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**Рубежный контроль №1**

**Текст программы:**

class Language:  
 *''' язык программирования '''* def \_\_init\_\_(self, id, name):  
 self.id = id  
 self.name = name  
  
class Library:  
 *''' библиотека языка программирования '''* def \_\_init\_\_(self, id, name, func\_num, lang\_id):  
 *''' func\_num - количество функций в библиотеке'''* self.id = id  
 self.name = name  
 self.func\_num = func\_num  
 self.lang\_id = lang\_id  
  
class Link:  
 *''' связь библиотеки с языком '''* def \_\_init\_\_(self, lib\_id, lang\_id):  
 self.lib\_id = lib\_id  
 self.lang\_id = lang\_id  
  
langs = [  
 Language(1, "Python"),  
 Language(2, "C++"),  
 Language(3, "Pascal"),  
  
 Language(10, "Python v0"),  
 Language(20, "C++ v0"),  
 Language(30, "Pascal v0"),  
]  
  
libs = [  
 Library(11, "random", 30, 1),  
 Library(12, "math", 50, 1),  
 Library(21, "vector", 40, 2),  
 Library(22, "algorithm", 20, 2),  
 Library(31, "Graph", 10, 3)  
]  
  
links = [  
 Link(11, 1),  
 Link(12, 1),  
 Link(21, 2),  
 Link(22, 2),  
 Link(31, 3),  
  
 Link(11, 10),  
 Link(12, 10),  
 Link(21, 20),  
 Link(22, 20),  
 Link(31, 30)  
]  
  
def main():  
 *''' связь один-ко-многим'''* one\_to\_many = [(lib.name, lib.func\_num, lang.name)  
 for lib in libs  
 for lang in langs  
 if lib.lang\_id == lang.id]  
  
 many\_to\_many\_temp = [(lang.name, link.lang\_id, link.lib\_id)  
 for lang in langs  
 for link in links  
 if lang.id == link.lang\_id]  
  
 ''' связь много-ко-многим'''  
 many\_to\_many = [(lib.name, lib.func\_num, lang\_name)  
 for lang\_name, lang\_id, lib\_id in many\_to\_many\_temp  
 for lib in libs if lib.id == lib\_id]  
  
 print('\nЗадание 1')  
 ans\_1 = {}  
 for lib\_name, x, lang\_name in one\_to\_many:  
 ''' если название языка начинается с "P" '''  
 if lang\_name[0] == 'P':  
 if lang\_name in ans\_1:  
 ans\_1[lang\_name].append(lib\_name)  
 else:  
 ans\_1[lang\_name] = [lib\_name]  
 print(\*ans\_1.items())  
  
 print('\nЗадание 2')  
 ans\_2 = {}  
 for x, func\_num, lang\_name in one\_to\_many:  
 if lang\_name in ans\_2:  
 ans\_2[lang\_name] = max(ans\_2[lang\_name], func\_num)  
 else:  
 ans\_2[lang\_name] = func\_num  
 ans\_2 = {key : value for key, value in sorted(ans\_2.items(), key = lambda item: item[1])}  
 print(\*ans\_2.items())  
  
 print('\nЗадание 3')  
 ans\_3 = []  
 for lib\_name, x, lang\_name in many\_to\_many:  
 ans\_3.append((lang\_name, lib\_name))  
 ans\_3 = sorted(ans\_3, key = lambda item: item[0])  
 print(\*ans\_3)  
  
if \_\_name\_\_ == '\_\_main\_\_':  
 main()

**Результаты выполнения программы:**

Задание 1

('Python', ['random', 'math']) ('Pascal', ['Graph'])

Задание 2

('Pascal', 10) ('C++', 40) ('Python', 50)

Задание 3

('C++', 'vector') ('C++', 'algorithm') ('C++ v0', 'vector') ('C++ v0', 'algorithm') ('Pascal', 'Graph') ('Pascal v0', 'Graph') ('Python', 'random') ('Python', 'math') ('Python v0', 'random') ('Python v0', 'math')