Exercise Sheet 4: SPARQL

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Exercise 4.1. Write a SPARQL query that counts the number of directed triangles along `eg:edge` edges. Which answer do you expect on the following graph?

```
_:1   eg:edge   _:1, _:2, _:3, _:4 .
_:2   eg:edge   _:1, _:3 .
_:3   eg:edge   _:1, _:2 .
_:4   eg:edge   _:1, _:4 .
```

Exercise 4.2. Show that Theorem 4.15 from the lecture fails in the presence of blank nodes: find disjoint BGPs P_1 and P_2 such that

$$\mathsf{eval}_G(P) \neq \mathsf{Join}(\mathsf{eval}_G(P_1), \mathsf{eval}_G(P_2)).$$

Exercise 4.3. Show that there are sets of solution mappings M_1 and M_2 such that

- each solution in M_1 is compatible with each solution in M_2,
- M_1 and M_2 together contain more than two solutions, and
- $\mathsf{Join}(M_1, M_2)$ contains just one solution.

Exercise 4.4. Consider the following graph.

```
eg:Arrival          eg:actorRole eg:aux1, eg:aux2 ;
                    eg:director  "Denis Villeneuve" .
eg:aux1             eg:actor     eg:Adams ;
                    eg:character "Louise Banks" .
eg:aux2             eg:actor     eg:Renner ;
                    eg:character "Ian Donnelly" .
eg:Gravity          eg:actorRole [ eg:actor eg:Bullock;
                                   eg:character "Ryan Stone" ] ;
                    eg:actorRole [ eg:actor eg:Clooney;
                                   eg:character "Matt Kowalski" ] ;
                    eg:director  "Alfonso Cuarón" .
eg:AmericanHustle   eg:actorRole eg:aux3, eg:aux4 ;
                    eg:director  "David Russell" .
eg:aux3             eg:actor     eg:Adams ;
                    eg:character "Sydney Prosser" .
eg:aux4             eg:actor     eg:Renner ;
                    eg:character "Carmine Polito" .
```

Write a SPARQL query that finds all pairs of actors that have co-starred in two movies. Which results do you expect?

Exercise 4.5. Consider a simple bipartite graph $G = \langle V, E \rangle$. Show that the following are equivalent:

1. G has exactly two distinct 2-colourings
2. G is connected