ΤΕΧΝΟΛΟΓΙΕΣ ΓΝΩΣΕΩΝ ΕΡΓΑΣΙΑ 1

ΜΑΛΩΝΑΣ ΚΩΝΣΤΑΝΤΙΝΟΣ
ID: 7115112200020
EMAIL: cs22200020@di.uoa.gr

Exercise 1

1.1) Find all Greek wines known by DBpedia and the region of Greece where they are produced

Query

Answer (sample)

1.2)Find all the Greek universities known to DBpedia. Output their name, the city that they are located and the number of prime ministers of Greece that have graduated from them (order answers by this number).

Query

Answer (sample)

Exercise 2

2.1) Give the official name and population of each municipality (δήμος) of Greece.

Query

Answer (sample)

2.2) For each region (περιφέρεια) of Greece, give its official name, the official name of each regional unit (περιφερειακή ενότητα) that belongs to it, and the official name of each municipality (δήμος) in this regional unit. Organize your answer by region, regional unit and municipality.

Query

Answer (sample)

2.3) For each municipality of the region Peloponnese with population more than 5,000 people, give its official name, its population, and the regional unit it belongs to. Organize your answer by municipality and regional unit.

Query

Answer

2.4) For each municipality of Peloponnese for which we have no seat (έδρα) information in the dataset, give its official name.

Query

Answer (sample)

2.5) For each municipality of Peloponnese, give its official name and all the administrative divisions of Greece that it belongs to according to Kallikratis. Your query should be the simplest one possible, and it should not use any explicit knowledge of how many levels of administration are imposed by Kallikratis.

Query

Answer (sample)

2.6) For each region of Greece, give its official name, how many municipalities belong to it, the official name of each regional unit (περιφερειακή ενότητα) that belongs to it, and how many municipalities belong to that regional unit.

Query

Answer (sample)

2.7) Check the consistency of the dataset regarding stated populations: the sum of the populations of all administrative units A of level L must be equal to the population of the administrative unit B of level L+1 to which all administrative units A belong to. (You have to write one query only.)

Query

Answer (sample)

Exercise 1

1.1) Find all Greek wines known by DBpedia and the region of Greece where they are produced

Query

```
PREFIX : <http://dbpedia.org/resource/>
PREFIX dbpedia2: <http://dbpedia.org/property/>
PREFIX dbpedia: <http://dbpedia.org/>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX foaf: <http://xmlns.com/foaf/0.1/>

SELECT ?w_n AS ?Wine  ?reg AS ?Region
WHERE
{
  #Filtering (removing unwanted links)
        {    {    {    {    {    {    {    {    ?link    dbo:wikiPageWikiLink
<http://dbpedia.org/resource/Category:Grape_varieties_of_Greece>            .
FILTER(?link != <http://dbpedia.org/resource/Zante_currant>) }
  . FILTER(?link != <http://dbpedia.org/resource/Grechetto>) } . FILTER(?link
!=       <http://dbpedia.org/resource/Muscat_Blanc_à_Petits_Grains>)        }
.FILTER(?link   !=   <http://dbpedia.org/resource/Moschato_(grape)>)   }   }   .
FILTER(?link    !=    <http://dbpedia.org/resource/Santorini_(wine)>)    }    .
FILTER(?link    !=    <http://dbpedia.org/resource/Muscat_(grape)>)    }    .
FILTER(?link != <http://dbpedia.org/resource/Ribolla_Gialla>) }

# Get the values
{?link dbp:name ?w_n . ?link dbo:wineRegion ?r . ?r dbo:country dbr:Greece .
?r dbp:name ?reg  }
UNION
{?link   rdfs:label   ?w_n   .   FILTER(?w_n   =   "Robola"@en)   .   ?link
dbo:wikiPageWikiLink ?ce   . FILTER(?ce = dbc:Cephalonia) . ?ce rdfs:label
?reg }
UNION
{?link foaf:isPrimaryTopicOf wikipedia-en:Romeiko . ?link rdfs:label ?w_n .
FILTER(?w_n = "Romeiko"@en) . ?link dbo:wikiPageWikiLink ?cy . FILTER(?cy =
dbr:Cyclades) .
?cy foaf:name ?reg}
UNION
{?link foaf:isPrimaryTopicOf wikipedia-en:Romeiko . ?link rdfs:label ?w_n .
FILTER(?w_n = "Romeiko"@en) . ?link dbo:wikiPageWikiLink ?cha . FILTER(?cha =
dbr:Chania) .
?cha dbp:centre ?reg}
UNION
{?link foaf:isPrimaryTopicOf wikipedia-en:Romeiko . ?link rdfs:label ?w_n .
FILTER(?w_n = "Romeiko"@en) . ?link dbo:wikiPageWikiLink ?kis . FILTER(?kis =
dbr:Kissamos) .
?kis dbp:captionSkyline ?reg}
UNION
```

```
{?link foaf:name ?w_n. FILTER regex(?w_n, "^Kotsifali") . ?link dbo:wikiPageWikiLink ?cy . FILTER(?cy = dbr:Cyclades) . ?cy dbp:name ?reg}
UNION
{?link foaf:name ?w_n. FILTER regex(?w_n, "^Kotsifali") . ?link dbo:wikiPageWikiLink ?cre . FILTER(?cre = dbr:Crete) . ?cre dbp:name ?reg . FILTER (?reg ="Crete"@en)}
UNION
{?link rdfs:label ?w_n . FILTER(?w_n = "Liatiko"@en) . ?link dbo:wikiPageWikiLink ?cre . FILTER(?cre = dbr:Cretan_wine) . ?cre dbo:wikiPageWikiLink ?cre_re . FILTER(?cre_re = dbr:Crete) . ?cre_re dbp:title ?reg}
UNION
{?link rdfs:label ?w_n . FILTER(?w_n = "Savatiano"@en) . ?link dbo:wikiPageWikiLink ?att . FILTER(?att = dbc:Attica) . ?att rdfs:label ?reg}
UNION
{?link rdfs:label ?w_n . FILTER(?w_n = "Savatiano"@en) . ?link dbo:wikiPageWikiLink ?euv . FILTER(?euv = dbr:Euboea) . ?euv dbp:name ?reg}
UNION
{?link rdfs:label ?w_n . FILTER(?w_n = "Rhoditis"@en) . ?link dbo:wikiPageWikiLink ?thes . FILTER(?thes = dbr:Thessaly) . ?thes dbp:name ?reg}
UNION
{?link rdfs:label ?w_n . FILTER(?w_n = "Rhoditis"@en) . ?link dbo:wikiPageWikiLink ?pel . FILTER(?pel = dbr:Peloponnese) . ?pel dbp:name ?reg}
UNION
{?link rdfs:label ?w_n . FILTER(?w_n = "Malvasia"@en) . ?link dbo:wikiPageWikiLink ?mon . FILTER(?mon = dbr:Monemvasia) . ?mon dbp:name ?reg}
UNION
{?link rdfs:label ?w_n . FILTER(?w_n = "Vilana"@en) . ?link dbo:wikiPageWikiLink ?cre . FILTER(?cre = dbr:Crete) . ?cre dbp:name ?reg . FILTER (?reg ="Crete"@en)}
UNION
{?link rdfs:label ?w_n . FILTER(?w_n = "Limnio"@en) . ?link dbo:wikiPageWikiLink ?lim . FILTER(?lim = dbr:Lemnos) . ?lim dbp:name ?reg}
UNION
{?link rdfs:label ?w_n . FILTER(?w_n = "Moschofilero"@en) . ?link dbo:wikiPageWikiLink ?pel . FILTER(?pel = dbr:Peloponnese) . ?pel dbp:name ?reg}
UNION
{?link rdfs:label ?w_n . FILTER(?w_n = "Thrapsathiri"@en) . ?link dbo:wikiPageWikiLink ?cre . FILTER(?cre = dbr:Crete) . ?cre dbp:name ?reg . FILTER (?reg ="Crete"@en)}
UNION
{?link rdfs:label ?w_n . FILTER(?w_n = "Thrapsathiri"@en) . ?link dbo:wikiPageWikiLink ?cy . FILTER(?cy = dbr:Cyclades) . ?cy dbp:name ?reg}
UNION
{?link rdfs:label ?w_n . FILTER(?w_n = "Malagousia"@en || ?w_n = "Agiorgitiko"@en) . ?link dbo:wikiPageWikiLink ?mal . FILTER(?mal = dbr:Nafpaktia || ?mal =dbr:Peloponnese || ?mal = dbr:Attica || ?mal = dbr:Nemea) . ?mal dbp:name ?reg}
UNION
```

```
{?link rdfs:label ?w_n . FILTER(?w_n = "Assyrtiko"@en) . ?link dbo:wikiPageWikiLink ?san . FILTER(?san = dbc:Santorini) . ?san rdfs:label ?reg} # The same doesn't work for Aidini
UNION
{?link rdfs:label ?w_n . FILTER(?w_n = "Aidini"@en || ?w_n = "Athiri"@en) . ?link dbo:wikiPageWikiLink ?san . FILTER(?san = dbr:Santorini_\(wine\) || ?san = dbr:Rhodes) . ?san dbp:name ?reg}
UNION
{?link rdfs:label ?w_n . FILTER(?w_n = "Lagorthi"@en) . ?link dbo:wikiPageWikiLink ?pl . FILTER(?pl = dbr:Ionian_Islands || ?pl = dbr:Peloponnese) . ?pl rdfs:label ?reg . FILTER(?reg = "Peloponnese"@en || ?reg = "Ionian Islands"@en)}
UNION
{?link rdfs:label ?w_n . FILTER(?w_n = "Negoska"@en ) . ?link dbo:wikiPageWikiLink ?ng . FILTER(?ng = dbr:Goumenissa) . ?ng rdfs:label ?reg . FILTER(?reg = "Goumenissa"@en)}
UNION
{?link rdfs:label ?w_n . FILTER(?w_n = "Mandilaria"@en)} # Doesn't have info for the origin, except only in the abstract text
UNION
{?link rdfs:label ?w_n . FILTER(?w_n = "Mavrodafni"@en || ?w_n = "Vidiano"@en ) . ?link dbo:wikiPageWikiLink ?ng . FILTER(?ng = dbr:Achaea || ?ng = dbr:Crete) . ?ng rdfs:label ?reg . FILTER(?reg = "Achaea"@en || ?reg = "Crete"@en)}
} GROUP BY ?w_n
```

