

CS4123 Autumn 2016
Homework Assignment 4
Binman database

The Binman is in the refuse and recycling business. He operates a fleet of collection trucks equipped with on-board weighing scales. Each bin is weighed before and after being emptied into the truck, so the Weight (in Kgs) refers to how much waste has been collected. A charge is then levied at a standard rate per Kilo. Below is a small **extract** from one of his database tables. The numbers in the first two columns are unique identifiers.

Invoices

Inum	Customer	Truck	Coll-Date	Bin	Weight
1212	343	10	18-Sep-16	Brown	15.00
1233	121	11	16-Sep-16	Green	15.44
1234	222	13	18-Sep-16	Green	13.12
2233	202	10	18-Sep-16	Black	21.34
2344	555	10	17-Sep-16	Black	18.99
2345	222	12	17-Sep-16	Brown	23.56
3322	434	11	16-Sep-16	Grey	32.44
3345	111	13	17-Sep-16	Grey	15.44
3467	333	10	17-Sep-16	Grey	21.34
4321	101	12	16-Sep-16	Brown	15.04
4455	303	12	18-Sep-16	Grey	23.12
4545	121	11	16-Sep-16	Brown	15.13
4566	555	12	19-Sep-11	Green	13.12
5432	101	13	17-Sep-16	Green	15.13
6544	333	10	21-Sep-16	Black	25.99

The basic sets are **Names, Numbers, Dates**

Q1 (a) Write declarations for the following domains: **IDS, Colours, Trucks**

(b) Using the basic sets and the domains, write declarations for the n-ary relation **Invoices**

(c) Write the declaration for a tuple in the relation. Refer to it as **i-tuple**.

Q2 Using IDS as the domain, write declarations for the following functions:

Customer, Truck, Coll-Date, Bin, Weight

Q3 Without using the keywords AND or OR, write Relational Algebra Operations for the following SQL statements:

- Select * from Invoices where Bin = 'Green' OR bin = 'Grey';
- Select distinct Bin from Invoices;
- Select Truck from Invoices minus Select Truck from Invoices where Weight > 25.00
- Select * from Invoices where Customer = 333 AND Bin = 'Black';
- Select Bin, Truck, Weight from Invoices;
- Select * from Invoices where Coll-date > '18-Sep-16';
- Select Inum, Customer from Invoices where Bin= 'Green' AND (customer = 434 OR Customer = 333);
- Select distinct Customer from Invoices where Coll-date between '16-Sep-16' AND '19-Sep-16';
- Select distinct Customer from Invoices where Customer between 222 AND 333;
- Select Inum, Customer, Weight*0.25 from Invoices where Coll-Date = '18-Sep-16';

Q4 Rewrite the first five queries in Q3 using Set Comprehension and the functions and domains that were introduced in the earlier questions. You may use AND and OR.