COMP 543, Homework 1

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HOMEWORK PROBLEMS

(1) Consider the following set of relations, which describe coffee and coffee drinkers:

DRINKS (PERSON, COFFEE)

HAS_BEAN (COFFEE, BEAN_NAME)

BEAN (BEAN_NAME, FROM_LOCATION)

The relation DRINKS tells us which people drink which coffees. The HAS_BEAN relation tells us what coffee beans go into each type of coffee. And the BEAN relation tells us which location each coffee bean comes from.

Write RA expressions to compute each of the following. Note that you can abbreviate attribute names if you'd like to write less (you can use P for PERSON, C for COFFEE, BN for BEAN_NAME, and FL for FROM_LOCATION). Each is worth 10 points, except for 1(a), which is worth 5 points.

(a) Which beans are in the coffee named "Blend 101"?

PROJECT(BN)(SELECT(C = "Blend 101")(HAS_BEAN))

(b) Which people drink a coffee that contains the "Pacas" coffee bean?

PROJECT(P)(SELECT(BN = "Pacas")(DRINKS * HAS_BEAN))

(c) Who does not drink a coffee containing a bean from the location "Rwanda"?

PROJECT(P)(DRINKS) - PROJECT(P)(SELECT(FL = "Rwanda")(DRINKS * HAS_BEAN * BEAN))

(2) Consider the same set of relations:

Write RC expressions to compute each of the following. Again, you can abbreviate attribute names. Each is worth 10 points, except for 2(a), which is worth 5 points.

(a) Which locations contribute a bean to the coffee named “Garuda blend”?

{b.FL | BEAN(b) and EXISTS(h)(HAS_BEAN(h) and h.BN = b.BN and h.C = “Garuda blend”)}

(b) Who has never tried a coffee containing a bean from the location “Hawaii”?

{d.P | DRINKS(d) and FORALL(dd)(DRINKS(dd) and dd.P = d.P => NOT EXISTS(h)(HAS_BEAN(h) and h.C = dd.C and EXISTS(b)(BEAN(b) and b.BN = h.BN and b.FL = “Hawaii”)))}

(c) Which people drink all of the coffees containing the bean “Caturra”?

{d.P | DRINKS(d) and FORALL(h)(HAS_BEAN(h) and h.BN = “Caturra” => EXISTS(dd)(DRINKS(dd) and dd.P = d.P and dd.C = h.C))}