Answer (sample)

SPARQL | HTML5 table

Wine	Region
"Xinomavro"@en	"Amyntaio"@en
"Xinomavro"@en	"Goumenissa"@en
"Rhoditis"@en	"Peloponnese"@en
"Moschofilero"@en	"Peloponnese"@en
"Savatiano"@en	"Attica"@en
"Thrapsathiri"@en	"Crete"@en
"Negoska"@en	"Goumenissa"@en
"Mandilaria"@en	
"Vilana"@en	"Crete"@en
"Romeiko"@en	"Chania"@en
"Rhoditis"@en	"Thessaly"@en
"Xinomavro"@en	"Naousa"@en
"Kotsifali"@en	"Crete"@en
"Kotsifali"@en	"Cyclades"@en
"Agiorgitiko"@en	"Peloponnese"@en

1.2)Find all the Greek universities known to DBpedia. Output their name, the city that they are located and the number of prime ministers of Greece that have graduated from them (order answers by this number).

Query

```
PREFIX : <http://dbpedia.org/resource/>
PREFIX dbpedia2: <http://dbpedia.org/property/>
PREFIX dbpedia: <http://dbpedia.org/>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX foaf: <http://xmlns.com/foaf/0.1/>

SELECT ?name AS ?University  COUNT(?persons) AS ?Prime_Ministers WHERE
{
{?list dbo:type <http://dbpedia.org/resource/List_of_universities_in_Greece>
.  # Take list of uni's
?list rdfs:label ?name .
```

```
?persons dbo:almaMater ?list .
?persons dbp:order dbr:Prime_Minister_of_Greece  .
FILTER(langMatches(lang(?name), "en"))}  # Take value of dbp:order
UNION
{?list dbo:type <http://dbpedia.org/resource/List_of_universities_in_Greece>
.
?list rdfs:label ?name .
?persons dbo:almaMater ?list .
?persons dbp:office dbr:Prime_Minister_of_Greece .
FILTER(langMatches(lang(?name), "en")) }  # Take value of dbp:office

UNION
{?list dbo:type <http://dbpedia.org/resource/List_of_universities_in_Greece>
.
?list rdfs:label ?name . FILTER(langMatches(lang(?name), "en"))}
}GROUP BY ?name ORDER BY DESC(COUNT(?persons))
```

Answer (sample)

SPARQL | HTML5 table

University	Prime_Ministers
"National and Kapodistrian University of Athens"@en	11
"Panteion University"@en	1
"International Hellenic University"@en	0
"School of Pedagogical and Technological Education"@en	0
"University of Central Greece"@en	0
"University of Western Greece"@en	0
"University of Western Macedonia"@en	0
"Agricultural University of Athens"@en	0

Exercise 2

2.1) Give the official name and population of each municipality (δήμος) of Greece.

Query

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX strdf: <http://strdf.di.uoa.gr/ontology#>
PREFIX gag: <http://geo.linkedopendata.gr/gag/ontology/>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
SELECT ?municipalityName ?population
WHERE
```

```
{?m rdf:type gag:Δήμος .
?m gag:έχει_επίσημο_όνομα ?municipalityName .
?m gag:έχει_πληθυσμό ?population\n
}
```

Answer (sample)


