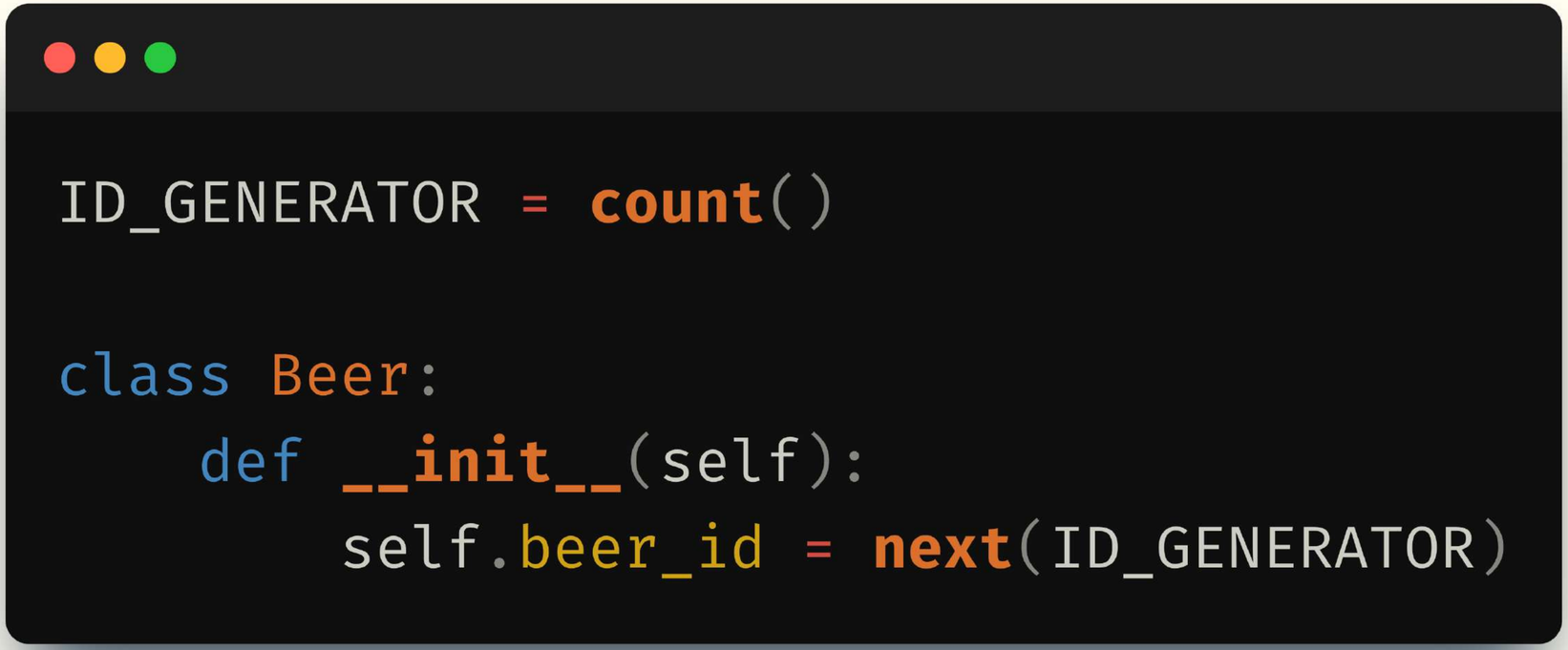
- `permutations`
- `product`
- `combinations`
- `combinations_with_replacement`

Infinite

- `count`
- `cycle`
- `repeat`

`tee`

count


ID_GENERATOR = count()
class Beer:
def __init__(self):
self.beer_id = next(ID_GENERATOR)

```python
ID_GENERATOR = count()

class Beer:
    def __init__(self):
        self.beer_id = next(ID_GENERATOR)
```

```python
b1, b2, b3 = Beer(), Beer(), Beer()
print(b1.beer_id)  # 0
print(b2.beer_id)  # 1
print(b3.beer_id)  # 2
```

cycle

```python
chckn_words = ["Chicken", "chicken", "Egg", "chicken", "chkn"]

for word in cycle(chckn_words):
    print(word, end=" ")
```

```
chckn_words = ["Chicken", "chicken", "Egg", "chicken", "chkn"]

for word in islice(cycle(chckn_words), 8):
    print(word, end=" ")
```

