23. Standart kutubxona: collections va itertools



Python standart kutubxonasida ko'p uchraydigan vazifalar uchun tayyor «asboblar» bor. Ular sikllar va lug'atlar bilan qo'lda yoziladigan kodni bir qatorga qisqartiradi va xatolar ehtimolini kamaytiradi. Bu darsda ikki eng foydali modul — `collections` va `itertools` bilan tanishamiz.

1. Counter — sanash

`Counter` har bir element necha marta uchrashini sanaydi. Natija — lug'atga o'xshash obyekt:

```
from collections import Counter
c = Counter("abrakadabra")
print(c)
print(c["a"], c["z"])
print(c.most_common(2))
```

Natija:

```
Counter({'a': 5, 'b': 2, 'r': 2, 'k': 1, 'd': 1})
5 0
[('a', 5), ('b', 2)]
```

```
from collections import Counter
sozlar = "olma nok olma anor nok olma".split()
c = Counter(sozlar)
```

```
for soz, k in c.most_common():
    print(soz, k)
print(sum(c.values()), len(c))
```

Natija:

```
olma 3
nok 2
anor 1
6 3
```

2. defaultdict — kalit bo'lmasa ham ishlaydi

Oddiy lug'atda yo'q kalitga murojaat KeyError beradi. `defaultdict(list)` yo'q kalit uchun avtomatik bo'sh ro'yxat yaratadi — guruhlash uchun ideal:

```
from collections import defaultdict
guruh = defaultdict(list)
for ism, shahar in [("Ali", "Nukus"), ("Vali", "Xiva"), ("Gani", "Nukus")]:
    guruh[shahar].append(ism)
print(dict(guruh))

sanoq = defaultdict(int)
for harf in "salom":
    sanoq[harf] += 1
print(dict(sanoq))
```

Natija:

```
{'Nukus': ['Ali', 'Gani'], 'Xiva': ['Vali']}
{'s': 1, 'a': 1, 'l': 1, 'o': 1, 'm': 1}
```

3. deque — ikki tomonlama navbat

deque (dek) boshidan ham, oxiridan ham tez qo'shish va olishga mo'ljallangan. Ro'yxatning `pop(0)` amali sekin (O(n)), deque'niki — tez (O(1)):

```
from collections import deque
q = deque([1, 2, 3])
q.append(4)
q.appendleft(0)
print(q)
print(q.popleft(), q.pop(), q)
q.rotate(1)
print(q)
oxirgi3 = deque(maxlen=3)
for x in range(1, 7):
    oxirgi3.append(x)
print(list(oxirgi3))
```

Natija:

```
deque([0, 1, 2, 3, 4])
0 4 deque([1, 2, 3])
```

```
deque([3, 1, 2])
[4, 5, 6]
```

4. namedtuple — nomli kortej

```
from collections import namedtuple
Nuqta = namedtuple("Nuqta", ["x", "y"])
p = Nuqta(3, 4)
print(p, p.x, p[1])
Talaba = namedtuple("Talaba", "ism ball")
guruh = [Talaba("Ali", 78), Talaba("Malika", 95)]
print(max(guruh, key=lambda t: t.ball).ism)
```

Natija:

```
Nuqta(x=3, y=4) 3 4
Malika
```

5. itertools — takrorlash asboblari

Funksiya	Natija	Misol
`count(a, q)`	a dan cheksiz sanash	0, 1, 2, …
`cycle(s)`	s ni cheksiz aylantirish	A B C A B …
`chain(a, b)`	ketma-ketliklarni ulash	[1,2] + [3] → 1 2 3
`product(a, b)`	barcha juftliklar (dekart ko'paytma)	(1,'x'), (1,'y'), …
`permutations(s, k)`	o'rin almashtirishlar	ab, ba
`combinations(s, k)`	takrorsiz tanlovlar (tartib muhim emas)	ab, ac, bc
`accumulate(s)`	jamlanma yig'indilar	1, 3, 6, 10
`groupby(s)`	ketma-ket bir xil elementlarni guruhlash	aaabb → a:3, b:2

```
from itertools import chain, product, permutations, combinations, accumulate
print(list(chain([1, 2], [3], (4, 5))))
print(list(product("ab", [1, 2])))
print(["".join(p) for p in permutations("abc")])
print(list(combinations([1, 2, 3, 4], 2)))
print(list(accumulate([1, 2, 3, 4])))
```

Natija:

```
[1, 2, 3, 4, 5]
[('a', 1), ('a', 2), ('b', 1), ('b', 2)]
['abc', 'acb', 'bac', 'bca', 'cab', 'cba']
[(1, 2), (1, 3), (1, 4), (2, 3), (2, 4), (3, 4)]
[1, 3, 6, 10]
```

```
from itertools import count, cycle, islice, groupby
print(list(islice(count(10, 5), 4)))
print(list(islice(cycle("AB"), 5)))
for harf, guruh in groupby("aaabbbbcc"):
    print(harf, len(list(guruh)))
```

Natija:

```
[10, 15, 20, 25]
['A', 'B', 'A', 'B', 'A']
a 3
b 4
c 2
```

> **Eslatma**
>
> `count` va `cycle` cheksiz — ulardan `islice` yoki `break` bilan kerakli qismini oling, aks holda dastur tugamaydi.

6. Amaliy misol: lotereya va jamoalar

```
from itertools import combinations
from math import comb
print("5 tadan 2 tasini tanlash:", comb(5, 2))
oquvchilar = ["Ali", "Vali", "Gani", "Zarina"]
for juft in combinations(oquvchilar, 2):
    print(*juft)
```

Natija:

```
5 tadan 2 tasini tanlash: 10
Ali Vali
Ali Gani
Ali Zarina
Vali Gani
Vali Zarina
Gani Zarina
```

7. Xulosa

- Counter — sanash va `most_common`; defaultdict — guruhlash va sanash KeyError'siz.
- deque — ikki tomondan tez navbat, `maxlen` bilan oxirgi n ta element.
- namedtuple — maydonlari nomli yengil kortej.
- itertools: chain, product, permutations, combinations, accumulate, groupby, count/cycle + islice.