```
[municipalityName="ΔΗΜΟΣ ΣΙΦΝΟΥ";population="2442"^^<http://www.w3.org/2001/XMLSchema#integer>]
[municipalityName="ΔΗΜΟΣ ΠΑΛΑΜΑ";population="19144"^^<http://www.w3.org/2001/XMLSchema#integer>]
[municipalityName="ΔΗΜΟΣ ΛΕΡΟΥ";population="8207"^^<http://www.w3.org/2001/XMLSchema#integer>]
[municipalityName="ΔΗΜΟΣ ΝΕΣΤΟΥ";population="23486"^^<http://www.w3.org/2001/XMLSchema#integer>]
[municipalityName="ΔΗΜΟΣ ΑΣΤΥΠΑΛΑΙΑΣ";population="1238"^^<http://www.w3.org/2001/XMLSchema#integer>]
[municipalityName="ΔΗΜΟΣ ΠΛΑΤΑΝΙΑ";population="18622"^^<http://www.w3.org/2001/XMLSchema#integer>]
[municipalityName="ΔΗΜΟΣ ΑΛΙΜΟΥ";population="38047"^^<http://www.w3.org/2001/XMLSchema#integer>]
[municipalityName="ΔΗΜΟΣ ΑΜΦΙΛΟΧΙΑΣ";population="21445"^^<http://www.w3.org/2001/XMLSchema#integer>]
[municipalityName="ΔΗΜΟΣ ΧΑΛΚΙΔΕΩΝ";population="92202"^^<http://www.w3.org/2001/XMLSchema#integer>]
[municipalityName="ΔΗΜΟΣ ΤΗΛΟΥ";population="1139"^^<http://www.w3.org/2001/XMLSchema#integer>]
[municipalityName="ΔΗΜΟΣ ΝΕΑΣ ΖΙΧΝΗΣ";population="13579"^^<http://www.w3.org/2001/XMLSchema#integer>]
[municipalityName="ΔΗΜΟΣ ΝΑΥΠΑΚΤΙΑΣ";population="29842"^^<http://www.w3.org/2001/XMLSchema#integer>]
[municipalityName="ΔΗΜΟΣ ΔΡΑΜΑΣ";population="56062"^^<http://www.w3.org/2001/XMLSchema#integer>]
[municipalityName="ΔΗΜΟΣ ΠΟΛΥΓΥΡΟΥ";population="22189"^^<http://www.w3.org/2001/XMLSchema#integer>]
[municipalityName="ΔΗΜΟΣ ΕΟΡΔΑΙΑΣ";population="44497"^^<http://www.w3.org/2001/XMLSchema#integer>]
[municipalityName="ΔΗΜΟΣ ΜΥΚΗΣ";population="15724"^^<http://www.w3.org/2001/XMLSchema#integer>]
[municipalityName="ΔΗΜΟΣ ΛΗΜΝΟΥ";population="18104"^^<http://www.w3.org/2001/XMLSchema#integer>]
[municipalityName="ΔΗΜΟΣ ΛΕΙΨΩΝ";population="698"^^<http://www.w3.org/2001/XMLSchema#integer>]
[municipalityName="ΔΗΜΟΣ ΠΗΝΕΙΟΥ";population="20232"^^<http://www.w3.org/2001/XMLSchema#integer>]
[municipalityName="ΔΗΜΟΣ ΠΥΛΑΙΑΣ-ΧΟΡΤΙΑΤΗ";population="46904"^^<http://www.w3.org/2001/XMLSchema#integer>]
[municipalityName="ΔΗΜΟΣ ΜΑΡΚΟΠΟΥΛΟΥ ΜΕΣΟΓΑΙΑΣ";population="15608"^^<http://www.w3.org/2001/XMLSchema#integer>]
[municipalityName="ΔΗΜΟΣ ΤΡΙΠΟΛΗΣ";population="23665"^^<http://www.w3.org/2001/XMLSchema#integer>]
```


2.2) For each region (περιφέρεια) of Greece, give its official name, the official name of each regional unit (περιφερειακή ενότητα) that belongs to it, and the official name of each municipality (δήμος) in this regional unit. Organize your answer by region, regional unit and municipality.

Query

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX strdf: <http://strdf.di.uoa.gr/ontology#>
PREFIX gag: <http://geo.linkedopendata.gr/gag/ontology/>
PREFIX owl: <http://www.w3.org/2002/07/owl#>

SELECT ?region ?regional_unit ?municipality
WHERE
{
?m rdf:type gag:Δήμος .
?m gag:έχει_επίσημο_όνομα ?municipality .
?m gag:ανήκει_σε ?reg_un .
?reg_un gag:έχει_επίσημο_όνομα ?regional_unit .
?reg_un gag:ανήκει_σε ?reg .
?reg gag:έχει_επίσημο_όνομα ?region .
}
```

Answer (sample)


```
[region="ΠΕΡΙΦΕΡΕΙΑ ΝΟΤΙΟΥ ΑΙΓΑΙΟΥ";municipality="ΔΗΜΟΣ ΣΙΦΝΟΥ";regional_unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΜΗΛΟΥ"]
[region="ΠΕΡΙΦΕΡΕΙΑ ΘΕΣΣΑΛΙΑΣ";municipality="ΔΗΜΟΣ ΠΑΛΑΜΑ";regional_unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΚΑΡΔΙΤΣΑΣ"]
[region="ΠΕΡΙΦΕΡΕΙΑ ΝΟΤΙΟΥ ΑΙΓΑΙΟΥ";municipality="ΔΗΜΟΣ ΛΕΡΟΥ";regional_unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΚΑΛΥΜΝΟΥ"]
[region="ΠΕΡΙΦΕΡΕΙΑ ΑΝ. ΜΑΚΕΔΟΝΙΑΣ ΘΡΑΚΗΣ";municipality="ΔΗΜΟΣ ΝΕΣΤΟΥ";regional_unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΚΑΒΑΛΑΣ"]
[region="ΠΕΡΙΦΕΡΕΙΑ ΝΟΤΙΟΥ ΑΙΓΑΙΟΥ";municipality="ΔΗΜΟΣ ΑΣΤΥΠΑΛΑΙΑΣ";regional_unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΚΑΛΥΜΝΟΥ"]
[region="ΠΕΡΙΦΕΡΕΙΑ ΚΡΗΤΗΣ";municipality="ΔΗΜΟΣ ΠΛΑΤΑΝΙΑ";regional_unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΧΑΝΙΩΝ"]
[region="ΠΕΡΙΦΕΡΕΙΑ ΑΤΤΙΚΗΣ";municipality="ΔΗΜΟΣ ΑΛΙΜΟΥ";regional_unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΝΟΤΙΟΥ ΤΟΜΕΑ ΑΘΗΝΩΝ"]
[region="ΠΕΡΙΦΕΡΕΙΑ ΔΥΤΙΚΗΣ ΕΛΛΑΔΑΣ";municipality="ΔΗΜΟΣ ΑΜΦΙΛΟΧΙΑΣ";regional_unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΑΙΤΩΛΟΑΚΑΡΝΑΝΙΑΣ"]
[region="ΠΕΡΙΦΕΡΕΙΑ ΣΤΕΡΕΑΣ ΕΛΛΑΔΑΣ";municipality="ΔΗΜΟΣ ΧΑΛΚΙΔΕΩΝ";regional_unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΕΥΒΟΙΑΣ"]
[region="ΠΕΡΙΦΕΡΕΙΑ ΝΟΤΙΟΥ ΑΙΓΑΙΟΥ";municipality="ΔΗΜΟΣ ΤΗΛΟΥ";regional_unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΡΟΔΟΥ"]
[region="ΠΕΡΙΦΕΡΕΙΑ ΚΕΝΤΡΙΚΗΣ ΜΑΚΕΔΟΝΙΑΣ";municipality="ΔΗΜΟΣ ΝΕΑΣ ΖΙΧΝΗΣ";regional_unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΣΕΡΡΩΝ"]
[region="ΠΕΡΙΦΕΡΕΙΑ ΔΥΤΙΚΗΣ ΕΛΛΑΔΑΣ";municipality="ΔΗΜΟΣ ΝΑΥΠΑΚΤΙΑΣ";regional_unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΑΙΤΩΛΟΑΚΑΡΝΑΝΙΑΣ"]
[region="ΠΕΡΙΦΕΡΕΙΑ ΑΝ. ΜΑΚΕΔΟΝΙΑΣ ΘΡΑΚΗΣ";municipality="ΔΗΜΟΣ ΔΡΑΜΑΣ";regional_unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΔΡΑΜΑΣ"]
[region="ΠΕΡΙΦΕΡΕΙΑ ΚΕΝΤΡΙΚΗΣ ΜΑΚΕΔΟΝΙΑΣ";municipality="ΔΗΜΟΣ ΠΟΛΥΓΥΡΟΥ";regional_unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΧΑΛΚΙΔΙΚΗΣ"]
[region="ΠΕΡΙΦΕΡΕΙΑ ΔΥΤΙΚΗΣ ΜΑΚΕΔΟΝΙΑΣ";municipality="ΔΗΜΟΣ ΕΟΡΔΑΙΑΣ";regional_unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΚΟΖΑΝΗΣ"]
[region="ΠΕΡΙΦΕΡΕΙΑ ΑΝ. ΜΑΚΕΔΟΝΙΑΣ ΘΡΑΚΗΣ";municipality="ΔΗΜΟΣ ΜΥΚΗΣ";regional_unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΞΑΝΘΗΣ"]
[region="ΠΕΡΙΦΕΡΕΙΑ ΒΟΡΕΙΟΥ ΑΙΓΑΙΟΥ";municipality="ΔΗΜΟΣ ΛΗΜΝΟΥ";regional_unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΛΗΜΝΟΥ"]
[region="ΠΕΡΙΦΕΡΕΙΑ ΝΟΤΙΟΥ ΑΙΓΑΙΟΥ";municipality="ΔΗΜΟΣ ΛΕΙΨΩΝ";regional_unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΚΑΛΥΜΝΟΥ"]
[region="ΠΕΡΙΦΕΡΕΙΑ ΔΥΤΙΚΗΣ ΕΛΛΑΔΑΣ";municipality="ΔΗΜΟΣ ΠΗΝΕΙΟΥ";regional_unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΗΛΕΙΑΣ"]
[region="ΠΕΡΙΦΕΡΕΙΑ ΚΕΝΤΡΙΚΗΣ ΜΑΚΕΔΟΝΙΑΣ";municipality="ΔΗΜΟΣ ΠΥΛΑΙΑΣ-ΧΟΡΤΙΑΤΗ";regional_unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΘΕΣΣΑΛΟΝΙΚΗΣ"]
[region="ΠΕΡΙΦΕΡΕΙΑ ΑΤΤΙΚΗΣ";municipality="ΔΗΜΟΣ ΜΑΡΚΟΠΟΥΛΟΥ ΜΕΣΟΓΑΙΑΣ";regional_unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΑΝΑΤΟΛΙΚΗΣ ΑΤΤΙΚΗΣ"]
```


2.3) For each municipality of the region Peloponnese with population more than 5,000 people, give its official name, its population, and the regional unit it belongs to. Organize your answer by municipality and regional unit.

