Assignment 6

Relational Algebra Operations

The following set of relations is from the East Coast Aquarium database that appears in Chapter 14 of your text book.  Read Chapter 14 to get a better understanding of these relations.

* Species (Species Code, Latin Name, English Name)
* Location (Location Code, Place in Building, Size, Head Keeper)
* Population (Species Code, Location Code, Number of Animals)
* Food (Type of Food)
* Feeding (Species Code, Type of Food, Amount of Food, Feeding Interval)
* Habitats (Habitat Type)
* Can Live (Species Code, Habitat Type)
* Where Found (Location Code, Habitat Type)
* Source (Source Code, Source Name, Source Address, Source Phone, Contact Person)
* Can Supply (Source Code, Species Code)
* Shipment (P.O. #, Source Code, Order Date, Order Total $)
* Shipment Items (P.O. #, Species Code, Number of Animals, Each $, Line $)

Give the relational algebra operations (i.e., RESTRICT, PROJECT, JOIN, UNION, DIFFERENCE/MINUS, PRODUCT, INTERSECT) for each query listed below.

For example, to answer the query "List the Order Date for the P.O. # 85093", you would use the following two relational algebra operations:

* RESTRICT FROM Shipment WHERE P.O. # = 85093 GIVING One Order
* PROJECT Order Date FROM One Order GIVING One Order Date

Complex examples:

1. List the names of all head keepers who are responsible for Hammerhead Sharks.

RESTRICT FROM Species WHERE English Name = ‘Hammerhead shark’ GIVING One Species

PROJECT Species Code FROM One Species GIVING One Species Code

JOIN One Species Code TO Population OVER Species Code GIVING One Species Locations

JOIN One Species Locations TO Location OVER Location Code GIVING Location Details

PROEJCT Head Keeper FROM Location Details GIVING Keeper Names(Note: Can drop first PROJECT above – just better perf this way – must join Species and Population instead of using One Species Code)

2. List the Latin name of all species that do not live in location 1 (the main tank).

RESTRICT FROM Population WHERE Location Code = 1 GIVING One Place

PROJECT Species Code FROM One Place GIVING Which Live There

PROJECT Species Code FROM Species GIVING Species List

Species List MINUS Which Live There GIVING Do Not Live There

JOIN Do Not Live There TO Species OVER Species Code GIVING All Data

PROJECT Latin Name FROM All Data GIVING Latin Name List

(Note: Be careful to handle species can habitat multiple tanks / locations)

Queries:

1. List the habitats that have species with code 155.

RESTRICT FROM species WHERE species\_numb = 155 GIVING oneSpecies

JOIN oneSpecies TO can\_live\_in OVER species\_numb GIVING oneSpeciesCanLiveIn

JOIN oneSpeciesCanLiveIn TO habitat OVER habitat\_numb GIVING oneSpeciesHabitat

PROJECT habitat\_numb FROM oneSpeciesHabitat GIVING oneSpeciesHabitatList

1. List the place in the building of all locations that are less than 50 gallons in size.

RESTRICT FROM location WHERE fluid\_capacity <= 50 GIVING less\_than\_50

PROJECT place\_in\_building FROM less\_than\_50 GIVING less\_than\_50\_location

1. List the types of food eaten by Bottlenose Dolphins.

RESTRICT FROM Species WHERE English Name = ‘Bottlenose Dolphins’ GIVING oneDolphins

JOIN oneDolphines TO feeding OVER species\_numb GIVING dolphinFeed

JOIN dolphinFeed TO food OVER food\_numb GIVING dolphinFood

PROJECT food\_numb, food\_description FROM dolphinFood GIVING dolphineFoodList

1. List the English name and species code of each species that live in location code 222.

RESTRICT FROM location WHERE tank\_numb = 222 GIVING location222

JOIN location222 TO population OVER tank\_numb GIVING location222population

JOIN location222population TO species OVER species\_numb GIVING location222species

PROJECT species\_numb, English\_name FROM location222species GIVING location222speciesList

1. List the English name of all species that can live in a coral reef habitat.

RESTRICT FROM habitat WHERE habitat\_description = ‘coral reef’ GIVING coral\_reef\_habitat

JOIN coral\_reef\_habitat TO can\_live\_in OVER habitat\_numb GIVING coral\_reef\_habitat\_can\_live\_in

JOIN coral\_reef\_habitat\_can\_live\_in TO species OVER species\_numb GIVING coral\_reef\_species

PROJECT English\_name FROM coral\_reef\_species GIVING coral\_reef\_species\_english\_name

1. List the Latin name of all species that eat meal worms.

RESTRICT FROM food WHERE food\_description = ‘meal worms’ GIVING meal\_worm

JOIN meal\_worm TO feeding OVER food\_numb GIVING feeding\_meal\_worm

JOIN feeding\_meal\_worm TO species OVER species\_numb GIVING eat\_meal\_worm\_species

PROJECT latin\_name FROM eat\_meal\_worm\_species GIVING latin\_name\_list

1. List the Latin name of all species that do not eat mealworms.

RESTRICT FROM food WHERE food\_description = ‘meal worms’ GIVING meal\_worm

JOIN meal\_worm TO feeding OVER food\_numb GIVING feeding\_meal\_worm

JOIN feeding\_meal\_worm TO species OVER species\_numb GIVING eat\_meal\_worm\_species

PROJECT species\_numb FROM eat\_meal\_worm\_species GIVING eat\_worm\_species

PROJECT species\_numb FROM species GIVING species\_list

Species\_list MINUS eat\_worm\_species GIVING do\_not\_eat\_worm\_species

JOIN do\_not\_eat\_worm\_species TO species OVER species\_numb GIVING data

PROJECT latin\_name FROM data GIVING latin\_name\_list

1. List the contact person and phone number at each source that can supply harbor seals.

RESTRICT FROM species WHERE English\_name = ‘harbor seals’ GIVING harbor\_seal

JOIN harbor\_seal TO can\_supply OVER species\_numb GIVING harbor\_seal\_supply

JOIN harbor\_seal\_supply TO source OVER source\_numb GIVING harbor\_seal\_supply\_source

PROJECT source\_numb, source\_name, source\_contact\_first, source\_contact\_last, source\_contact\_phone, source\_contact\_ext FROM harbor\_seal\_supply\_source GIVING source\_contact\_list

1. List the name of each source from which an animal costing more than $5,000 was ordered.

RESTRICT FROM shipmentItems WHERE each$ >= 5000 GIVING highCostAnimals

JOIN highCostAnimals TO shipment over P.O. GIVING highCostAnimalsShipment

JOIN highCostAnimalsShipment TO source OVER source\_code GIVING highCostAnimalSource

PROJECT source\_name FROM highCostAnimalSource GIVING highCostAnimalSourceName

1. List the English name of all species that were ordered on purchase order # 85093.

RESTRICT FROM shipment WHERE P.O = ‘85093’ GIVING oneOrder

JOIN oneOrder TO shipment\_items OVER P.O. GIVING oneOrderShipment

JOIN oneOrderShipment TO species OVER species\_code GIVING shipment\_species

PROJECT English\_name FROM shipment\_species GIVING oneOrder\_english\_name