Исходный код

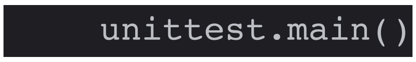
Файл main.py

```python
from operator import itemgetter
from typing import List, Tuple, Dict


class Conductor:
    """Дирижер"""

    def __init__(self, id, name, salary):
        self.id = id
        self.name = name
        self.salary = salary


class Orchestra:
    """Оркестр"""

    def __init__(self, id, name, conductor_id):
        self.id = id
        self.name = name
        self.conductor_id = conductor_id


class ConductorOrchestra:
    """
    'Дирижеры оркестра' для реализации связи многие-ко-многим
    """

    def __init__(self, conductor_id, orchestra_id):
        self.conductor_id = conductor_id
        self.orchestra_id = orchestra_id


def join_data(one: List[Conductor], many: List[Orchestra]) -> 
List[Tuple[str, int, str]]:
    """Соединение данных один-ко-многим"""
    return [(c.name, c.salary, o.name) for o in many for c in 
one if o.conductor_id == c.id]


def calculate_total_salary(orchestra: Orchestra, conductors: 
List[Conductor], conductor_orchestras: 
List[ConductorOrchestra]) -> Tuple[str, int]:
    """Вычисление общей зарплаты для оркестра"""
    conductor_ids = [co.conductor_id for co in 
conductor_orchestras if co.orchestra_id == orchestra.id]
    total_salary = sum([c.salary for c in conductors if c.id 
in conductor_ids])
    return orchestra.name, total_salary


def find_conductors_for_symphony(orchestras: List[Orchestra], 
conductors: List[Conductor], conductor_orchestras: 
List[ConductorOrchestra]) -> Dict[str, List[str]]:
    """Поиск дирижеров для Symphony Orchestra"""
    res_A3 = {}
    for orchestra in orchestras:
        if 'Symphony' in orchestra.name:
            conductor_ids = [co.conductor_id for co in
conductor_orchestras if co.orchestra_id == orchestra.id]
            conductor_names = [c.name for c in conductors
if c.id in conductor_ids]
            res_A3[orchestra.name] = conductor_names
    return res_A3


if __name__ == '__main__':
    conductors = [
        Conductor(1, 'John Smith', 5000),
        Conductor(2, 'Emily Johnson', 6000),
        Conductor(3, 'Michael Davis', 5500)
    ]

    orchestras = [
        Orchestra(1, 'Symphony Orchestra', 1),
        Orchestra(2, 'Chamber Orchestra', 2),
        Orchestra(3, 'Philharmonic Orchestra', 3)
    ]

    conductor_orchestras = [
        ConductorOrchestra(1, 1),
        ConductorOrchestra(2, 2),
        ConductorOrchestra(3, 3),
        ConductorOrchestra(1, 2),
        ConductorOrchestra(2, 1),
        ConductorOrchestra(3, 2),
    ]

    # Задание A1
    res_A1 = join_data(conductors, orchestras)
    print('Задание A1')
    print(sorted(res_A1, key=itemgetter(2)))

    # Задание A2
    res_A2_unsorted = [calculate_total_salary(orchestra, conductors, conductor_orchestras) for orchestra in orchestras]
    res_A2 = sorted(res_A2_unsorted, key=itemgetter(1), reverse=True)  # Сортировка по убыванию суммарной зарплаты
    print('\nЗадание A2')
    print(res_A2)

    # Задание A3
    res_A3 = find_conductors_for_symphony(orchestras, conductors, conductor_orchestras)
    print('\nЗадание A3')
    print(res_A3)
```