Query

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX strdf: <http://strdf.di.uoa.gr/ontology#>
PREFIX gag: <http://geo.linkedopendata.gr/gag/ontology/>
PREFIX owl: <http://www.w3.org/2002/07/owl#>

SELECT ?municipality  ?regional_unit
WHERE
{
?m rdf:type gag:Δήμος .
?m gag:έχει_επίσημο_όνομα ?municipality .
?m gag:ανήκει_σε ?reg_un .
?m gag:έχει_πληθυσμό ?population .
?reg_un gag:έχει_επίσημο_όνομα ?regional_unit .
?reg_un gag:ανήκει_σε ?reg .
?reg gag:έχει_επίσημο_όνομα 'ΠΕΡΙΦΕΡΕΙΑ ΠΕΛΟΠΟΝΝΗΣΟΥ'.
FILTER(?population > 5000).
}
```

Answer

```
[municipality="ΔΗΜΟΣ ΟΙΧΑΛΙΑΣ";regional_unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΜΕΣΣΗΝΙΑΣ"]
[municipality="ΔΗΜΟΣ ΚΑΛΑΜΑΤΑΣ";regional_unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΜΕΣΣΗΝΙΑΣ"]
[municipality="ΔΗΜΟΣ ΠΥΛΟΥ-ΝΕΣΤΟΡΟΣ";regional_unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΜΕΣΣΗΝΙΑΣ"]
[municipality="ΔΗΜΟΣ ΔΥΤΙΚΗΣ ΜΑΝΗΣ";regional_unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΜΕΣΣΗΝΙΑΣ"]
[municipality="ΔΗΜΟΣ ΜΕΣΣΗΝΗΣ";regional_unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΜΕΣΣΗΝΙΑΣ"]
[municipality="ΔΗΜΟΣ ΤΡΙΦΥΛΙΑΣ";regional_unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΜΕΣΣΗΝΙΑΣ"]
[municipality="ΔΗΜΟΣ ΒΕΛΟΥ-ΒΟΧΑΣ";regional_unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΚΟΡΙΝΘΙΑΣ"]
[municipality="ΔΗΜΟΣ ΣΙΚΥΩΝΙΩΝ";regional_unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΚΟΡΙΝΘΙΑΣ"]
[municipality="ΔΗΜΟΣ ΞΥΛΟΚΑΣΤΡΟΥ-ΕΥΡΩΣΤΙΝΗΣ";regional_unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΚΟΡΙΝΘΙΑΣ"]
[municipality="ΔΗΜΟΣ ΛΟΥΤΡΑΚΙΟΥ-ΑΓ.ΘΕΟΔΩΡΩΝ";regional_unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΚΟΡΙΝΘΙΑΣ"]
[municipality="ΔΗΜΟΣ ΚΟΡΙΝΘΙΩΝ";regional_unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΚΟΡΙΝΘΙΑΣ"]
[municipality="ΔΗΜΟΣ ΝΕΜΕΑΣ";regional_unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΚΟΡΙΝΘΙΑΣ"]
[municipality="ΔΗΜΟΣ ΕΥΡΩΤΑ";regional_unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΛΑΚΩΝΙΑΣ"]
[municipality="ΔΗΜΟΣ ΜΟΝΕΜΒΑΣΙΑΣ";regional_unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΛΑΚΩΝΙΑΣ"]
[municipality="ΔΗΜΟΣ ΣΠΑΡΤΗΣ";regional_unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΛΑΚΩΝΙΑΣ"]
[municipality="ΔΗΜΟΣ ΑΝΑΤΟΛΙΚΗΣ ΜΑΝΗΣ";regional_unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΛΑΚΩΝΙΑΣ"]
[municipality="ΔΗΜΟΣ ΤΡΙΠΟΛΗΣ";regional_unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΑΡΚΑΔΙΑΣ"]
[municipality="ΔΗΜΟΣ ΒΟΡΕΙΑΣ ΚΥΝΟΥΡΙΑΣ";regional_unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΑΡΚΑΔΙΑΣ"]
[municipality="ΔΗΜΟΣ ΜΕΓΑΛΟΠΟΛΗΣ";regional_unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΑΡΚΑΔΙΑΣ"]
[municipality="ΔΗΜΟΣ ΓΟΡΤΥΝΙΑΣ";regional_unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΑΡΚΑΔΙΑΣ"]
[municipality="ΔΗΜΟΣ ΝΟΤΙΑΣ ΚΥΝΟΥΡΙΑΣ";regional_unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΑΡΚΑΔΙΑΣ"]
[municipality="ΔΗΜΟΣ ΝΑΥΠΛΙΕΩΝ";regional_unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΑΡΓΟΛΙΔΑΣ"]
[municipality="ΔΗΜΟΣ ΑΡΓΟΥΣ-ΜΥΚΗΝΩΝ";regional_unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΑΡΓΟΛΙΔΑΣ"]
[municipality="ΔΗΜΟΣ ΕΠΙΔΑΥΡΟΥ";regional_unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΑΡΓΟΛΙΔΑΣ"]
[municipality="ΔΗΜΟΣ ΕΡΜΙΟΝΙΔΑΣ";regional_unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΑΡΓΟΛΙΔΑΣ"]
```

2.4) For each municipality of Peloponnese for which we have no seat (έδρα) information in the dataset, give its official name.

Query

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX strdf: <http://strdf.di.uoa.gr/ontology#>
PREFIX gag: <http://geo.linkedopendata.gr/gag/ontology/>
PREFIX owl: <http://www.w3.org/2002/07/owl#>

SELECT ?municipality ?seat
WHERE
{
?m rdf:type gag:Δήμος .
?m gag:έχει_επίσημο_όνομα ?municipality .
OPTIONAL{?m gag:έχει_έδρα ?seat} .
?m gag:ανήκει_σε ?reg_un .
?reg_un gag:ανήκει_σε ?reg .
?reg gag:έχει_επίσημο_όνομα 'ΠΕΡΙΦΕΡΕΙΑ ΠΕΛΟΠΟΝΝΗΣΟΥ'.
FILTER(!bound(?seat)) .
}
```

