Python Collections – Part 3 (Advanced Collections Module)

# namedtuple

A namedtuple is an immutable, lightweight object similar to a tuple but with named fields.  
Example:  
```python  
from collections import namedtuple  
  
Employee = namedtuple('Employee', ['id', 'name', 'department'])  
emp1 = Employee(101, 'Gopi', 'IT')  
print(emp1.name)  
print(emp1.\_asdict())  
```

# deque

Deque (Double-Ended Queue) allows fast appends and pops from both ends.  
Example:  
```python  
from collections import deque  
  
dq = deque([1, 2, 3])  
dq.append(4)  
dq.appendleft(0)  
print(dq)  
dq.pop()  
dq.popleft()  
dq.rotate(2)  
print(dq)  
```

# Counter

Counter is a subclass of dict for counting hashable objects.  
Example:  
```python  
from collections import Counter  
  
fruits = ['apple', 'banana', 'apple', 'orange']  
count = Counter(fruits)  
print(count)  
print(count.most\_common(1))  
count.update({'banana':1, 'pear':2})  
print(count)  
```

# defaultdict

Defaultdict provides a default value for missing keys.  
Example:  
```python  
from collections import defaultdict  
  
inventory = defaultdict(int)  
inventory['apple'] += 5  
inventory['banana'] += 3  
  
grouped = defaultdict(list)  
data = [('A', 1), ('B', 2), ('A', 3)]  
for k, v in data:  
 grouped[k].append(v)  
print(grouped)  
```

# OrderedDict

OrderedDict preserves insertion order and allows key reordering.  
Example:  
```python  
from collections import OrderedDict  
  
od = OrderedDict()  
od['a'] = 10  
od['b'] = 20  
od['c'] = 30  
print(od)  
od.move\_to\_end('a')  
od.move\_to\_end('b', last=False)  
print(od)  
```

# ChainMap

ChainMap logically groups multiple dictionaries.  
Example:  
```python  
from collections import ChainMap  
  
defaults = {'theme': 'light', 'language': 'English'}  
user = {'theme': 'dark'}  
  
settings = ChainMap(user, defaults)  
print(settings['theme'])  
print(settings['language'])  
admin = {'access': 'admin'}  
combined = settings.new\_child(admin)  
print(combined)  
```

# Summary Table

| Class | Description | Mutable | Use Case |  
|--------|--------------|----------|-----------|  
| namedtuple | Tuple with named fields | ❌ | Structured immutable data |  
| deque | Double-ended queue | ✅ | Queue/stack operations |  
| Counter | Count occurrences | ✅ | Frequency analysis |  
| defaultdict | Auto-initialized dict | ✅ | Grouping and aggregation |  
| OrderedDict | Dict preserving order | ✅ | Ordered configurations, caches |  
| ChainMap | Combine multiple dicts | ✅ | Context layering, settings merge |