Файл tests.py

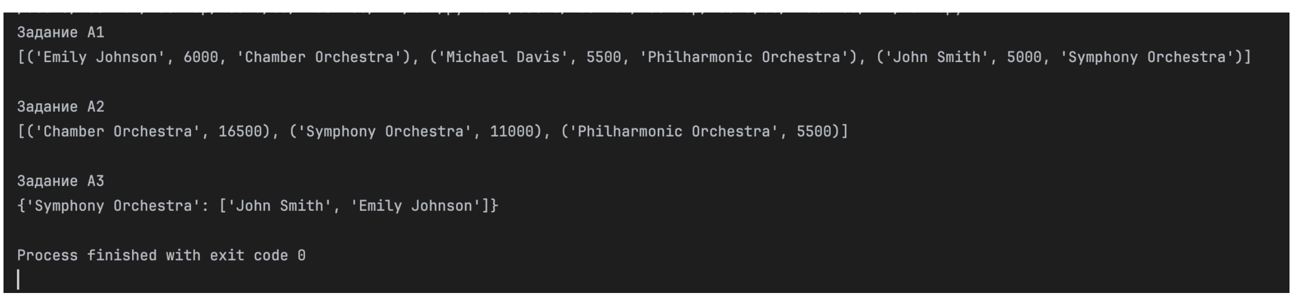
```
import unittest
from main import *


class TestOrchestraProgram(unittest.TestCase):
    def setUp(self):
        self.conductors = [
            Conductor(1, 'John Smith', 5000),
            Conductor(2, 'Emily Johnson', 6000),
            Conductor(3, 'Michael Davis', 5500)
        ]

        self.orchestras = [
            Orchestra(1, 'Symphony Orchestra', 1),
            Orchestra(2, 'Chamber Orchestra', 2),
            Orchestra(3, 'Philharmonic Orchestra', 3)
        ]

        self.conductor_orchestras = [
            ConductorOrchestra(1, 1),
            ConductorOrchestra(2, 2),
            ConductorOrchestra(3, 3),
            ConductorOrchestra(1, 2),
            ConductorOrchestra(2, 1),
            ConductorOrchestra(3, 2),
        ]
```

```python
    def test_join_data(self):
        result = join_data(self.conductors, self.orchestras)
        expected_result = [
            ('John Smith', 5000, 'Symphony Orchestra'),
            ('Emily Johnson', 6000, 'Chamber Orchestra'),
            ('Michael Davis', 5500, 'Philharmonic
Orchestra')
        ]
        self.assertEqual(result, expected_result)

    def test_calculate_total_salary(self):
        orchestra = self.orchestras[0]  # Symphony Orchestra
        result = calculate_total_salary(orchestra,
self.conductors, self.conductor_orchestras)
        expected_result = ('Symphony Orchestra', 11000)
        self.assertEqual(result, expected_result)

    def test_find_conductors_for_symphony(self):
        result =
find_conductors_for_symphony(self.orchestras,
self.conductors, self.conductor_orchestras)
        expected_result = {'Symphony Orchestra': ['John
Smith', 'Emily Johnson']}
        self.assertEqual(result, expected_result)


if __name__ == '__main__':
```



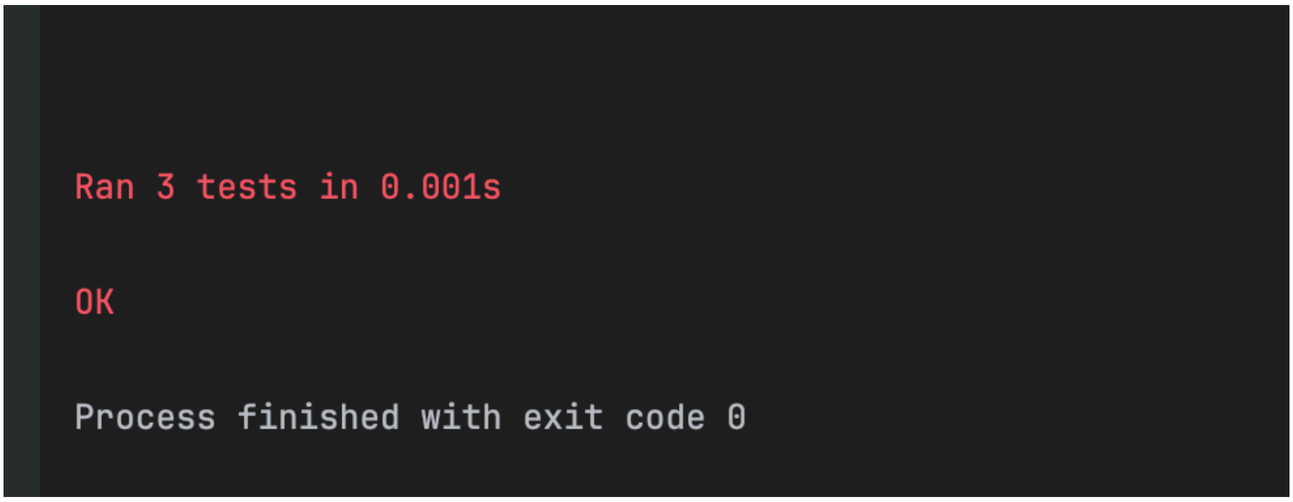
```
    unittest.main()
```

main.py - вывод



```
Задание А1
[('Emily Johnson', 6000, 'Chamber Orchestra'), ('Michael Davis', 5500, 'Philharmonic Orchestra'), ('John Smith', 5000, 'Symphony Orchestra')]

Задание А2
[('Chamber Orchestra', 16500), ('Symphony Orchestra', 11000), ('Philharmonic Orchestra', 5500)]

Задание А3
{'Symphony Orchestra': ['John Smith', 'Emily Johnson']}

Process finished with exit code 0
```

tests.py - результат



```
Ran 3 tests in 0.001s

OK

Process finished with exit code 0
```