Answer (sample)

```
[municipality="ΔΗΜΟΣ ΟΙΧΑΛΙΑΣ"]
[municipality="ΔΗΜΟΣ ΚΑΛΑΜΑΤΑΣ"]
[municipality="ΔΗΜΟΣ ΠΥΛΟΥ-ΝΕΣΤΟΡΟΣ"]
[municipality="ΔΗΜΟΣ ΔΥΤΙΚΗΣ ΜΑΝΗΣ"]
[municipality="ΔΗΜΟΣ ΜΕΣΣΗΝΗΣ"]
[municipality="ΔΗΜΟΣ ΤΡΙΦΥΛΙΑΣ"]
[municipality="ΔΗΜΟΣ ΒΕΛΟΥ-ΒΟΧΑΣ"]
[municipality="ΔΗΜΟΣ ΣΙΚΥΩΝΙΩΝ"]
[municipality="ΔΗΜΟΣ ΞΥΛΟΚΑΣΤΡΟΥ-ΕΥΡΩΣΤΙΝΗΣ"]
[municipality="ΔΗΜΟΣ ΛΟΥΤΡΑΚΙΟΥ-ΑΓ.ΘΕΟΔΩΡΩΝ"]
[municipality="ΔΗΜΟΣ ΚΟΡΙΝΘΙΩΝ"]
[municipality="ΔΗΜΟΣ ΝΕΜΕΑΣ"]
[municipality="ΔΗΜΟΣ ΕΥΡΩΤΑ"]
[municipality="ΔΗΜΟΣ ΜΟΝΕΜΒΑΣΙΑΣ"]
[municipality="ΔΗΜΟΣ ΣΠΑΡΤΗΣ"]
[municipality="ΔΗΜΟΣ ΕΛΑΦΟΝΗΣΟΥ"]
[municipality="ΔΗΜΟΣ ΑΝΑΤΟΛΙΚΗΣ ΜΑΝΗΣ"]
[municipality="ΔΗΜΟΣ ΤΡΙΠΟΛΗΣ"]
[municipality="ΔΗΜΟΣ ΒΟΡΕΙΑΣ ΚΥΝΟΥΡΙΑΣ"]
[municipality="ΔΗΜΟΣ ΜΕΓΑΛΟΠΟΛΗΣ"]
[municipality="ΔΗΜΟΣ ΓΟΡΤΥΝΙΑΣ"]
```

2.5) For each municipality of Peloponnese, give its official name and all the administrative divisions of Greece that it belongs to according to Kallikratis. Your query should be the simplest one possible, and it should not use any explicit knowledge of how many levels of administration are imposed by Kallikratis.

Query

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX strdf: <http://strdf.di.uoa.gr/ontology#>
PREFIX gag: <http://geo.linkedopendata.gr/gag/ontology/>
PREFIX owl: <http://www.w3.org/2002/07/owl#>

SELECT ?name ?type ?ab_type
WHERE
{
?x rdf:type gag:Δήμος .
?x gag:έχει_επίσημο_όνομα ?name .
?x gag:ανήκει_σε* ?div .
?div rdf:type ?type .
?div gag:έχει_επίσημο_όνομα 'ΠΕΡΙΦΕΡΕΙΑ ΠΕΛΟΠΟΝΝΗΣΟΥ' .
?x gag:ανήκει_σε* ?ab_div .
?ab_div rdf:type ?ab_type .
} GROUP BY ?name ?type ?ab_type
```

Answer (sample)

[name="ΔΗΜΟΣ ΟΙΧΑΛΙΑΣ";type=http://geo.linkedopendata.gr/gag/ontology/Περιφέρεια;ab_type=http://geo.linkedopendata.gr/gag/ontology/Δήμος]
[name="ΔΗΜΟΣ ΟΙΧΑΛΙΑΣ";type=http://geo.linkedopendata.gr/gag/ontology/Περιφέρεια;ab_type=http://geo.linkedopendata.gr/gag/ontology/Περιφερειακή_Ενότητα]
[name="ΔΗΜΟΣ ΟΙΧΑΛΙΑΣ";type=http://geo.linkedopendata.gr/gag/ontology/Περιφέρεια;ab_type=http://geo.linkedopendata.gr/gag/ontology/Περιφέρεια]
[name="ΔΗΜΟΣ ΟΙΧΑΛΙΑΣ";type=http://geo.linkedopendata.gr/gag/ontology/Περιφέρεια;ab_type=http://geo.linkedopendata.gr/gag/ontology/Αποκεντρωμένη_Διοίκηση]
[name="ΔΗΜΟΣ ΟΙΧΑΛΙΑΣ";type=http://geo.linkedopendata.gr/gag/ontology/Περιφέρεια;ab_type=http://geo.linkedopendata.gr/gag/ontology/Χώρα]
[name="ΔΗΜΟΣ ΚΑΛΑΜΑΤΑΣ";type=http://geo.linkedopendata.gr/gag/ontology/Περιφέρεια;ab_type=http://geo.linkedopendata.gr/gag/ontology/Δήμος]
[name="ΔΗΜΟΣ ΚΑΛΑΜΑΤΑΣ";type=http://geo.linkedopendata.gr/gag/ontology/Περιφέρεια;ab_type=http://geo.linkedopendata.gr/gag/ontology/Περιφερειακή_Ενότητα]
[name="ΔΗΜΟΣ ΚΑΛΑΜΑΤΑΣ";type=http://geo.linkedopendata.gr/gag/ontology/Περιφέρεια;ab_type=http://geo.linkedopendata.gr/gag/ontology/Περιφέρεια]

2.6) For each region of Greece, give its official name, how many municipalities belong to it, the official name of each regional unit (περιφερειακή ενότητα) that belongs to it, and how many municipalities belong to that regional unit.

Query

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX strdf: <http://strdf.di.uoa.gr/ontology#>
PREFIX gag: <http://geo.linkedopendata.gr/gag/ontology/>
PREFIX owl: <http://www.w3.org/2002/07/owl#>

SELECT ?region_name ?total_m ?unit ?total_reg_un WHERE
{
{SELECT ?region_name (COUNT(?municipality) AS ?total_m)
WHERE
{
?m rdf:type gag:Δήμος .
?m gag:έχει_επίσημο_όνομα ?municipality .
?m gag:ανήκει_σε ?reg_un .
?reg_un gag:ανήκει_σε ?region .
?region gag:έχει_επίσημο_όνομα ?region_name .
} GROUP BY ?region_name
}
{SELECT  ?unit (COUNT(?municipality) AS ?total_reg_un)
WHERE
{ ?m rdf:type gag:Δήμος .
?m gag:έχει_επίσημο_όνομα ?municipality .
?m gag:ανήκει_σε ?reg_un .
?reg_un gag:έχει_επίσημο_όνομα ?unit .
} GROUP BY ?unit
}
} GROUP BY ?region_name ?total_m ?unit ?total_reg_un ORDER BY ?region_name
?total_m ?unit ?total_reg_un
```

Answer (sample)

[region_name="ΠΕΡΙΦΕΡΕΙΑ ΙΟΝΙΩΝ ΝΗΣΩΝ";unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΚΟΡΙΝΘΙΑΣ";total_reg_un="6"^^<http://www.w3.org/2001/XMLSchema#integer>;total_m="7"^^<http://www.w3.org/2001/XMLSchema#integer>]
[region_name="ΠΕΡΙΦΕΡΕΙΑ ΙΟΝΙΩΝ ΝΗΣΩΝ";unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΚΩ";total_reg_un="2"^^<http://www.w3.org/2001/XMLSchema#integer>;total_m="7"^^<http://www.w3.org/2001/XMLSchema#integer>]
[region_name="ΠΕΡΙΦΕΡΕΙΑ ΙΟΝΙΩΝ ΝΗΣΩΝ";unit="ΠΕΡΙΦΕΡΕΙΑΚΗ ΕΝΟΤΗΤΑ ΛΑΚΩΝΙΑΣ";total_reg_un="5"^^<http://www.w3.org/2001/XMLSchema#integer>;total_m="7"^^<http://www.w3.org/2001/XMLSchema#integer>]

2.7) Check the consistency of the dataset regarding stated populations: the sum of the populations of all administrative units A of level L must be equal to the population of the administrative unit B of level L+1 to which all administrative units A belong to. (You have to write one query only.)

