LOE

Basic Concepts

Solution **1.1** By now you should be able to do it without help.

### Informal to formal

Solution **1.2** ANSWER:

- D = <E, C, P>
- E = Alice, Bill, The Eiffel Tower, Paris
- C = place, city
- P = locatedIn, visited
- M = place(The Eiffel Tower), city(Paris), locatedIn(The Eiffel Tower, Paris), visited(Alice, The Eiffel Tower), visited(Bill, The Eiffel Tower)

NOTE: there are some implicit concepts that are not represented, e.g. the fact that Alice and Bill are persons; in this example all properties are Object Properties.
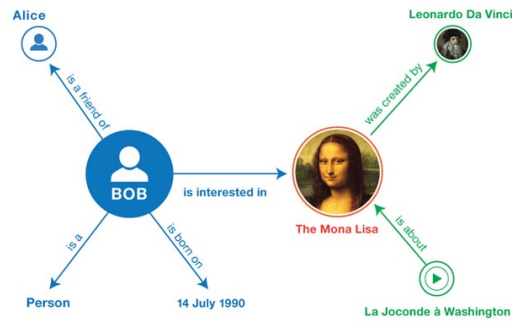
Solution **1.3** ANSWER: Yes. A case is described below with a Venn Diagram.
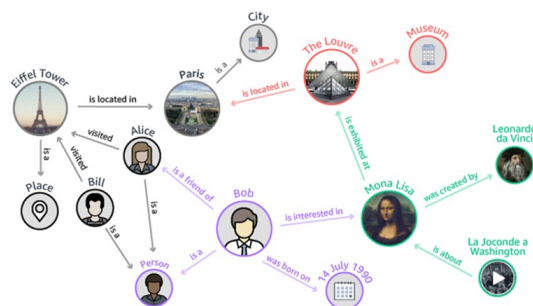
Solution **1.4**

- wasCreatedBy(TheMonaLisa, LeonardoDaVinci)
- isAbout(LaJocondeAWashington, TheMonaLisa)
- Person(Bob)
- friendOf(Bob, Alice)
- isBornOn(Bob,"14 July 1990")
- interestedIn(Bob, TheMonaLisa)

NOTE: isBornIn is a Data Property, while the other properties are Object Properties.

Solution **1.5**

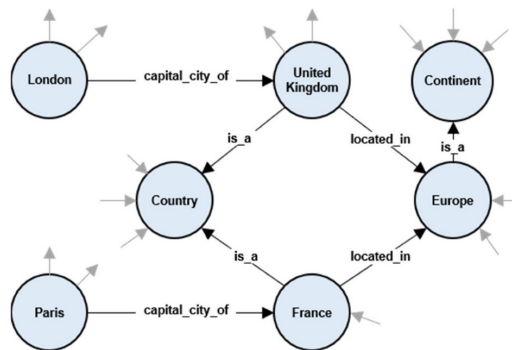- Interpretation function I
- $\mathcal{I}_e$(Bob) = Bob White
- $\mathcal{I}_e$(Alice) = Alice Black
- $\mathcal{I}_e$(LeonardoDaVinci) = Leonardo Da Vinci
- $\mathcal{I}_e$(TheMonaLisa) = The Mona Lisa
- $\mathcal{I}_E$(Person) = Person
- $\mathcal{I}_O$(wasCreatedBy) = created
- $\mathcal{I}_O$(isAbout) = about

TODO: Intended model (just the venn diagram)

Solution **1.6**

Solution **1.7** Theory $\mathcal{T}$:

- profession(Andy, programmer)
- dateOfBirth(Andy, 1981)
- wife(Andy, Amy)
- bornIn(Andy, Washington)

- brotherOf(Bob, Andy)

Solution **1.8** By now you should be able to do it without help.

Solution **1.9** By now you should be able to do it without help.

Solution **1.10** By now you should be able to do it without help.

Solution **1.11** ANSWERS:

- is true because Alice hasViewed Titanic and Titanic directed James Cameron.
- are true because the nodes corresponding to the given labels are sources of an arc, whereas the data values (values) must necessarily be only destinations of arcs.
- is false because we can decide how to model it, as an entity or as a value.
- Same as 2.
- is false because there is nothing in KG to indicate that they are people.
- is false because being in KG destinations of arcs, we can also decide to model them as a data value.
- is true because in KG the destination nodes of arcs with label "hasSeen" are themselves source nodes of other arcs.

Reasoning

Entailment

Solution **1.12** Model M: Andy is born on 1993 in Washington. He is married with Carol and currently employed as programmer. He has a brother called Bob. M as a set of facts in natural language:

- Andy is born on 1993.
- Andy is born in Washington.
- Andy is married with Carol.
- The profession of Andy is the programmer.
- Andy's brother is called Bob.

Solution **1.13** ANSWER: yes, and $\mathcal{T}$ is also complete w.r.t. M

Solution **1.14** Here's the solution:

- $\mathcal{KG} \models$ bornin(Andy, Washington)
- $\mathcal{KG} \models$ profession(Bob, Lawyer)
- $\mathcal{KG} \not\models$ wife(Andy, Aileen)

Solution **1.15** Here's the solution: wife(Bob, Aileen), wife(Andy, Amy) and $\emptyset$ (in fact, there is no explicit representation of concepts in this $\mathcal{KG}$).

Correctness and Completeness

Solution **1.16** ANSWERS:

1. is false because in E the integers must be represented as integers (integer), where name and value must coincide; this is true for all data values.
2. is true because it is okay to add in D more elements than the table (a model is a subset of the domain), i.e. in the specific case "city" as etype intended even if not explicitly represented in the table; note that entity and dtype should always be put in C.
3. is true because cities here are represented as elements of the entity set, that is, the set containing all entities.
4. is true because the domain can also have more elements than the table.
5. is false because an element for Naples is missing in E; a domain must have all the elements mentioned in the language, otherwise the corresponding interpretation cannot be defined.
6. is true because the interpretation function need not preserve names.
7. is false because, given the table, residence cannot be an etype.
8. is not a model definition because the formalization of the domain is not complete; the Rs are missing.