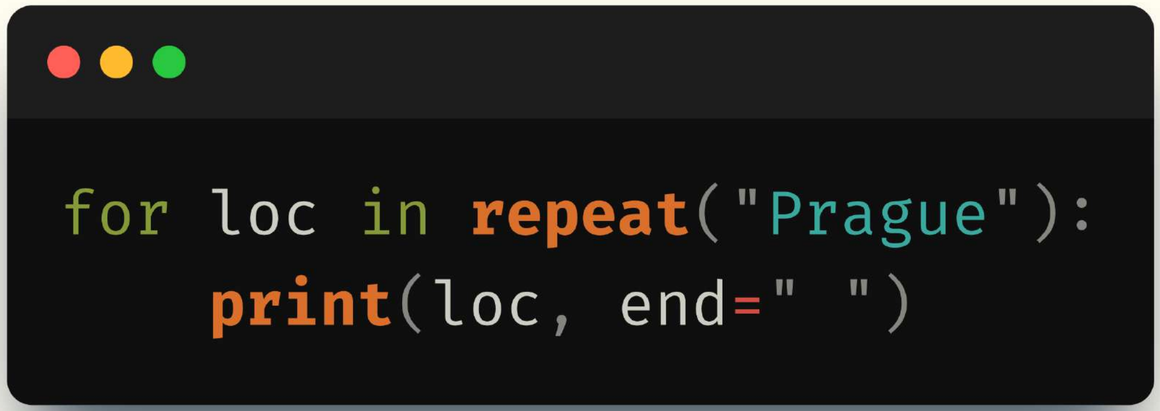
```
Chicken chicken Egg chicken chkn Chicken chicken Egg
```

```python
chckn_words = ["Chicken", "chicken", "Egg", "chicken", "chkn"]

print(" ".join(islice(cycle(chckn_words), 8)))
```

```
Chicken chicken Egg chicken chkn Chicken chicken Egg
```

repeat


for loc in repeat("Prague"):
print(loc, end=" ")

```python
for loc in repeat("Prague"):
    print(loc, end=" ")
```

```
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```


for loc in repeat("Prague", 3):
print(loc, end=" ")

```python
for loc in repeat("Prague", 3):
    print(loc, end=" ")
```

```
Prague Prague Prague
```

```python
for year, loc in zip(range(2023, 2026), repeat("Prague")):
        print(f"EP {year} location: {loc}")
```

```python
for year, loc in zip(range(2023, 2026), repeat("Prague")):
        print(f"EP {year} location: {loc}")
```

```
EP 2023 location: Prague
EP 2024 location: Prague
EP 2025 location: Prague
```

```python
locations = chain(
    ["online", "Dublin"],
    repeat("Prague", 3),
)

for year, loc in zip(count(2021), locations):
    print(f"EP {year} location: {loc}")
```


locations = chain(
["online", "Dublin"],
repeat("Prague", 3),
)
for year, loc in zip(count(2021), locations):
print(f"EP {year} location: {loc}")

```python
locations = chain(
    ["online", "Dublin"],
    repeat("Prague", 3),
)

for year, loc in zip(count(2021), locations):
    print(f"EP {year} location: {loc}")
```

```
EP 2021 location: online
EP 2022 location: Dublin
EP 2023 location: Prague
EP 2024 location: Prague
EP 2025 location: Prague
```

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- compress
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- takewhile

Complementary

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Reshaping

- batched
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Combinatorial

- permutations
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Infinite

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tee

filterfalse
(vs filter)

```
people = [("Harry", 17), ("Anne", 21), ("George", 5)]

def is_adult(person): return person[1] >= 18
```

```python
people = [("Harry", 17), ("Anne", 21), ("George", 5)]

def is_adult(person): return person[1] >= 18
```

```python
for name, _ in filter(is_adult, people):
    print(name, end=" ")
```

```python
people = [("Harry", 17), ("Anne", 21), ("George", 5)]

def is_adult(person): return person[1] >= 18
```

```python
for name, _ in filter(is_adult, people):
    print(name, end=" ")
```

```
Anne
```

```python
people = [("Harry", 17), ("Anne", 21), ("George", 5)]

def is_adult(person): return person[1] >= 18
```

```python
for name, _ in filter(is_adult, people):
    print(name, end=" ")
```

```
Anne
```

```python
for name, _ in filterfalse(is_adult, people):
    print(name, end=" ")
```

```python
people = [("Harry", 17), ("Anne", 21), ("George", 5)]

def is_adult(person): return person[1] >= 18
```

```python
for name, _ in filter(is_adult, people):
    print(name, end=" ")
```

```
Anne
```

```python
for name, _ in filterfalse(is_adult, people):
    print(name, end=" ")
```

```
Harry George
```

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zip_longest (vs zip)


names = ["Harry", "Anne", "George"]
ages = [17, 21]

```
names = ["Harry", "Anne", "George"]
ages = [17, 21]
```

```
for name, age in zip(names, ages)
    print(name, age)
```

```
names = ["Harry", "Anne", "George"]
ages = [17, 21]
```

```
for name, age in zip(names, ages)
    print(name, age)
```

```
Harry 17
Anne 21
```

```
names = ["Harry", "Anne", "George"]
ages = [17, 21]
```

```
for name, age in zip(names, ages)
    print(name, age)
```

```
Harry 17
Anne 21
```

```
for name, age in zip_longest(names, ages):
    print(name, age)
```

```
names = ["Harry", "Anne", "George"]
ages = [17, 21]
```

```
for name, age in zip(names, ages)
    print(name, age)
```

```
Harry 17
Anne 21
```

```
for name, age in zip_longest(names, ages):
    print(name, age)
```

```
Harry 17
Anne 21
George None
```

```
for name, age in zip_longest(names, ages, fillvalue=99):
    print(name, age)
```

```
Harry 17
Anne 21
George 99
```

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Maybe next year ;)

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How to write good code?

How to write good code?

Go write bad code!

Rodrigo 🐍🚀

mathspp.com/drops