Query

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX strdf: <http://strdf.di.uoa.gr/ontology#>
PREFIX gag: <http://geo.linkedopendata.gr/gag/ontology/>
PREFIX owl: <http://www.w3.org/2002/07/owl#>

SELECT ?type_x (SUM(?x_pop) AS ?pop_x) ?type_y ?y_pop
WHERE
{
?x rdf:type gag:Δημοτική_Ενότητα .
?x gag:ανήκει_σε* ?y .
?x rdf:type ?type_x .
?y rdf:type ?type_y .
?x gag:έχει_πληθυσμό ?x_pop .
?y gag:έχει_πληθυσμό ?y_pop .
} GROUP BY ?type_x ?x_pop ?type_y ?y_pop ORDER BY ?y_pop
```

Answer (sample)

[type_y=http://geo.linkedopendata.gr/gag/ontology/Χώρα;type_x=http://geo.linkedopendata.gr/gag/ontology/Δημοτική_Ενότητα;pop_x="926"^^<http://www.w3.org/2001/XMLSchema#integer>;y_pop="10263619"^^<http://www.w3.org/2001/XMLSchema#integer>]
[type_y=http://geo.linkedopendata.gr/gag/ontology/Χώρα;type_x=http://geo.linkedopendata.gr/gag/ontology/Δημοτική_Ενότητα;pop_x="3646"^^<http://www.w3.org/2001/XMLSchema#integer>;y_pop="10263619"^^<http://www.w3.org/2001/XMLSchema#integer>]

[type_y=http://geo.linkedopendata.gr/gag/ontology/Χώρα;type_x=http://geo.linkedopendata.gr/gag/ontology/Δημοτική_Ενότητα;pop_x="8772"^^<http://www.w3.org/2001/XMLSchema#integer>;y_pop="10263619"^^<http://www.w3.org/2001/XMLSchema#integer>]
[type_y=http://geo.linkedopendata.gr/gag/ontology/Χώρα;type_x=http://geo.linkedopendata.gr/gag/ontology/Δημοτική_Ενότητα;pop_x="835"^^<http://www.w3.org/2001/XMLSchema#integer>;y_pop="10263619"^^<http://www.w3.org/2001/XMLSchema#integer>]

2.8) Give the decentralized administrations (αποκεντρωμένες διοικήσεις) of Greece that consist of more than two regional units. (You cannot use SPARQL 1.1 aggregate operators to express this query.)

Query

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX strdf: <http://strdf.di.uoa.gr/ontology#>
PREFIX gag: <http://geo.linkedopendata.gr/gag/ontology/>
PREFIX owl: <http://www.w3.org/2002/07/owl#>

SELECT DISTINCT ?dec_name
WHERE
{
?x rdf:type gag:Περιφερειακή_Ενότητα .
?x gag:ανήκει_σε ?region .
?region gag:ανήκει_σε ?dec .
?y rdf:type gag:Περιφερειακή_Ενότητα .
?y gag:ανήκει_σε ?region_2 .
?region_2 gag:ανήκει_σε ?dec .
?z rdf:type gag:Περιφερειακή_Ενότητα .
?z gag:ανήκει_σε ?region_3 .
?region_3 gag:ανήκει_σε ?dec .
?dec gag:έχει_επίσημο_όνομα ?dec_name .
FILTER((?x != ?y) && (?y != ?z) && (?x != ?z)) .
}
```

Answer

```
[dec_name="ΑΠΟΚΕΝΤΡΩΜΕΝΗ ΔΙΟΙΚΗΣΗ ΑΙΓΑΙΟΥ"]
[dec_name="ΑΠΟΚΕΝΤΡΩΜΕΝΗ ΔΙΟΙΚΗΣΗ ΘΕΣΣΑΛΙΑΣ-ΣΤΕΡΕΑΣ ΕΛΛΑΔΑΣ"]
[dec_name="ΑΠΟΚΕΝΤΡΩΜΕΝΗ ΔΙΟΙΚΗΣΗ ΜΑΚΕΔΟΝΙΑΣ-ΘΡΑΚΗΣ"]
[dec_name="ΑΠΟΚΕΝΤΡΩΜΕΝΗ ΔΙΟΙΚΗΣΗ ΚΡΗΤΗΣ"]
[dec_name="ΑΠΟΚΕΝΤΡΩΜΕΝΗ ΔΙΟΙΚΗΣΗ ΑΤΤΙΚΗΣ"]
[dec_name="ΑΠΟΚΕΝΤΡΩΜΕΝΗ ΔΙΟΙΚΗΣΗ ΠΕΛΟΠΟΝΝΗΣΟΥ-ΔΥΤΙΚΗΣ ΕΛΛΑΔΑΣ-ΙΟΝΙΟΥ"]
[dec_name="ΑΠΟΚΕΝΤΡΩΜΕΝΗ ΔΙΟΙΚΗΣΗ ΗΠΕΙΡΟΥ-ΔΥΤΙΚΗΣ ΜΑΚΕΔΟΝΙΑΣ"]
```

Exercise 3

For that exercise I tried my queries that do not use the inferencer to return the same results with the queries that use the inferencer (use of * operator). If I did not use the aforementioned operator the results from the queries that do not use the inferencer would be less in number as it was expected.

3.1) Find all subclasses of class CollegeOrUniversity (note that http://schema.org/ prefers to use the equivalent term “type” for “class”).

Query

```
PREFIX org: <https://schema.org/>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
SELECT ?x
WHERE {?x rdfs:Class/rdfs:subClassOf org:CollegeOrUniversity}
```

Answer

It does not return anything because CollegeOrUniversity does not have subclasses.

3.2) Find all the superclasses of class CollegeOrUniversity.

Query

```
PREFIX org: <https://schema.org/>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
SELECT ?x
WHERE {org:CollegeOrUniversity rdfs:subClassOf ?x}
```

Answer

```
[x=https://schema.org/EducationalOrganization]
[x=http://www.w3.org/2000/01/rdf-schema#Resource]
[x=https://schema.org/CollegeOrUniversity]
[x=https://schema.org/CivicStructure]
[x=https://schema.org/Organization]
[x=https://schema.org/Place]
[x=https://schema.org/Thing]
```

3.3) Find all properties defined for the class CollegeOrUniversity together with all the properties inherited by its superclasses.

Query

```
PREFIX org: <https://schema.org/>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
SELECT DISTINCT ?p ?pr_sup
WHERE {
{org:CollegeOrUniversity ?p ?x .
} UNION
{org:CollegeOrUniversity rdfs:subClassOf ?x .
?x ?pr_sup ?val .
}
}
```

Answer

```
[p=http://www.w3.org/2000/01/rdf-schema#subClassOf]
[p=http://www.w3.org/2000/01/rdf-schema#comment]
[p=http://www.w3.org/1999/02/22-rdf-syntax-ns#type]
[p=http://www.w3.org/2000/01/rdf-schema#label]
[pr_sup=http://www.w3.org/2000/01/rdf-schema#subClassOf]
[pr_sup=http://www.w3.org/2000/01/rdf-schema#label]
[pr_sup=http://www.w3.org/2000/01/rdf-schema#comment]
[pr_sup=http://www.w3.org/1999/02/22-rdf-syntax-ns#type]
```

3.4) Find all classes that are subclasses of class Thing and are found in at most 2 levels of subclass relationships away from Thing.

Query

```
PREFIX org: <https://schema.org/>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
SELECT DISTINCT ?x_1 ?x_2
WHERE {
?x_1 rdfs:subClassOf org:Thing .
?x_2 rdfs:subClassOf ?x_1 .
}
```

Answer (sample)

```
[x_2=https://schema.org/StadiumOrArena;x_1=https://schema.org/SportsActivityLocation]
[x_2=https://schema.org/SportsClub;x_1=https://schema.org/SportsActivityLocation]
[x_2=https://schema.org/SportsActivityLocation;x_1=https://schema.org/SportsActivityLocation]
[x_2=https://schema.org/SportsTeam;x_1=https://schema.org/SportsOrganization]
[x_2=https://schema.org/SportsOrganization;x_1=https://schema.org/SportsOrganization]
[x_2=https://schema.org/EventSeries;x_1=https://schema.org/EventSeries]
[x_2=https://schema.org/HowToSection;x_1=https://schema.org/HowToSection]
[x_2=https://schema.org/Motorcycle;x_1=https://schema.org/Vehicle]
[x_2=https://schema.org/Car;x_1=https://schema.org/Vehicle]
```

Without inferencer

3.5) Find all subclasses of class CollegeOrUniversity (note that http://schema.org/ prefers to use the equivalent term “type” for “class”). (without inferencer)

Query

```
PREFIX org: <https://schema.org/>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
SELECT ?x
WHERE {?x rdfs:Class/rdfs:subClassOf* org:CollegeOrUniversity}
```

Answer

It does not return anything because CollegeOrUniversity does not have subclasses.

3.6) Find all the superclasses of class CollegeOrUniversity. (without inferencer)

Query

```
PREFIX org: <https://schema.org/>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
SELECT ?x
WHERE {org:CollegeOrUniversity rdfs:subClassOf* ?x}
```

Answer

```
[x=https://schema.org/CollegeOrUniversity]
[x=https://schema.org/EducationalOrganization]
[x=https://schema.org/CivicStructure]
[x=https://schema.org/Organization]
[x=https://schema.org/Place]
[x=https://schema.org/Thing]
```

3.7) Find all properties defined for the class CollegeOrUniversity together with all the properties inherited by its superclasses. (without inferencer)

Query

```
[p=http://www.w3.org/2000/01/rdf-schema#subClassOf]
[p=http://www.w3.org/2000/01/rdf-schema#comment]
[p=http://www.w3.org/1999/02/22-rdf-syntax-ns#type]
[p=http://www.w3.org/2000/01/rdf-schema#label]
[pr_sup=http://www.w3.org/2000/01/rdf-schema#subClassOf]
[pr_sup=http://www.w3.org/2000/01/rdf-schema#comment]
[pr_sup=http://www.w3.org/1999/02/22-rdf-syntax-ns#type]
[pr_sup=http://www.w3.org/2000/01/rdf-schema#label]
```

3.8) Find all classes that are subclasses of class Thing and are found in at most 2 levels of subclass relationships away from Thing. (without inferencer)

Query

```
PREFIX org: <https://schema.org/>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
SELECT DISTINCT ?x_1 ?x_2
WHERE {
?x_1 rdfs:subClassOf org:Thing .
?x_2 rdfs:subClassOf ?x_1 .
 }
```

Answer (sample)

```
[x_2=https://schema.org/WorkersUnion;x_1=https://schema.org/Organization]
[x_2=https://schema.org/Project;x_1=https://schema.org/Organization]
[x_2=https://schema.org/GovernmentOrganization;x_1=https://schema.org/Organization]
[x_2=https://schema.org/Consortium;x_1=https://schema.org/Organization]
[x_2=https://schema.org/EducationalOrganization;x_1=https://schema.org/Organization]
[x_2=https://schema.org/NewsMediaOrganization;x_1=https://schema.org/Organization]
[x_2=https://schema.org/LibrarySystem;x_1=https://schema.org/Organization]
[x_2=https://schema.org/Airline;x_1=https://schema.org/Organization]
```

Exercise 4

Quadruples					NL Questions	
					Question	Missing Knowledge
Question	Paraphrase	Query	Answer		Give the lower and upper value of the stack that is in normal mode condition.	-
What was the mitigation action suggested when the system was in membrane mechanical stress?	What action should be taken when the system is in membrane mechanical stress?	PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> PREFIX owl: <http://www.w3.org/2002/07/owl#> PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#> PREFIX xsd: <http://www.w3.org/2001/XMLSchema#> PREFIX sosa: <http://www.w3.org/ns/sosa/>	http://www.semanticweb.org/savtr/ontologies/2022/9/PEMFC_DI#decreaseTemperature		Get the parts of the FuelCellStack	-

		PREFIX sm: <http://www.semanticweb.org/savtr/ontologies/2022/9/PEMFC_DI#> PREFIX system: <http://www.w3.org/ns/ssn/systems/> PREFIX xml: <http://www.w3.org/XML/1998/namespace/> SELECT ?x WHERE { ?x rdf:type sm:MitigationAction . ?x sm:suggestedFor sm:membraneMechanicalStress }					
Which stacks does the system contain?	Retrieve the stacks of companies and the stacks of anode/cathode components	PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> PREFIX owl: <http://www.w3.org/2002/07/owl#> PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#> PREFIX xsd: <http://www.w3.org/2001/XMLSchema#> PREFIX sosa: <http://www.w3.org/ns/sosa/> PREFIX sm: <http://www.semanticweb.org/savtr/ontologies/2022/9/PEMFC_DI#> PREFIX system: <http://www.w3.org/ns/ssn/systems/> PREFIX xml: <http://www.w3.org/	http://semanticweb.cs.vu.nl/2009/11/sem/output_temp_stack2_t2 http://semanticweb.cs.vu.nl/2009/11/sem/obs_temp_stack1_t2 http://semanticweb.cs.vu.nl/2009/11/sem/temp_stack_2 http://semanticweb.cs.vu.nl/2009/11/sem/stack2 http://semanticweb.cs.vu.nl/2009/11/sem/obs_temp_stack1_t1 http://semanticweb.cs.vu.nl/2009/11/sem/temp_stack_1 http://semanticweb.cs.vu.nl/2009/11/sem/output_temp_stack1_t_2 http://semanticweb.cs.vu.nl/2009/11/sem/stack1 http://semanticweb.cs.vu.nl/2009/11/sem/output_temp_stack2_t1 http://semanticweb.cs.vu.nl/2009/11/sem/output_temp_stack1_t_1			In what states we say we are in failure mode?	-

		XML/1998/namespace/> SELECT DISTINCT ?s WHERE { ?s ?p ?o .FILTER regex(str(?s), "^((?!anode).)*$") . FILTER regex(str(?s), "^((?!cathode).)*$") . FILTER regex(str(?s), "stack|Stack")}	http://semanticweb.cs.vu.nl/2009/11/sem/obs_temp_stack2_t1 http://www.semanticweb.org/savtr/ontologies/2022/9/PEMFC_DI#temp_stack_2_operating_range http://semanticweb.cs.vu.nl/2009/11/sem/obs_temp_stack2_t2 http://www.semanticweb.org/savtr/ontologies/2022/9/PEMFC_DI#FuelCellStack				
Which calculated values are affected by rh_air?	Which value is observed by the sensor manufactured by company 2?	PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> PREFIX owl: <http://www.w3.org/2002/07/owl#> PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#> PREFIX xsd: <http://www.w3.org/2001/XMLSchema#> PREFIX sosa: <http://www.w3.org/ns/sosa/> PREFIX sm: <http://www.semanticweb.org/savtr/ontologies/2022/9/PEMFC_DI#> PREFIX system: <http://www.w3.org/ns/ssn/systems/> PREFIX xml: <http://www.w3.org/XML/1998/namespace/> PREFIX sem: <http://semanticweb.cs.vu.nl/2009/11/sem/> SELECT DISTINCT	http://www.semanticweb.org/savtr/ontologies/2022/9/PEMFC_DI#relativeHumidity		What parts the fuel cell system contains?	-

		?val
		WHERE
		{
		?x
		sosa:madeBySensor sm:rh_air .
		?x
		sosa:observedProperty ?val .
		}					

When did the membrane start to suffer
from mechanical stress?
	What was the time observed by stoich_result_t2	PREFIX rdf:
		<http://www.w3.org/1999/02/22-rdf-syntax-ns#>
		PREFIX owl:
		<http://www.w3.org/2002/07/owl#>
		PREFIX rdfs:
		<http://www.w3.org/2000/01/rdf-schema#>
		PREFIX xsd:
		<http://www.w3.org/2001/XMLSchema#>
		PREFIX sosa:
		<http://www.w3.org/ns/sosa/>
		PREFIX sm:
		<http://www.semanticweb.org/savtr/ontologies/2022/9/PEMFC_DI#>
		PREFIX system:
		<http://www.w3.org/ns/ssn/systems/>
		PREFIX xml:
		<http://www.w3.org/XML/1998/namespace/>
		
		SELECT ?s
		WHERE
		{
		?x sm:atTime_inSec ?s .
		?x
		sm:indicatesMode sm:membraneMechanicalStress .
		}
			"2.2"^^<http://www.w3.org/2001/XMLSchema#double>		Get all the results of the components of the system .	-

On which parts of the system is the temperature measured?	Which stacks have value for the temperature?	PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
		PREFIX owl: <http://www.w3.org/2002/07/owl#>
		PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
		PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
		PREFIX sosa: <http://www.w3.org/ns/sosa/>
		PREFIX sm: <http://www.semanticweb.org/savtr/ontologies/2022/9/PEMFC_DI#>
		PREFIX system: <http://www.w3.org/ns/ssn/systems/>
		PREFIX xml: <http://www.w3.org/XML/1998/namespace/>
		
		SELECT ?x
		WHERE
		{
		?x rdf:type sm:TemperatureSensorOutput .
		?x sm:hasValue ?y .
		
		}
			http://semanticweb.cs.vu.nl/2009/11/sem/output_temp_stack1_t_2
			http://semanticweb.cs.vu.nl/2009/11/sem/output_temp_stack1_t_1
			http://semanticweb.cs.vu.nl/2009/11/sem/output_temp_stack2_t1
			http://semanticweb.cs.vu.nl/2009/11/sem/output_temp_stack2_t2
						Get all the name of the properties and the time they got observed	-

Where are the relative humidity sensors placed?	What is the components of the sensor companies that observe relative humidity?	PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
		PREFIX owl: <http://www.w3.org/2002/07/owl#>
		PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
		PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
		PREFIX sosa: <http://www.w3.org/ns/sosa/>
		PREFIX sm: <http://www.semanticweb.org/savtr/ontologies/2022/9/PEMFC_DI#>
		PREFIX system: <http://www.w3.org/ns/ssn/systems/>
		PREFIX xml: <http://www.w3.org/XML/1998/namespace/>
		
		SELECT ?y
		WHERE
		{
		?x rdf:type sm:RelativeHumiditySensor .
		?x sosa:isHostedBy ?y .
		}
			http://www.semanticweb.org/savtr/ontologies/2022/9/PEMFC_DI#stack1_anode
			http://www.semanticweb.org/savtr/ontologies/2022/9/PEMFC_DI#stack2_cathode
						Get the values of the temperature sensors.	-

Are there any sensors from sensor_company_1 that returned invalid results?	Are all the results from sensor_company_1 reliable ?	PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
		PREFIX owl: <http://www.w3.org/2002/07/owl#>
		PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
		PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
		PREFIX sosa: <http://www.w3.org/ns/sosa/>
		PREFIX sm: <http://www.semanticweb.org/savtr/ontologies/2022/9/PEMFC_DI#>
		PREFIX system: <http://www.w3.org/ns/ssn/systems/>
		PREFIX xml: <http://www.w3.org/XML/1998/namespace/>
		PREFIX sem: <http://semanticweb.cs.vu.nl/2009/11/sem/>
		
		SELECT ?x ?y
		WHERE
		{
		?x sem:manufacturedBy sm:sensor_company_1 .
		?x sm:isReliable ?y .
		FILTER(?y = false)
		}
			doen't return anything because all results are **reliable**			Get the year the components of the each stack got manufactured	-

Which system components were manufactured by which companies?	Retrieve the names of the companies and the components they produce.	PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> PREFIX owl: <http://www.w3.org/2002/07/owl#> PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#> PREFIX xsd: <http://www.w3.org/2001/XMLSchema#> PREFIX sosa: <http://www.w3.org/ns/sosa/> PREFIX sm: <http://www.semanticweb.org/savtr/ontologies/2022/9/PEMFC_DI#> PREFIX system: <http://www.w3.org/ns/ssn/systems/> PREFIX xml: <http://www.w3.org/XML/1998/namespace/> PREFIX sem: <http://semanticweb.cs.vu.nl/2009/11/sem/> SELECT ?company ?component WHERE { ?x rdf:type ?component . ?x sem:manufacturedBy ?company . FILTER(?component != owl:NamedIndividual) } GROUP BY ?company ?component	http://www.semanticweb.org/savtr/ontologies/2022/9/PEMFC_DI#sensor_company_2	http://www.semanticweb.org/savtr/ontologies/2022/9/PEMFC_DI#RelativeHumiditySensor	Get the number of voltage cycles of each component of each stack.	-

			http://www.semanticweb.org/savtr/ontologies/2022/9/PEMFC_DI#sensor_company_2	http://www.w3.org/ns/sosa/Sensor	What sensors exist in the system?	-
			http://www.semanticweb.org/savtr/ontologies/2022/9/PEMFC_DI#fc_company_2	http://www.semanticweb.org/savtr/ontologies/2022/9/PEMFC_DI#Anode	What type of values get observed in the system?	-
			http://www.semanticweb.org/savtr/ontologies/2022/9/PEMFC_DI#fc_company_1	http://www.semanticweb.org/savtr/ontologies/2022/9/PEMFC_DI#FuelCellStack	Get all the available mitigation actions.	-
			http://www.semanticweb.org/savtr/ontologies/2022/9/PEMFC_DI#sensor_company_1	http://www.semanticweb.org/savtr/ontologies/2022/9/PEMFC_DI#TemperatureSensor		
			http://www.semanticweb.org/savtr/ontologies/2022/9/PEMFC_DI#fc_company_2	http://www.semanticweb.org/savtr/ontologies/2022/9/PEMFC_DI#FuelCellStack		
What was the output of the sensors from which the stoichiometry was calculated before the 2"?	Retrieve the stoichiometry value that calculated at the min time.	PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> PREFIX owl: <http://www.w3.org/2002/07/owl#> PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#> PREFIX xsd: <http://www.w3.org/2001/XMLSchema#> PREFIX sosa: <http://www.w3.org/	http://www.semanticweb.org/savtr/ontologies/2022/9/PEMFC_DI#stoich_result_t1	6^^<http://www.w3.org/2001/XMLSchema#integer>		

		ns/sosa/>
		PREFIX sm:
		<http://www.semanticweb.org/savtr/ontologies/2022/9/PEMFC_DI#>
		PREFIX system:
		<http://www.w3.org/ns/ssn/systems/>
		PREFIX xml:
		<http://www.w3.org/XML/1998/namespace/>
		
		SELECT ?name ?val WHERE
		{
		?name rdf:type sm:StoichiometryResult .
		?name sm:hasValue ?val .
		?y sm:describedBy ?name_2 .
		?y sm:atTime_inSec ?time .
		FILTER(?name = ?name_2 && ?time < 2)
		}				

When was the stoichiometry value more than 7?	Retrieve the max time of calculation of stoichiometry	PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> PREFIX owl: <http://www.w3.org/2002/07/owl#> PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#> PREFIX xsd: <http://www.w3.org/2001/XMLSchema#> PREFIX sosa: <http://www.w3.org/ns/sosa/> PREFIX sm: <http://www.semanticweb.org/savtr/ontol	http://www.semanticweb.org/savtr/ontologies/2022/9/PEMFC_DI#stoich_result_t2	2.2^^<http://www.w3.org/2001/XMLSchema#double>		

		ogies/2022/9/PEMFC_DI#>
		PREFIX system:
		<http://www.w3.org/ns/ssn/systems/>
		PREFIX xml:
		<http://www.w3.org/XML/1998/namespace/>
		
		SELECT ?name ?time WHERE
		{
		?name rdf:type sm:StoichiometryResult .
		?name sm:hasValue ?val .
		?y sm:describedBy ?name_2 .
		?y sm:atTime_inSec ?time .
		FILTER(?name = ?name_2 && ?val > 7)
		}				